


[HOME](#) / [Glossary](#) /

[This Site](#)
[All of NOAA](#)

Glossary

- [Main Page](#)
- [References](#)

Glossary

This glossary contains nearly 3,000 technical terms, with their definitions, explanations, and illustrative materials where apropos. The aim of the CoRIS glossary is to help the student or layperson, as well as the professional scientist and manager, to understand the complex language and terminology of coral reef ecosystem science when accessing any part of the NOAA Coral Reef Information System (CoRIS), including the scientific and technical literature and data. Habitats and communities adjacent to the coral reefs, such as sea grass meadows, mangrove forests and associated hard and soft substrate habitats are included within the scope of the coral reef ecosystem.

The glossary contains terms concerned with ecology, biogeography, evolution, taxonomy, morphology, physiology, cell and molecular biology, genetics, mapping, development, fisheries, oceanography, geosciences, conservation programs, remote-sensing, physics, chemistry, and data and information management.

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (12.7 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

Making a Contribution

We encourage the professional and academic community to contribute terms to the glossary. Suggestions will be reviewed by glossary staff.

Most terms related to corals, coral reefs, coral reef data and information, and coral reef threats and hazards already are listed in the glossary.

Contributors should provide:

1. the term, its definition, and a reference source;
2. its relationship to coral reefs, if it is not evident;
3. (optional) a related photograph and caption; and
4. the contributor's name, affiliation, and phone and/or email.

Please send your contributions to coris@noaa.gov. Write *Glossary Addition* in the subject of the email.

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[Main Page](#)
[References](#)

This Site
All of NOAA

Glossary of Terminology: A

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

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Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

abalone - a univalve mollusk (class Gastropoda) of the genus *Haliotis*. Abalones are harvested commercially for food consumption. The shell is lined with mother-of-pearl and used for commercial (ornamental) purposes



Ron McPeak

Sea otters are in direct competition with humans for abalone. (Photo: Ron McPeak)

abatement - reducing the degree or intensity of, or eliminating

abaxial - away from, or distant from the axis

abbreviate - shortened

abcauline - pertaining to hydrozoan polyps that extend outwards from the common stem

abdomen - in higher animals, the portion of the body that contains the intestines and other viscera other than the lungs and heart; in arthropods, the rearmost segment of the body, which contains part of the digestive tract and all the reproductive organs



The ventral surface of the abdomen of an American lobster. Prominent are the swimmerettes, uropods, and telson.

abdominal fin - a term used to describe the location of the pelvic (ventral) fins when they are inserted far behind pectorals. This is the more primitive condition. More recently evolved conditions have the pelvic fins in the thoracic or jugular positions. A salmon, for example, has its pelvic fins in the abdominal position. An angelfish has the pelvic fins in the thoracic position, and blennies have the pelvic fins in the jugular position, anterior to the pelvic girdle

abductor - a type of muscle whose function is to move an appendage or body part away from the body of an animal. Abductors work antagonistically with adductors

aberrant - a term used to describe an atypical appearance or behavior in an animal or plant

abient - avoiding or turning away from a source of stimulation

abiogenic - refers to things not involved with or produced by living organisms

abiotic - refers to nonliving objects, substances or processes

ablation - the experimental removal or killing of some part of an organism

abnormal - not normal; contrary to the usual structure, position, behavior or rule

aboral - situated opposite to, or away from the mouth; normally used to describe radially symmetrical animals, such as starfishes, sea urchins, and jellyfishes



Spines protect the aboral surface of a sea urchin. (Photo: NOAA)

abraded - worn or frayed

abbranchiate - lacking gills

abrasion - the mechanical process of gradually breaking down a hard layer

absolute tautonymy - in taxonomy, the identical spelling of a generic-group name and one of its included specific-group names, such as the fish, *Badis badis*, or the western lowland gorilla, *Gorilla gorilla gorilla*

absolute zero - the temperature at which all motion will cease (0 degrees Kelvin or -273.15 degrees C)

absorption - the biological process that follows digestion, by which the products of digestion are transferred into the organism's internal environment, enabling them to reach the cells

absorptive feeder - an animal, such as a parasitic tapeworm, that absorbs digested food products through the body wall



A parasitic tapeworm is an absorptive feeder. The narrowest point is the "head" or scolex which attaches the parasite to the intestinal lining by means of suckers and/or little hooks. Predigested nutrients are absorbed through the wall of each of the progressively larger segments. These animals have no digestive canal. (Photo: HHS/Centers for

abundance - the number or amount of something, e.g., the number of organisms per unit of habitat space or number of individuals in a stock or a population

abyssal plain - the ocean bottom offshore from the continental margin, usually very flat with a slight slope

abyssal zone - the deep sea region below 2,000 meters (some consider it to be the region below 4000+ meters). This region is characterized by continuous cold, extremely high water pressure, low nutrients, and near or total absence of light, except for bioluminescence

abyssalpelagic zone - the pelagic environment from a depth of 4000 m to 7000 m. The water temperature in this zone is constantly near freezing; also called the "abyssopelagic zone"

acanthaceous - being armed with spines or other pointed projections

Acanthaster - the Crown-of-Thorns starfish genus. *Acanthaster planci* is a voracious Indo-Pacific predator of corals



Crown-of-Thorns starfish (*Acanthaster sp.*), a voracious predator of corals.

acantho- - a prefix meaning "with spines"



The phylum Acanthocephala contains about 1,000 species of spiny-headed worms. All are endoparasites in the intestinal tract of vertebrates, especially fishes. (Image: Dr. Rick Gillis, Biol. Dept., Univ. of Wisconsin)

acanthocaulus - a juvenile coral of some species that is attached to the substrate either directly or on a stalk

acanthotrich (acanthotrichium) - in fishes, a spiny dorsal or anal fin ray

acaudal - lacking a tail

acaudal - lacking a tail

accepted name - in taxonomy, a name adopted by an author as the correct name for a taxon

accessory pigment - a photosynthetic pigment which absorbs light and transfers energy to chlorophylls during photosynthesis

accessory respiratory organ - in fishes, a superficial or internal organ which complements the gills in respiration when the fish is in poorly oxygenated water or in air

accidental host - a host in which a parasite is not commonly found

accidental parasite - a parasite in or on an organism other than its normal host; an incidental parasite

acclimation (acclimatization) - a change that occurs in an organism to allow it to tolerate a new environment

accretion - growth by virtue of an increase in intercellular material

accuracy - the closeness by which a set of measurements approaches the true value

acellular - describes the construction of an organism or tissue that is a mass of protoplasm which is not divided into cells, e.g., some structural parts of slime molds and fungi

acentric - not centered

acerate - needle-shaped

acerose - having a sharp, rigid point

acetal - any organic compound formed by adding alcohol molecules to aldehyde molecules

achelate - lacking a claw or pincer-like structure

achromic - unpigmented; without color

aciculate - needle-like or having needle-like parts

aciculum - a chitinous basal seta or rod supporting the parapodial lobes in polychaete worms

acid - a substance that increases the hydrogen ion concentration in a solution

acid rain - the precipitation of sulfuric acid and other acids as rain. The acids form when sulfur dioxide and nitrogen oxides released during the combustion of fossil fuels combine with water and oxygen in the atmosphere

acidic - having a pH of less than 7

acidification - the lowering of pH in water or soils, commonly associated with changes caused by external processes such as greenhouse gases, acid precipitation and acidic runoff. Ocean acidification is the name given to the ongoing decrease in the pH of the Earth's oceans, caused by their uptake of anthropogenic carbon dioxide from the atmosphere. It is believed that the resulting decrease in pH will have negative consequences, primarily for oceanic calcifying organisms such as corals, foraminiferans, coccolithophores, mollusks, crustaceans, and echinoderms

acidophilia - an abnormal increase in the number of eosinophils in the blood which is characteristic of allergic states and various parasitic infections; also called "eosinophilia"

acidophilous - having an affinity for or thriving in acidic conditions, e.g., in a bog or marsh

aciniform - resembling a cluster of berries

acoelomate - an animal that does not have a true coelom or body cavity, i.e., a body cavity between the outer wall and the gut and lined with mesoderm. Acoelomate phyla include the flatworms (Platyhelminthes), ribbonworms (Nemertea), and jaw worms (Gnathostomulida)



Acoelomate flatworms such as this *Pseudoceros* sp. lack a coelom (body cavity). (Photo: Adam Petrusek)

acolonial coral - a solitary coral that does not form a colony

acontioid - one of many adhesive threads of tube anemones situated on the lower portion of the mesenteries

acontium - a thread-like part of a coral polyp's or anemone's digestive system and employed as defensive or aggressive structures when extruded

acoustic scattering - the irregular reflection, refraction, or diffraction of a sound in many directions

acoustic signature - a set of characteristics used to describe a sound signal. This may include sound echos from targets, radiated and ambient noise, with salient echo characteristics including target strength, spectral reflectivity versus frequency, doppler shift, doppler spread and target range extent

acoustic tag - a sound transmitter attached to an aquatic animal to track its movements



Radio tag (anterior) and acoustic tag (posterior) attached to a loggerhead turtle. (Photo: Alan Rees/ ARCHELON)

acquired - developed in response to the environment, not inherited, such as a character trait resulting from environmental effects (acquired characteristic)

acquired character - a non-inherited character, of function or structure, developed in an organism as a result of environmental influences during the individual's life

acre - an area equal to 43,560 square feet or 4,046.87 square meters. One square mile equals 640 acres

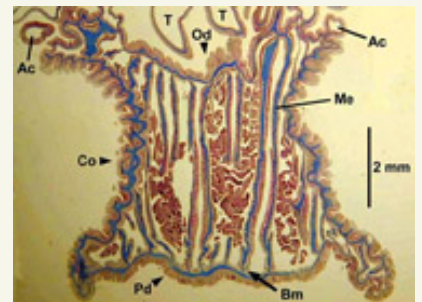
acrocyt - in hydrozoans, a sac containing a completely developed planula larva

Acropora - a genus of hard (stony) corals that contain the elkhorn and staghorn corals. In May 2006, NOAA's national Marine Fisheries Service decided to list elkhorn corals (*Acropora palmata*) and staghorn corals (*Acropora cervicornis*) as threatened species under the Endangered Species Act (ESA). A species is considered threatened if it is likely to become an endangered species within the foreseeable future



Staghorn coral (*Acropora* sp.).

acrorhagus - a sac, covered with nematocysts, that protrudes from below the sweeper tentacles or on the column of certain anthozoans



Longitudinal section of *A. alicemartinae* (azocarmine triple staining). Ac: acrorhagus; Bm: basilar muscle; Co: column; Me: mesenteries; Od: oral disc; Pd: pedal disc; T: tentacles (Photo: V. Häussermann & G. Försterra/U.Frankfort)

acrosome - a protrusion on the anterior end of a sperm cell that contains digestive enzymes that enables the sperm cell to penetrate the layers around the oocyte (ovum)

acrosphere - the knobbed tentacle tip of an anthozoan, usually bearing numerous nematocysts

acrotroch - a band of cilia anterior to the prototroch (preoral band) in larvae of polychaete worms

actic - pertains to littoral rocky shores as a habitat

actin - one of two proteins involved in muscle contraction. Actin assembles into long polymer rods called microfilaments which interact with the other muscle protein, myosin, to cause shortening (contraction) in muscle cells. Actin also serves as an important structural molecule for the cytoskeletons of many eukaryotic cells

actiniform - ray-like; star-shaped

actinobiology - the study of effects of radiation upon living organisms

actinometer - an instrument for measuring incident radiation

actinopharynx - a short, flagellated tube between the mouth and gastrovascular cavity of an anthozoan polyp. It arises as an invagination of the oral epidermis; the pharynx of an actinarian; also called the "stomodaeum"

actinophore - a pterygiophore and its associated fin ray

Actinopterygii - a class of bony fishes comprising the ray-finned fishes, which make up about half of all vertebrate species known. They are found in most aquatic habitats from the abyssal depths of the ocean, greater than 10,000 m, to high altitude freshwater streams and ponds; a few species can even move about on land for short periods of time. Ray-finned fishes constitute a major human food source



This squirrel fish is a member of the class Actinopterygii, the ray-finned fishes. Note the hard and soft rays in its fins.

actinostome - the mouth of a radially symmetrical animal

actinotroch - a larval form found in the Phoronida (horseshoe worms)

actinula - a hydrozoan larval stage that looks like either a polyp or medusa, depending upon whether the mouth is turned upward or downward



Actinula larval stage of the hydrozoan, Tubularia.
(photo: BIODIDAC)

action potential - the electrical signal which rapidly propagates along the membrane of the axon of nerve cells, as well as over the surface of some muscle and glandular cells. It is caused by change in membrane electrical potential, the underlying cause of which is a change in flow of ions across the membrane due to voltage-activated ion channels. It leads to an all-or-nothing action current, the nervous impulse

activated charcoal - a porous form of carbon that acts as a powerful adsorbent. Activated charcoal is used to remove toxins from water and air, decolorize liquids, and recover solvents

activator - a substance or physical agent that stimulates transcription of a specific gene or operon

active efflux - in microbiology, a mechanism responsible for the extrusion of toxic substances and antibiotics outside the cell. Its importance lies in its contribution to bacterial antimicrobial resistance

active search - search behavior in which a herbivore or predator moves around its environment looking for food

active site - a specific region of an enzyme where a substrate binds and catalysis takes place

active transport - the pumping of molecules or ions through a membrane against their concentration gradient. This action requires the expenditure of energy through ATP hydrolysis

aculeate - bearing a sharp point

aculeiform - having a sharp point; needle-shaped

acumen - the pointed tip of the rostrum in decapod crustaceans

acuminate - a shape which gradually tapers to a point



The fierasfer, *Carapus bermudensis*, possess an acuminate shape. The tapered end allows the fish to retreat tail first, for protection, into the digestive canal of a sea cucumber when threatened. (Photo: D. Flescher, NOAA/National Marine Fisheries Service)

acute - sudden or brief

adambulacral - pertains to structures situated along the ambulacral grooves of echinoderms

adanal - located near the anus

adapertural - in gastropods, a location near the shell aperture

adaptation - changes in gene frequencies resulting from selective pressures being placed upon a population by environmental factors. This results in a greater fitness of the population to its ecological niche

adaptive behavior - any behavior that enables an organism to adjust to a particular situation or environment

adaptive management - the process of changing a management strategy in response to measuring its success

adaptive radiation - the evolution of a single evolutionary stock into a number of different species

adaptive value - the degree to which a characteristic helps an organism to survive and reproduce, or affords greater fitness in its environment

adaptive zone - a particular type of environment requiring unique adaptations then allowing adaptive radiation to occur

adaxial - situated on the side of, or facing toward an axis

adcauline - pertaining to hydrozoan polyps that bend towards, or are near to the common stem

addorsal - close to, but not on the middle of the dorsal surface

adductor - a type of muscle whose function is to pull an appendage or body part inwards, towards the body of an animal

adeniform - gland-shaped; resembling a gland

adenine - one of the four nitrogenous bases in DNA that make up the letters ATGC. Adenine is the "A". The others are guanine, cytosine, and thymine. Adenine always pairs with thymine

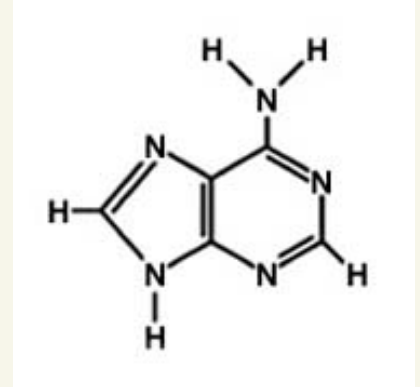


Diagram of the chemical structure of adenine, one of the four nitrogenous bases in DNA.

adenose - glandular

adenosine triphosphate (ATP) - a nucleoside triphosphate, ATP is the predominant supplier of metabolic energy in living cells. ATP supplies the chemical energy to drive endergonic reactions (requiring work or the expenditure of energy), perform mechanical work, provide heat and even produce bioluminescence

adenovirus - a group of DNA-containing viruses which cause diseases in animals. In humans, they produce acute respiratory tract infections with symptoms resembling the common cold. They are used in gene cloning, as vectors for expressing large amounts of recombinant proteins in animal cells. They are also used to make live-virus vaccines against more dangerous pathogens

adhesion - the molecular force of attraction between two unlike materials that acts to hold them together

adhesive disc - in fishes, a sucker-like organ for clinging to various surfaces, e.g. the modified pelvic fins in clingfishes and snailfishes, and the dorsal fin in remoras (shark suckers)



The dorsal fin of the remora (also called shark sucker or pilotfish) is modified to function as an adhesive disc (Photo: NOAA)

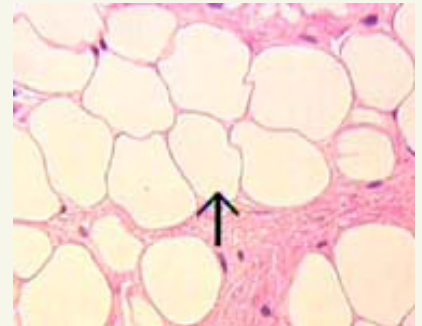
adhesive egg - an egg which adheres on contact to a substrate or to other eggs

adhesive pad - an adhesive sucker located near the tip of a tentacle, in some hydrozoan medusae, utilized for clinging to plants or algae

adiabatic process - a process which occurs with no exchange of heat between a system and its environment

adient - tending toward or approaching a source of stimulation

adipocyte - a fat cell



Adipose tissue. The large empty looking structures are adipocytes (fat cells). (Photo: University of Saskatuwan Biology Dept.)

adipose fin - in fishes, a small fleshy fin which lacks fin rays. It is found in fishes such as salmon, and most catfishes



The adipose fin of this chum salmon lies between the dorsal and caudal fins. (Image: U.S. Fish and Wildlife Service)

adjacently sympatric - pertains to those aspects of a parapatric speciation event whereby the daughter species are minimally isolated geographically

admedial - near the medial plane

adnate - joined together

Adobe Acrobat - Acrobat Reader is a software product from Adobe, designed to view .pdf (portable document format) documents downloaded from the World Wide Web

adoral - near or toward the mouth

adpressed - pressed close to or lying flat against something; apressed

adradial canal - one of eight non-branched ciliated canals which originates from the gastric pouches of scyphozoan medusae. The flow of digested food materials is toward the ring canal

adsorbent - the solid substrate material onto which a substance is adsorbed

adsorbtion - adhesion of an extremely thin layer of molecules to the surface of a solid with which they are in contact, as when charcoal adsorbs gases

adult - a fully developed and sexually mature animal, physically capable of reproducing under appropriate physiological, ecological and sociobiological conditions



An adult Nassau grouper. It is sexually mature and capable of reproducing.

advanced - new, unlike the evolutionary ancestral or primitive condition

advection - the transport of substances in a fluid by the flow of that fluid

adventitious - accidental or acquired; not natural or hereditary; found somewhere other than in the normal or usual place; additional

adventitious root - a root that originates from any part of the plant other than the root system

adventive plant - a species of plant that has been introduced into an area but has not become permanently established

aeolian - pertaining to the erosion, transport, and deposition of materials by wind

aeolid nudibranch - a type of nudibranch (order Nudibranchia) in which the mantle is extended into long finger-like projections, the cerata (sing: ceras), rather than a feather-like external gill on the dorsal surface. The cerata contain branches of the digestive gland. The tips of the cerata contain cnidosacs which usually store nematocysts that are obtained from ingested cnidarian prey, such as hydroids, sea anemones and soft corals. If threatened, the nudibranch is capable of discharging these stinging cells through a terminal pore in the ceras. This action is an effective deterrent to predators



Aeolid nudibranchs lack gills and utilize their dorsal cerata for respiration and defense. (Photo: Dr Bill Rudman)

aeration - the addition of air to a liquid

aerenchyma - a specialized parenchymous tissue in seagrass leaves that has regularly arranged air spaces or lacunae. These internal air spaces serve for flotation and exchange of gasses

aerial photography - photographs taken from an aircraft or satellite utilized to interpret environmental conditions and geographic features

aerial root - a root which grows out from the stem above ground level

aerobic - deriving energy from a process requiring free oxygen

aerobic respiration - a form of respiration in which molecular oxygen is consumed and carbon dioxide and water are produced

aesthetasc - an array of small hairs which contain chemosensory neurons (e.g., olfactory neurons) on a branch of the antennules of malacostracan crustaceans, such as lobsters, crabs, and mantis shrimp



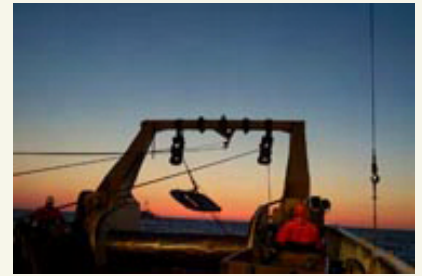
Three antennular segments with pairs of aesthetasc sensilla on their ventral surfaces. (Photo: Deforest Mellon, Ph.D./University of Virginia)

aesthete - unique to chitons (Polyplacophora -Mollusca), aesthetes are photosensitive mantle cells, present in very high densities. Although they are involved in light responses, their exact function is unknown

afferent - refers to a structure that leads to or toward a given position. For example, The portion of the peripheral nervous system that carries information from the organs and tissues of the body to the central nervous system (brain or nerve cord) or a small artery that carries blood to the filtration system of the kidney

affinity index - a measure of the relative similarity of the composition of two samples. Reciprocal affinity is a measure of distance

aft - in, near, or toward the stern (rear) of a vessel



Sunrise as viewed from the aft deck of the NOAA Ship Albatross IV. (Photo: NOAA)

agamogenesis - reproduction without fertilization by a male gamete; parthenogenesis

agamospecies - species which replicate asexually

agar - a gelatinous material extracted from the walls of some red algae, mainly species of *Gelidium* and *Gracilaria*. Agar is used as a support medium, when supplemented by appropriate buffers and/or nutrients and other ingredients, for cultures of microorganisms and tissues, electrophoresis, etc

age class - a group of individuals of a species all of the same age

age distribution - the frequency of different ages or age groups in a given population

age structure - the relative proportion of individuals in each age group in a population

agglomerate - to group or gather together in a dense cluster

agglutinate - clumped together, as if by glue

aggregate - a group of species, other than a subgenus, within a genus, or a group of subspecies within a species. An aggregate may be denoted by a group name

aggregate - a collection of units or particles forming a body or mass (noun); to form such a body or mass (verb)

aggressive mimicry - a type of mimicry which results in a deceived species being preyed upon or parasitized by a predator species. The mimic's cues may be visual, auditory, olfactory or behavioral

Agnatha - agnathans are the most primitive and ancient of the vertebrates. As the name "Agnatha" implies, they lack jaws. Paired fins are also generally absent, and the adult retains the notochord. The skeleton is cartilaginous. The agnathans include the lampreys and hagfishes



The mouth of a jawless agnathan, the sea lamprey. Adults feed by attaching themselves to their prey, rasping a hole in the skin, and consuming blood and body fluids. (Photo: Minnesota Sea Grant)

agonist - in pharmacology, a molecule that triggers a cellular response by interacting with a receptor

agonistic behavior - aggressive, negative behaviors, such as fighting, threatening, and fleeing

agricultural pollution - the liquid and solid wastes from all types of farming, including runoff from pesticides, fertilizers and feedlots; erosion and dust from plowing, animal manure, carcasses, crop residues and debris

agricultural run-off - the drainage of water from agricultural land

aground - touching, resting or lodged on the bottom of shallow water. The opposite is "afloat"

AGRRA (Atlantic and Gulf Rapid Reef Assessment) - an international collaboration of scientists and managers aimed at determining the regional condition of reefs in the Western Atlantic and Gulf of Mexico

Agulhas ring - large pulses of warm and salty water of Indian Ocean origin which enter the Atlantic Ocean directly south of the Cape of Good Hope in the form of anticyclonic eddies. The process of ring detachment is associated with perturbations of the Agulhas Current that retroflects south of Africa

ahead - in front of, or forward of the vessel

ahermatypic coral - a coral that lacks zooxanthellae and does not build reefs

AIMS (Australian Institute of Marine Science) - the Australian Institute of Marine Science (AIMS) was established by the Commonwealth government in 1972 to generate and transfer the knowledge needed for the sustainable use and protection of the marine environment through innovative, world-class scientific and technological research. It is a federally-funded and independent statutory authority governed by a Council appointed by the Australian government. AIMS has its headquarters at Cape Ferguson, 25km east of Townsville in North Queensland



AIMS field operations jetty at Cape Ferguson. (Photo: AIMS)

air bladder - an air sac located in the coelomic cavity of many fishes. In some fishes it may retain a tubular connection with the pharynx or esophagus; also known as a gas bladder or swim bladder, it functions variously as a hydrostatic organ, a sound conductor, a sound production organ, and in respiration. It is absent in sharks and rays, and some bony fishes

air compressor - an apparatus that compresses or pressurizes air for scuba tanks. Air is compressed from the atmospheric level (14.7 psi at sea level) to the capacity of the tank, which is generally between 2500-3000 psi

aktological - pertaining to shallow inshore environments and communities

aktology - the study of shallow inshore ecosystems

alate - winged

albatross - any of large web-footed birds belonging to the family Diomedidae, chiefly distributed throughout the oceans of the southern hemisphere. Albatrosses have a hooked beak and long, narrow wings

albedo - the ratio of the amount of light reflected by an object and the amount light falling on it (incident light); a measure of the reflectivity or intrinsic brightness of an object (a white, perfectly reflecting surface would have an albedo of 1.0; a black perfectly absorbing surface would have an albedo of 0.0)

albicant - whitish color

albinism - hereditary absence of pigment in an organism. Albino animals have no color in their skin, scales, hairs and eyes. The term is also used for absence of chlorophyll in plants. Some organisms exhibit partial albinism. White tigers, for example, possess black stripes on a white background



An albino catfish. The fish's skin cells contain no dark melanin granules.

albino - a pigmentless white phenotype, determined by a mutation in a gene which codes for a pigment-synthesizing enzyme

albugineous - white colored

alcohol - any of a class of organic compounds in which one or more hydroxyl groups are attached to a carbon compound

alcyonarian - a soft coral of the order Alcyonacea, class Anthozoa, phylum Cnidaria. They consist of a firm body, throughout which calcareous spicules are dispersed. The surface is studded with polyps. They are closely related to the scleractinian (hard or stony) corals but lack the rigid, stony exoskeleton



Alcyonarians are colonial soft corals that lack the CaCO_3 exoskeleton of the hard or stony corals. An endoskeleton of calcareous spicules provide support for the body, which is studded with polyps.

aldehyde - an organic molecule containing a $-\text{COH}$ group. It is a colorless volatile liquid, obtained from alcohol by oxidation. An example of these aromatic compounds is formaldehyde

alecithal - a type of egg that does not contain yolk

Alee effect - the social dysfunction and failure to mate successfully when population density falls below a certain threshold

algae - unicellular, multicellular, solitary, or colonial organisms that contain chlorophyll. They lack roots, stems, leaves, flowers, and seeds. Algae are in the Kingdom Protista

algaecide - a chemical agent specifically designed and used to kill or inhibit the growth of algae; also called 'algicide'

algaestat - a chemical agent which retards and prevents the reproduction and growth of algae

algal bloom - a sudden spurt of algal growth that can indicate potentially hazardous changes in local water chemistry

algal galls - a response of gorgonia (*Pseudoplexaura spp.*) to tissue invasion by the algae, *Entocladia endozoica*, in Florida and Caribbean waters. The host gorgonia react to the algal filaments by producing capsules (galls) composed of skeletal elements that isolate the algae from the host tissue, at the expense of the skeletons' tensile strength and elasticity. The gorgonium readily breaks apart at the sites of the weakened skeleton. For more information and illustrations, see: http://www.coral.noaa.gov/coral_disease/algal_galls.shtml

algal mat - a dense layer of algae, usually filamentous, which blankets the bottom in a shallow water environment. An algal mat can also be a 'mat' of microscopic species, usually diatoms, covering soft bottoms, or a mat of floating algae



A helmet conch feeding on an algal mat in sand
(Photo: James Stuby)

algal reef - a reef, usually exposed to wave action, composed of coralline algae and vermatid gastropods. The coralline algae occur in forms of cups or funnels



Coralline algae makes up part of an algal reef.

algal ridge - a low ridge at the seaward margin of a reef flat, largely composed of skeletons of calcareous algae. A synonym of **Lithothamnion ridge**

algal turf - densely packed algae, usually filamentous, which rise less than one centimeter above the substratum upon which they are growing. A synonym of turf algae

algaliculous - pertaining to an organism that lives on or around seaweed

algin - a polysaccharide derived from brown algae. Algins are used for many industrial processes

algophagous - refers to an organism that feeds upon algae

algorithm - A computer program (or set of programs) which is designed to systematically solve a certain kind of problem

alien species - a species which does not naturally occur within an area and which has usually arrived as a result of deliberate or accidental human intervention. Alien species often have adverse effects on native species as a result of competition

alima - a larval stage of a mantis shrimp

alimentary canal - the canal, including the stomach and intestines, leading from the mouth to the anus

aliquot - a portion of a sample; a subsample

alizarin - a red dye made from the roots of the madder plant, *Rubia tinctorum*, or produced synthetically from coal tar. A bone specific stain, alizarin red S is commonly used to stain the skeletal elements of a fish specimen. In this procedure, the muscles are rendered transparent by emersing the specimen in a caustic agent, such as potassium hydroxide



A Dover sole, cleared and stained with alizarin red S, to highlight the bony structures (Photo: Natural History Museum, london)

alkaline - having a pH of more than 7. Alkaline solutions are also said to be basic

All Islands Coral Reef Initiative - a cooperative effort among Hawaii, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands to improve the management of coral reefs in island areas

ALL Species Foundation - a non-profit organization dedicated to the complete inventory of all species of life on Earth within the next 25 years - a human generation (<http://www.all-species.org/>)

all-or-none law - an action that occurs either completely or not at all, such as the generation of an action potential by a neuron, or the contraction of a muscle cell

allantois - a vascularized extra-embryonic membrane of amniote embryos that forms as a narrow outgrowth of the hind portion of the gut. In birds and reptiles, it stores waste products of embryonic metabolism. The allantois fuses with the chorion to form the chorio-allantoic membrane in birds and reptiles, and a part of the placenta in mammals

Allee's Principle - there is a positive relationship between individual fitness and either the numbers or density of conspecifics. In other words, as the number of individuals in a population increases, or as population density increases, survival and reproduction also increase

allele - one of the variant forms of a gene at a particular locus, or location, on a chromosome. Different alleles produce variation in inherited characteristics. In an individual, one form of the allele (the dominant one) may be expressed more than another form (the recessive one)

allelochemical - a chemical substance produced by one organism that is toxic or inhibitory to the growth or well being of another

allelomimetic behavior - behavioral activities that have strong components of social facilitation, imitation, and group coordination; imitation of behavioral habits of another animal, usually of the same species; behavior in social animals in which each animal does the same thing as those nearby. It is developed to a high degree in schools of fishes, flocks of birds, and and herds or pods of mammals

allelopathic substance - a substance produced by one organism that adversely affects another organism

allelopathy - a particular form of amensalism found in plants. In this interaction, one species produces and releases chemical substances that inhibit the growth of another species

allergen - an antigen that provokes an immune response

allo - - a prefix meaning other, or differing from the normal or usual

alloantigen - an antigen that occurs in some but not other members of the same species

allochoric - occurring in two or more communities within a given geographical region

allochronic speciation - speciation without geographical separation through the acquisition of different breeding seasons or behavior patterns

allochthonous population - an organism or a population of organisms foreign to a given ecosystem; they have arrived from elsewhere

allocryptic - pertaining to organisms that conceal themselves with coverings of other organisms or with inanimate materials

allogenic - resulting from factors acting from outside a system or material transported into an area from the outside which alters the system's habitat; genetically different individuals belonging to the same species; when describing transplantation biology, the donating individual is of the same species, but not one's self

allogenic succession - a kind of ecological succession in which one kind of community replaces another because of a change in the environment which was external to and independent of that produced by the community itself

allograft - a piece of tissue or an organ transferred from one individual to another individual of the same species

allometric equation - the general form of the allometric equation is $y = bxa$ where y = measure/process in question, x is size, a is the allometric exponent (which tells you the relationship between x & y), and $b = a$ constant (the allometric coefficient)

allometric growth - type of differential growth in which parts of the same organism grow at different rates. For example, in humans, the head and body grow at different rates, resulting in a human adult with completely different proportions from those of an infant

allometry - study of the relative growth relationships between different parts of an organism; mathematically expressed by the allometric equation $y = mx + b$, where y = predicted size of body part; x = observed body weight; m = slope acquired; and b = the value of y where it intercepts the vertical axis. Allometry is studied during the growth of a single organism, as a comparison between different organisms of the same species, and between organisms in different species. The allometric equation is graphed on an XY axis, with the body size on the x-axis and the part size on the y-axis. The scatter produced by the different measurements being compared can then be analyzed for useful data

allomone - a chemical substance that induces a response in an individual of another species that is beneficial to the emitting organism. Many allomones are essentially chemical deterrents. For example, a chemical substance that is produced by a prey species to repel a predator species

allomorphosis - allometry based on the comparison of related individuals, rather than upon ontogeny. Systematic change of shape among successive adults of a phyletic sequence, for example, is allomorphosis; the rapid development of specialized organs or increase of specialization in an organism

alloparent - an animal which exhibits parental behavior towards another animal's offspring

allopatric speciation - speciation which occurs in populations initially isolated geographically, such as by habitat fragmentation or migration. As natural selection and genetic drift act independently in isolated populations, separation will eventually produce organisms that cannot interbreed

allopatric species - species occupying mutually exclusive geographical areas

allopolyploid - a type of polyploid species resulting from two different species interbreeding and combining their chromosomes

allorecognition - the ability of an individual organism to distinguish its own tissues from those of another; the recognition of antigens, expressed on the surface of cells of non-self origin. Allorecognition has been described in nearly all multicellular phyla

alloresponse - allorecognition, followed by the immune effector mechanisms generated by the recognition process

allosome - a chromosome which deviates in size, form or behavior from other chromosomes. An allosome is usually a sex chromosome

allotopic - refers to species with overlapping ranges but do not occupy the same space. They do not "live together"

allotype - in taxonomy, a paratype of the opposite sex to the holotype

allozyme - a form of an enzyme that differs in amino acid sequence from other forms of the same enzyme and is encoded by one allele at a single locus

alluvial - relating to mud and/or sand deposited by flowing water

alluvium - sediments deposited by erosional processes, usually by streams

almost atoll - an atoll whose rim is less than 75 percent complete as a circle at low tide

Along Track Reef Imaging System (ATRIS) - a boat-mounted instrument that acquires continuous digital still EXIF-format images of shallow-marine substrates. Images are acquired via a digital still camera mounted in a waterproof housing that is deployed on a pole attached to a survey vessel. Images are instantaneously transferred to a shipboard computer and stored. ATRIS acquires high resolution, color digital images that are accurately geo-located in real-time. For a typical mission, 1,000 ATRIS images are captured per hour at a survey speed of 1 knot. ATRIS was developed by the U.S. Geological Survey

alpha animal - in animal behavior, the individual that takes a lead role and occupies the dominant position in a group

alpha particle - a particle emitted from the nucleus of an atom, containing two protons and two neutrons, identical to the nucleus (without the electrons) of a helium atom

alpha taxonomy - descriptive taxonomy concerned primarily with the discovery, description, and naming of species, usually on the basis of morphological characters

alternation of generations - a life cycle in which a multicellular diploid stage is followed by a haploid stage, and so on; found in land plants and many algae and fungi

alternative hypothesis - in statistics, the hypothesis that is adopted when the null hypothesis is rejected

altimeter - an instrument for measuring altitude

altimetry - a technique to measure the height of the sea surface from radar pulses transmitted from a satellite



Artist's rendition of a satellite measuring altimetry.

altricial - born or hatched undeveloped; requiring maternal care after birth; as opposed to precocial

altruism - a form of behavior in which an individual risks lowering its fitness for the benefit of another; in evolutionary biology, an organism is said to behave altruistically when its behavior benefits other organisms, at a cost to itself. The costs and benefits are measured in terms of reproductive fitness, or expected number of offspring

alveolus - one of thousands of tiny air sacs at the end of the bronchioles in lungs. Alveoli are the sites of gaseous exchange between the atmosphere and the blood. Oxygen passes into the lung capillaries and CO₂ passes from the capillaries into the lungs and is exhaled

ambient noise - acoustic signals originating from a variety of underwater sources, such as propeller cavitation, engine noises, animal sounds, wind, waves, and rain

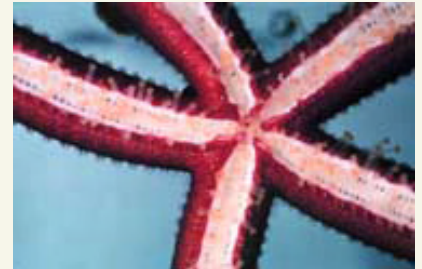


The sounds produced by the spotted boxfish, *Ostracion meleagris*, contribute to the ambient noise on Pacific reefs.

ambient pressure - the pressure surrounding an organism. On land, it results from the weight of the atmosphere. At depth, it comes from the weight of the water plus the weight of the atmosphere

ambit - the geographic range or extent in which an organism normally lives or grows

ambulacrum - a row of tube feet of an echinoderm



The ray of a starfish revealing the ambulacral groove and tube feet.

ambush predator - a predator that hides and waits for prey to pass in close proximity rather than actively hunting for it

amensalism - a type of symbiosis where two (or more) organisms from different species live in close proximity to one another, and where one of the members suffers as a result of the relationship while the other is unaffected by it

amino acid - the building block of a protein. Twenty different amino acids are used to synthesize proteins. The shape and other properties of each protein is dictated by its precise sequence of amino acids. Humans must include adequate amounts of 9 of the 20 amino acids in their diet. These "essential" amino acids cannot be synthesized from other precursors

amino acid sequence - the order of amino acids as they occur in a polypeptide chain. This is referred to as the 'primary structure' of proteins

amino group - a nitrogen atom single-bonded to two hydrogen atoms (-NH_2); imparts basic properties to an amino acid

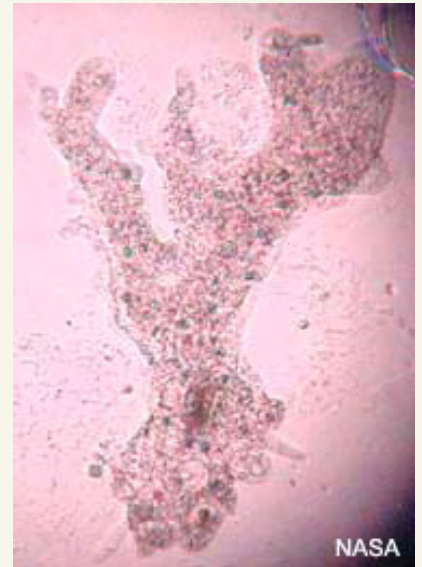
amitosis - an unusual form of cell division in which the nucleus cleaves without change in its component structure (such as the formation of chromosomes), followed by the division of the cytoplasm. Amitosis may occur chiefly in highly specialized cells which are incapable of long-continued multiplication, in transitory structures, and in early stages of degeneration

ammonotelic - having ammonia as the chief excretory product of nitrogen metabolism

amnion - a non-vascular extra-embryonic membrane of amniote embryos that forms a fluid-filled cavity surrounding the embryo. It protects the embryo by functioning as a shock absorber

amniote - a vertebrate whose embryo is surrounded by a fluid-filled sac, the amnion; characteristic of reptiles, birds, and mammals

amoeba - a-naked freshwater or marine protozoan protist that forms temporary pseudopodia for food and water capture, and locomotion -



An amoeba thrusting out pseudopodia (false feet).
(Photo: NASA)

amoebocyte - a phagocytic cell found circulating in the body cavity of coelomates, particularly annelids and mollusks, or crawling by amoeboid movement through the interstitial spaces of sponges; an amoeboid cell in sponges that transports nutrients and is found in the matrix between the epidermal and collar cells; any cell having the shape or properties of an amoeba

amoeboid - amoeba-like

amoeboid movement - a type of motility of a cell in which cytoplasmic streaming (directional flow of cytoplasm) extrudes outward of the cell to form pseudopodia (false feet) so that the cell can change its location

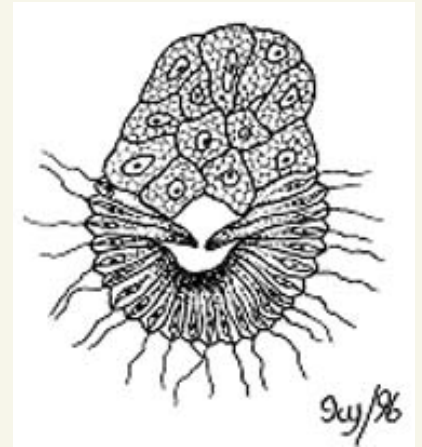
amorphous - lacking a distinct form or shape

Amphibia - a class of vertebrates that consists of frogs, toads, newts, salamanders, and caecilians. These organisms live at the land/water interface and spend most of their life cycle in water. With exception of some tree frogs, all must reproduce in water or otherwise moist conditions. Amphibians are not typically marine



The African Bullfrog, *Pyxicephalus adspersus*. This amphibian is an inhabitant of Namibia. (Photo: Copyright Miguel Vences and Frank Glaw, 1998)

amphiblastula - a sponge larva that appears as a hollow ball with anterior flagellated cells and posterior larger and nonflagellated cells (megascleres)



Amphiblastula larva of a sponge. (Photo: Copyright BIODIDAC)

amphidiploid - an allopolyploid; an organism produced by hybridization of two species followed by chromosome doubling

amphidromous - refers to the migratory behavior of fishes moving from fresh water to the ocean and vice versa, not for reproductive purposes but occurring regularly at some stage of the life cycle

amphimixis - sexual reproduction involving the fusion of male and female gametes and the formation of a zygote

amphipathic - refers to molecules with both hydrophobic and hydrophilic regions. Proteins and lipids may be amphipathic

amphophilic - having an affinity for both basic and acidic dyes

amplicon - the DNA product of a polymerase chain reaction (PCR), usually an amplified segment of a gene or DNA sequence

amplification - in genomics, the process of increasing the number of copies of a particular gene or chromosomal sequence

amplified ribosomal DNA restriction analysis (ARDRA) - DNA fingerprinting based on restriction patterns of ribosomal DNA. The method consists of amplification of the 16S rRNA gene (rDNA) and subsequent restriction digestion of the amplicon

ampulla - a membranous vesicle

ampullae of Lorenzini - small vesicles and pores around the head of a shark that form part of an extensive subcutaneous sensory network system that detects weak magnetic fields produced by other fishes, at least over short ranges. This enables the shark to locate prey that are buried in the sand, or orient to nearby movement. The ampullae may also allow the shark to detect changes in water temperature



The ampullae of Lorenzini are small vesicles and pores that form part of a subcutaneous sensory network of sharks. These vesicles and pores are found around the head of the shark and are visible to the naked eye. They appear as dark spots in this photograph of a porbeagle shark head. (Photo: Dr. Steven Campana, Bedford Institute of Oceanography)

amural form - a coral growth form in which the corallite walls are partially or wholly lost; the septa stay unreduced

amylopectin - a highly branched polymer of glucose found in plants

amylose - a linear polymer of glucose

anabolism - the metabolic processes that consumes energy and involve the synthesis of larger, complex molecules from simpler ones

anadromous species - a species that spends its adult life in the ocean but swims upriver to freshwater spawning grounds in order to reproduce, e.g., Pacific salmon



The chinook salmon is an anadromous fish which spends most of its life in the ocean, but returns to fresh water streams for spawning

anaerobe - an organism that can live in the absence of oxygen

anaerobic - deriving energy from a process that does not require free oxygen

anagenesis - the evolutionary process whereby one species evolves into another without any splitting of the phylogenetic tree

anaglyph - a stereoscopic picture consisting of two images of the same object, taken from slightly different angles, in two complementary colors. When viewed through colored spectacles, the images merge to produce a stereoscopic sensation, i.e., that appears three-dimensional when superimposed; anything carved in low relief

anal fin - the single fin situated on the ventral midline of a fish, behind the anus, and anterior to the caudal fin



Anal fin of a bony fish.
(Photo: John Lyons,
University of Wisconsin)

analgesia - the absence of pain in response to stimulation that would normally be painful

analgesic - any drug intended to alleviate pain. Analgesics increase a patient's pain threshold, thereby decreasing the sensation of pain. Analgesics range from aspirin and acetaminophen to narcotics

analogous behavior - behavior exhibited by different species that is similar in function, but does not originate from a common ancestry

analogous structure - a body part that serves the same function in different organisms, but differs in structure and embryological development, e.g., the wing of an insect and a bird

analysis of covariance - an analysis of variance in which the data are adjusted or controlled for the presence of one or more other variables

analysis of variance - a statistical technique for testing for differences in the means of several data populations

anamniote - an aquatic vertebrate whose embryonic stage is not surrounded by an amnion. Fishes and amphibians are anamniotes



Fish eggs and larvae. These aquatic vertebrates do not possess an amnion during embryonic development. (Photo: NOAA/National Marine Fisheries Service)

anaphylaxis - a severe, potentially life-threatening, allergic reaction, which can occur after an animal sting or as a reaction to an injected drug. Less commonly, the reaction occurs after a particular food or drug has been taken by mouth. Symptoms may include vascular collapse, shock and respiratory distress; also called "anaphylactic shock"

anastomose - a term that refers to coral branches which grow back together after the initial division

anastomosis - the union or connecting of branches forming a meshwork or a network

anatomy - the science of internal morphology as revealed by dissection

ancestor - any organism, population, or species from which some other organism, population, or species is descended

ancestral - in evolution, a trait that has been inherited unchanged from an ancestor

ancestral polyp - an anthozoan polyp which develops from a sexually produced larva and gives rise to a colony by asexual budding

ancestral trait - a trait shared by a group of organisms as a result of descent from a common ancestor

ancestrula - the first (parental) zooid of a bryozoan colony, formed from a settled and metamorphosed larva. It is often smaller and morphologically distinct from the zooids that bud from it

anchialine cave - a coastal cave formed in limestone or volcanic rock that is flooded with seawater. These marine or brackish water bodies lack surface connections to the sea. They include the longest submerged caves on Earth

anchialine pool - a land-locked brackish body of water that displays tidal fluctuations but has no surface connection to the sea. Anchialine pools are restricted to highly porous substrates, such as recently solidified molten rock or limestone adjacent to the sea



An anchialine pool, Halua Pond, located in the Ūhihi-Kīna'u Reserve, Maui (Photo: Hawai'i's Natural Area Reserves System (NARS))

Andavadoaka - a small fishing village located on the southwestern coast of Madagascar. It lies on the edge of a shallow lagoon protected from the open ocean by a series of fringing and submerged barrier reefs. The coral reefs, including patch reefs, in the region are in generally pristine shape, ranging from moderate to excellent. The reefs are not directly threatened by terrigenous sedimentation, as elsewhere in the country, due to the absence of major rivers. However, they are at risk from over fishing from a still small but rapidly increasing population of Vezo fishermen. Conservation efforts are currently underway to maintain the present status of these coral reefs, including the establishment of a marine protected area network encompassing parts of the barrier and patch reef systems

androgen - a principal male steroid hormone, such as testosterone, which stimulates the development and maintenance of the male reproductive system and secondary male sexual characteristics

androgenesis - male parthenogenesis, i.e., the development of a haploid embryo from a male nucleus. The maternal nucleus is eliminated or inactivated subsequent to fertilization of the ovum, and the haploid individual (referred to as androgenetic) contains the genome of the male gamete only in its cells

anemochory - the dispersal of seeds, fruits, or other plant parts by wind

anemometer - an instrument for measuring wind velocity

anemone - a cnidarian of the class Anthozoa that possesses a flexible cylindrical body and a central mouth surrounded by tentacles



A sea anemone of the Phylum Cnidaria, Class Anthozoa. The tentacles bear stinging cells which are used for food capture and defense.

aneuploidy - the condition of having an abnormal number of chromosomes; a chromosome number that is not an exact multiple of the haploid number

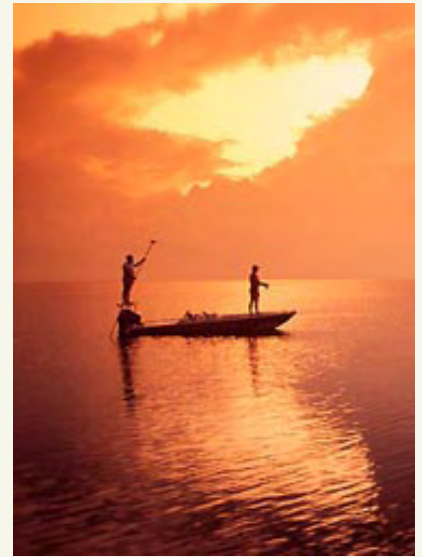
angelfish - any species of colorful deep-bodied, laterally compressed, spiny-rayed fishes in the family Pomacanthidae. They resemble the closely related butterfly fishes, but generally possess a more robust body and a sharp preopercular spine. There are other kinds of unrelated fresh water angelfishes, belonging to the family Cichlidae, which are common home aquarium fishes



The yellowmask angelfish (*Pomacanthus xanthurus*) photographed on a reef in Papua New Guinea (Photo: Tom Doepfner/Brown University)

angiogenesis - the growth and proliferation of new blood vessels. Angiogenesis is a normal biological process that occurs in both healthy and disease states. It is essential for the growth of tumors. Tumor cells release chemicals to encourage blood vessel growth for their nourishment

angler - a person catching fish or shell fish with no intent to sell; includes people releasing the catch



A skiff, a guide, and an angler fishing for bonefish in Florida. (Photo: Bonefish and Tarpon Unlimited)

angstrom - a unit of length equal to one ten-thousandth of a micron (10^{-4} micron) or 10^{-10} of a meter

animal communication - animals use several ways to communicate with one another. These include the visual, auditory, and tactile senses, as well as certain chemicals involved in taste and smell. Other possibilities are magnetic fields and electrical discharges. Communication among animals helps them to recognize each other, cause reproductive behavior, and to organize social behaviors



The oyster toadfish, *Opsanus tau*, produces sounds during the reproductive season. These sounds facilitate mating. (Photo: NOAA)

animal hemisphere - the half of an oocyte or egg which contains less yolk, or the corresponding half of an early embryo with the more actively dividing cells

animal pole - the pole of a spherical oocyte or egg that is closest to the nucleus and contains most of the cytoplasm. The opposite pole is the vegetal pole, which, depending upon the type of egg, contains most of the nutritive or yolk granules. There is a graded distribution of cytoplasm and yolk along an axis between the poles that passes through the nucleus. After the fertilized egg undergoes cleavage and develops into a blastula, the same "geographic" points or reference are used

Animalia - the kingdom of multicellular heterotrophic eukaryotes that are capable of motility during some stage of their life history

animated GIF (Graphics Interchange Format) file - a graphic image on a Web page that moves

anisogamous - characterized by reproducing by the fusion of gametes that differ only in size, as opposed to gametes that are produced by oogamous species. Gametes of oogamous species, such as egg and sperm cells, are highly differentiated

ankylose - to fuse together

anneal - the pairing of complementary DNA or RNA sequences, via hydrogen bonding, to form a double-stranded polynucleotide. It is most often used to describe the binding of a short primer or probe

Annelida - an animal phylum that comprises the segmented worms, and includes earthworms, leeches, and a number of marine and freshwater species



A marine segmented worm of the phylum Annelida.

Annual Composite HotSpot map - a map that composites all of the average monthly HotSpot (see HotSpot) images for a given year

annular - ring-shaped

annulation - a circular or ring-like formation

annulus - a mark or ring that forms annually on the otoliths, scales, and bones of fishes that correspond to the annual period of growth. Annuli can be used to determine age and growth rates of fishes

anomaly - the deviation of a particular variable (e.g., temperature) from the mean or normal over a specified time

anonymous work - according to the International Code of Zoological Nomenclature, a published work that does not state the name of the author(s)

anoxic - the absence of free oxygen

antagonistic pleiotropy - in genetics, a situation in which a single gene creates multiple competing effects, such that beneficial effects of a trait created by the gene are offset by "losses" in other traits

antenna - one of the paired, flexible, and jointed sensory appendages on the head of a crustacean, an insect, or a myriapod (e.g., a centipede)



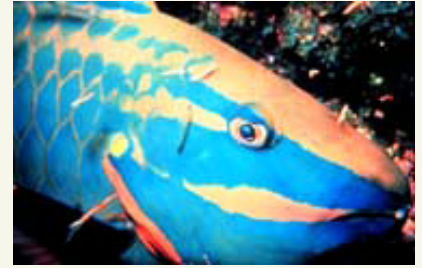
A spiny lobster displaying its paired uniramous antennae and biramous antennules. (Photo: Copyright Corel Corporation)

antennal gland - the main organ in crustaceans used for excretion and osmoregulation; the green gland

antennular fosette - in crustaceans, a depression, pit or socket containing the basal portion of the antennule

antennule - a small antenna, especially the first pair of antennae in crustaceans

anterior - morphologically, toward the head or front end of an individual, or proximal portion of a bodily part



Close up of the anterior end of a spotlight parrotfish supermale.

anteromesal - in the front and along the midline of a body

anteroposterior axis - the longitudinal axis of an animal, from head to tail

anthoblast - in stony corals, a young sessile polyp producing an anthocyathus, the disklike crown that separates from the stalk (anthocaulus)

anthocaulus - a polyp that develops asexually on the skeletons of some coral species

anthocodium - the free oral end of an anthozoan polyp, the basal portion of which is united with other zooids in a common mass; the upper tentacular part of the polyp that can be retracted into the calyx; It is a site of bioluminescence in some anthozoans

anthocyathus - the disklike crown portion of solitary stony corals that separates from the stalk (anthocaulus)

anthostele - the lower part of a cnidarian polyp, into which the distal portion of the polyp, the anthocodium (which includes the mouth and the tenacles) is withdrawn

Anthozoa - a class of Cnidaria that includes the stony corals, soft corals, sea anemones, gorgonians, and corallimorpharians



A deep-sea anemone photographed by the *Alvin* 2001 during a survey of Blake Ridge off the U.S. Georgia coast (Deep East

anthozoid - any of the individual zooids of a compound anthozoan

anthropogenic - made by people or resulting from human activities

anthropomorphism - attributing a human characteristic to an inanimate object or a non-human species

anti-codon - a triplet of nucleotide bases (codon) in tRNA (transfer RNA) that pairs with (is complementary to) a triplet in mRNA (messenger RNA). For example, if the codon is UCG, the anticodon is AGC

antibiosis - an antagonistic association between two organisms in which one of the organisms is adversely affected; an association between organisms that is harmful to one of them or between organisms and a metabolic product of another; the inhibition of growth of a microorganism by a substance produced by another microorganism

antibiotic - a chemical substance, e.g., penicillin, that kills or inhibits the growth of bacteria

antibody - a protein produced by higher animals in response to the presence of a specific antigen

anticryptic coloration - a color or color pattern used for concealment by a predator

anticyclone - an area of high pressure. Circulation is clockwise around the high in the Northern Hemisphere and counterclockwise in the Southern Hemisphere

antigen - a foreign macromolecule introduced into a host organism that elicits an immune response

antigenicity - the ability of an antigen to induce an immune response and combine with specific antibodies or T-cell receptors

antihelminthic - a chemical agent used to combat parasitic worms, such as roundworms and tape worms

Antillean z trap - a common type of fish trap used widely in the Caribbean and elsewhere. It takes the form of a double chevron or "Z" with two down-curving "horse-neck" entrance funnels. Typically, these measure between 180 and 230 cm in length and are 60 cm high

Antilles Current - one of the currents of the North Atlantic subtropical gyre flowing along the northern side of the Greater Antilles. Its water is supplied from the northern branch of the North Equatorial Current, drawn mainly from the Gulf Stream recirculation. The Antilles Current merges with the Florida Current east of the Straits of Florida

antinutrient - a compounds that inhibits the normal uptake of nutrients

antioxidant - a molecule that is capable of reacting with free radicals and neutralizing them; a compound that slows the rate of oxidation reactions

antioxidant - a substance that prevents cellular damage caused by free radicals, which are are highly reactive chemicals that often contain oxygen. They are produced when molecules are split to yield products that have unpaired electrons (oxidation). Antioxidants counteract the damaging effects of oxidation in body tissues

Antipatharia - an order of corals which contains the black and horny corals



Black coral in the order Antipatharia.

antipathin - a proteinaceous and chitinous material that forms the axis in an antipatharian coral

antipodal - diametrically opposite; located on the opposite side

antisense DNA - the strand of chromosomal DNA that is transcribed; a DNA sequence that is complementary to all or part of an mRNA molecule

antisymmetry - a pattern of deviation without a side bias. A side difference occurs for a given trait, but the larger side varies at random among individuals

antitoxin - a substance that neutralizes a toxin

antivenom (or antivenin, or antivenene) - a biological product (antitoxin) used in the treatment of venomous bites and stings

antrum - a hollow space or cavity

anus - the posterior opening of the digestive tract, through which waste products of digestion are released

aperture - an opening in some structure. For example, the opening in a snail's shell through which the snail emerges

apex - the tip, top, point, or angular summit of anything

apex predator - a predator which is not itself preyed upon as a species. These animals are often at the end of food chains, where they have a crucial role in maintaining and determining the health of ecosystems



This large blue shark is an apex predator in the ocean. (Photo: Greg Skomal, NOAA/NOS National Marine Sanctuaries)

aphorism - a concise statement of a general truth; a short pithy instructive saying

aphotic zone - that portion of the ocean where light is insufficient for plants to carry on photosynthesis

aphrioid form - a coral growth form in which the septa are reduced at their outer ends so neighbouring corallites are united by a zone of dissepiments (horizontal partitions within or outside of a corallite)

apical - relating to or located at the tip (an apex), or opposite to the base

apiculate - ending in a short, sharp point

Aplacophora - a class of Mollusca. They are a small group (less than 300 species) of wormlike mollusks that lack a shell. Some are associated with soft corals. Creeping species feed on cnidarians. Burrowing species are deposit feeders and carnivores

apobiosis - the local death of a part of an organism

apode fish - a fish which lacks pelvic (ventral) fins, such as the American or European eel

apogee - the point in the orbit of the Moon or man-made satellite farthest from the Earth; the point in the orbit of a satellite farthest from its companion body

apomixis - the asexual production of diploid offspring without the fusion of gametes. The embryo develops by mitotic division of the maternal or paternal gamete, or in the case of plants, by mitotic division of a diploid cell of the ovule

apomixis - in flowering plants, asexual reproduction through seed

apomorph - a derived character differing from the ancestral condition

apomorphy - a relatively derived or advanced or unique character state

apopinacocyte - in sponges, an endopinacocyte lining the excurrent canal

apopinacoderm - in sponges, a surface lined with apopinacocytes

apoptosis - a normal cellular process involving a genetically programmed series of events leading to the death of a cell; also called "programmed cell death (PCD)" or "cell suicide"

apopyle - the opening of a choanocyte chamber of a sponge into an excurrent canal

aporrhysa - the exhalent canals in sponges

aposematism - conspicuous warning coloration



A venomous lionfish (*Pterois volitans*) with conspicuous coloration. (Photo: Copyright Corel Corporation)

aposymbiosis - loss of a symbiont, such as zooxanthellae in hard corals

apparent shoreline - in areas where the land is obscured by marsh grass, mangrove forests, cypress or similar marine vegetation, the actual shoreline can not be accurately represented. Instead, the outer limit line of the vegetation area is delineated (where it would appear to the eye as the shoreline) and is referred to as the apparent shoreline

appeasement behavior - any conciliatory behavioral display. Appeasement cues often are exhibited toward threatening conspecifics when flight is either difficult or impossible; conciliation directed toward an aggressor or potential aggressor

appendage - any body part that extends from the main axis or trunk or cephalized portion of an organism

appendicular - relating to the appendages, as opposed to axial, which refers to the trunk and head of an organism

applet - a small Java program that can be embedded in a web page to create special effects. Applets differ from full-fledged Java code. They are not allowed to access certain resources on the local computer such as files and serial devices, and are prohibited from communicating with most other computers across a network

apprehensive behavior - any behavior that indicates an organism's anticipation of an adverse or noxious experience. Some behaviors include high level of alertness, defensive postures, and threat displays

approximate - in morphology, placed close together

apron reef - the initial stage of a fringing reef. It is discontinuous and covers a small area

aquaculture - the growing of aquatic organisms in controlled environments for any commercial, recreational, or public purpose; sector of fisheries that includes the rearing or raising under controlled conditions of aquatic products such as fishes, mollusks, crustaceans, sea weeds and other aquatic resources in sea, lakes and rivers. Examples are fish ponds, fish pens, and fish cages. Aquaculture is widespread, and in tropical countries has been a significant source of pollution in coastal waters and also contributes to the destruction of mangrove forests

aquarist - a hobbyist or professional that keeps organisms in an aquarium

Aquarius - *Aquarius* is an underwater ocean laboratory located in the NOAA Florida Keys National Marine Sanctuary. The laboratory is deployed three and half miles offshore, at a depth of 60 feet, next to spectacular coral reefs. Scientists live in *Aquarius* during ten-day missions using saturation diving to study and explore the coastal ocean. *Aquarius* is owned by NOAA and is operated by the National Undersea Research Center at the University of North Carolina at Wilmington



The *Aquarius*, an underwater ocean laboratory located in the NOAA Florida Keys National Marine Sanctuary. (Photo: NOAA/OAR National Undersea Research Program)

aqueous solution - a solution in which water is the solvent

aquifer - a subterranean layer of porous water-bearing rock, gravel, or sand capable of storing and conveying water to wells and streams

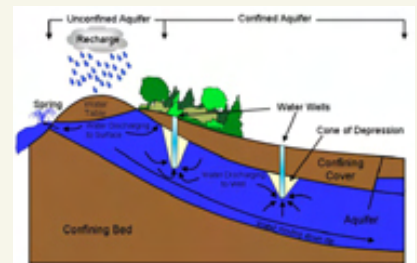


Diagram of an aquifer system. (Diagram: Texas A&M Univ.)

aquiferous system - water circulatory system in sponges composed of choanoderm, pores and chambers

Ara-A - an antiviral drug developed from the discovery of particular nucleosides (the basis of synthesis of Ara-A) in the marine sponge *Cryptotethia crypta*

Ara-C - an anticancer drug developed from the discovery of particular nucleosides (the basis of synthesis of Ara-C) in the marine sponge *Cryptotethia crypta*

arachnactis - a planktonic larva of tube anemones (Ceriantharia)

aragonite - a mineral species of calcium carbonate (CaCO_3) with a crystal structure different from the other two forms of CaCO_3 (vaterite and calcite). It is precipitated from ocean surface waters mainly by organisms (e.g., coral) that use it to make their shells and skeletons

aragonite saturation horizon - a natural boundary in the oceans below which organisms such as stony corals cannot maintain calcium carbonate structures. As carbon dioxide levels increase, the aragonite saturation horizon becomes shallower, severely limiting the distribution of stony corals in certain parts of the deep ocean; the limit between undersaturation and supersaturation of aragonite

aragonite skeleton - skeletons primarily composed of the aragonite form of calcium carbonate

arborescent - having a large tree-like appearance

arborescent colony - a coral colony with a tree-like growth structure

arc - in a geographical information system (GIS), an arc is a line that begin and end with a node. Intersections of arcs are always connected with a node. Arcs also make up part of a polygon

Arc/INFO - geographical information system (GIS) software developed by ESRI that is used to do more robust GIS operations

arch- - a prefix meaning 'ultimate beginning'

Archaea - a group of organisms that resemble bacteria. However, these organisms are biochemically and genetically different from bacteria. Some species live in the most extreme environments found on Earth

Archaeobacteria - an ancient group of prokaryotes, over 3.5 billion years old; sometimes this group is placed into a separate kingdom, the Archaea. Most biologists currently place it within the Kingdom Monera. Archaeobacteria inhabit extreme environments

archaeocyte - in sponges, an amoeboid cell capable of phagocytosis. Archaeocytes are totipotent, having the capability of differentiating into other types of sponge cells

archenteron - the primitive endoderm-lined gut of an animal embryo formed during gastrulation. It is formed by the invagination of blastula cells (blastomeres) into the blastocoel. The archenteron develops into the digestive tract of the adult animal

archetype - the plan or fundamental structure on which a group of organisms, or their systems of organs, are assumed to have been constructed; as, for example, the vertebrate archetype

archi- - a prefix meaning primitive, original, or ancestral

archipelago - a cluster of islands usually in the open ocean. Archipelagos are often volcanic, forming along ocean ridges or hotspots. Examples of archipelagos are the Japanese islands, the Hawaiian Islands, the Philippines, and the Malay archipelago, which includes all of the islands of Indonesia

arciform - bow-shaped

ArcIMS - ESRI software that allows for centrally hosting and serving GIS maps, data, and applications for use on the Internet

arcuate - crescent-shaped

ArcView - desktop geographical information system (GIS) software developed by ESRI used to do some basic GIS operations and print maps

area cladogram - a dendrogram that displays historical relationships among geographic areas, rather than phylogenetic relationships among taxa

arenaceous - a condition of skeletal architecture in sponges in which sand and/or foreign spicule debris partly or completely replaces native spicules within the sponge skeleton; resembling or containing sand; or growing in sandy areas

arenicolous - living in sand

areolate - appearance of a surface characterized by circular spots of tissue or areolae



a grouper with an areolate pattern of pigment (Photo: Agriculture, Fisheries and Conservation Department, Hong Kong)

argent - silvery color

ARGO Project - Argo is a global array of 3,000 free-drifting profiling floats that measures the temperature and salinity of the upper 2000 m of the ocean. This allows continuous monitoring of the temperature, salinity, and velocity of the upper ocean, with all data being relayed and made publicly available within hours after collection

Aristotle's lantern - a highly developed chewing apparatus used for feeding in some sea urchins

ARKive - a not-for-profit, UK-based organization whose mission is 'to promote the conservation of nature and public appreciation of biodiversity, through the power of wildlife imagery.' by finding, sorting, cataloging and copying the key audio-visual records of the world's animals, plants and fungi, and building them into comprehensive and enduring multi-media digital profiles (<http://www.arkive.org/coral/Coral/coral.html>)

ARMDES (AIMS Reef Monitoring Data Entry System) adapted database - a data entry and analysis program running on Microsoft Access, which enables users to input data from line transects, manta tows, and fish visual censuses into a standard access database and to carry out basic analysis of the data. It was created by AIMS and is distributed free of charge

aromatic - a type of hydrocarbon, such as benzene or toluene, with a specific type of ring structure

arrayed library - in genomics, Individual primary recombinant clones (hosted in phage, cosmid, YAC, or other vector) that are placed in two-dimensional arrays in microtiter dishes. Each primary clone can be identified by the identity of the plate and the clone location (row and column) on that plate. Arrayed libraries of clones can be used for many applications, including screening for a specific gene or genomic region of interest

arrhenotoky, arrhenotokous - parthenogenetic production of haploid males from unfertilized eggs. Fertilized eggs produce viable diploid females

arribada - a large aggregation of female sea turtles coming to shore to nest at the same place and at the same time

ARS (autonomous replicating sequence) - any eukaryotic DNA sequence that initiates and supports chromosomal replication; also called autonomous(ly) replicating segment

arterial gas embolism - a hazardous condition for scuba divers that is characterized by air bubbles released from ruptured lung air pockets (alveoli) into the pulmonary circulation. The bubbles then travel to the arterial circulation, where they may block blood flow in the small arteries or capillaries of the brain or heart. The results may be fatal. Arterial gas embolism in divers may be caused by holding one's breath during an ascent, wherein the lungs expand to the danger point

Arthropoda - an animal phylum that contains lobsters, crabs, shrimp, mantis shrimp, barnacles and copepods, fairy shrimp (all crustaceans), insects, centipedes, millipedes, spiders, scorpions, horseshoe crabs, pycnogonids (sea spiders), ticks and mites. Approximately three quarters of a million species are described, many more than all the other animal phyla combined. The crustaceans are the arthropods associated with coral reefs



A spiny lobster (phylum Arthropoda).

articular - pertaining to a joint

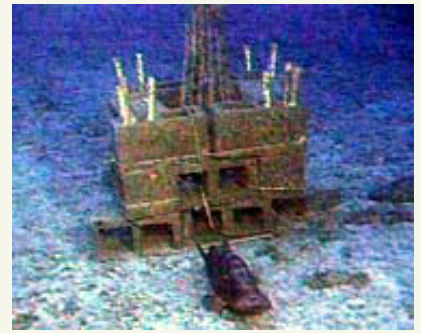
articulated - jointed, as in for example, the soft fin rays of fishes

articulating - united by means of a moveable joint

artifact - an object made by human workmanship, usually for some practical purpose

artificial classification - in taxonomy, classification based on convenient or conspicuous diagnostic characters without attention to characters which indicate phylogenetic relationship; often a classification based on a single arbitrarily chosen character, rather than an evaluation of the totality of characters

artificial reef - an artificial structure placed on the ocean floor to provide a hard substrate for sea life to colonize. Artificial reefs are constructed by sinking dense materials, such as old ships and barges, concrete ballasted tire units, concrete and steel demolition debris and dredge rock on the sea floor within designated reef sites



These concrete blocks were the first artificial structures deployed to provide a substrate for reestablishing colonies of Oculina coral (*Oculina varicosa*) and simulating fish habitat on Oculina Bank (central Florida Atlantic coast), which were destroyed by bottom trawling in the 1990s.

artificial selection - the practice of choosing individuals from a population for reproduction (selective breeding), usually because these individuals possess one or more desirable traits

artificial selection - a process in which humans select desirable genetic characteristics in plants and animals and selectively breed those animals and cultivate those plants to ensure that future generations of descendants have those specific desirable traits

artisanal fishing - fishing which is typically a small-scale operation that uses simple fishing methods; fishing for subsistence by coastal or ethnic island groups using traditional methods; fishing with the purpose of catching/collecting aquatic products for sale

ascidian - a solitary or colonial sea squirt of the phylum Chordata, class Ascidiacea. The adult form does not resemble vertebrate chordate animals but the larval stage possesses all basic chordate characteristics. Adult ascidians are sedentary, filter-feeding, cylindrical or globular animals, usually found attached to a substrate. The soft body is surrounded by a thick gelatinous to leathery test, or tunic (which also gives them the name of tunicate), often transparent or translucent. The test is secreted by the body wall of the adult animal. It is composed of cellulose, a carbohydrate unique in the animal kingdom

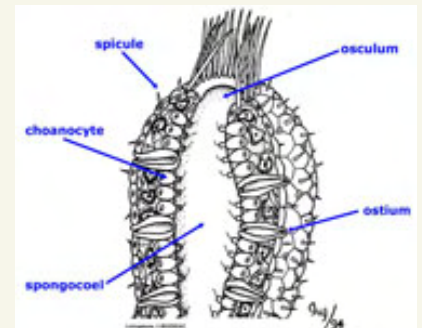


These adult ascidians (sea squirts) resemble invertebrates, but they are closely related to vertebrates and other members of the phylum Chordata.

ASCII (American Standard Code for Information Interchange) - a set of codes for representing alphanumeric information (e.g., a byte with a value of 77 represents a capital M). Text files, such as those created with the text editor of a computer system, are often referred to as ASCII files

asco - a prefix meaning "sack"

asconoid - simplest body form of sponges, with canals leading directly from the surrounding water to the interior spongocoel



Asconoid sponges have the simplest organization. Flagellated choanocytes line the spongocoel, drawing water through small ostia and expelling it through the osculum. (Illustration: BIODIDAC)

ase - a suffix used for the name of an enzyme, e.g., polymerase, lipase, cellulase

asexual embryogenesis - the sequence of events whereby embryos develop from somatic cells

asexual reproduction - reproduction that does not involve the union of sex cells (gametes) to produce a zygote. Examples in corals are budding and fragmentation

Asia-Pacific-Network for Global Change Research (APN) - an inter-governmental network for the promotion of global change research and links between science and policy making in the Asia-Pacific Region

aspergilliform - brush-shaped

aspergillosis - a widespread fungal infection of Caribbean soft corals. It affects six species of sea fans and sea whips. The pathogen is *Aspergillus sydowii*, a terrestrial fungus which infects gorgonia after germination of spores on the coral surface. This is followed by penetration and spread of hyphae in coral tissue, resulting in highly visible lesions which may be associated with complete loss of tissue and skeleton. Lesions often occur at multiple sites across an infected colony. -Purple galls may be produced by the coral host to encapsulate fungal hyphae. For more information and illustrations, see: http://www.coral.noaa.gov/coral_disease/aspergillosis.shtml

asperity - a peak or projection from a surface; pertains to roughness of a surface

assay - in general, the qualitative or quantitative analysis of a substance to determine its constituents and the relative proportion of each, or to determine the biological, chemical, or pharmacological potency of a drug

assemblage - a group or association of interacting populations of organisms in a given area or volume

assimilation - the biological process of absorbing nutrients into an organism's body after digestion

assimilation efficiency - the fraction of ingested food that is absorbed and used in metabolism

association - a group of species living in the same place at the same time

Association of Marine Laboratories of the Caribbean (AMLC) - AMLC is a confederation of more than 30 marine research, education, and resource management institutions endeavoring to encourage the production and exchange of research and resource management information, advance the cause of marine and environmental education in the region, and facilitate cooperation and mutual assistance among its membership. It was founded in 1956 by marine researchers with interests in the marine science of the tropical Atlantic and the Caribbean. The strength of AMLC lies in the diversity of its member laboratories and the extensive expertise of its membership

astaxanthin - a carotenoid pigment found in crustaceans. Astaxanthins may give a green color to the musculature of fishes which feed on crustaceans

astern - behind the vessel; toward the rear of the vessel

asthenosphere - a layer of soft but solid, mobile rock comprising the lower part of the upper mantle from about 100 to 350 km beneath the Earth's surface

asymmetric competition - competition between two organisms (or species) in which one is much more adversely affected than the other

asymmetry - the lack or absence of balanced proportions between parts of a thing; without symmetry

ata (atmosphere absolute) - one (1) ata is the atmospheric pressure at sea level

atavism - the reappearance of an ancestral character after an interval of generations

atmosphere - a unit of pressure, abbreviated as *atm*; "one atmosphere" is the pressure of the atmosphere at sea level, i.e., 760 mm Hg. Two atmospheres is twice this pressure, 1520 mm Hg, etc.; the air surrounding the earth, from sea level to outer space

atmospheric pressure - the pressure of the atmosphere at any given altitude or location; it is synonymous with barometric pressure

atoke - the anterior, nonreproductive part of a marine polychaete worm, as distinct from the posterior, reproductive part (epitoke) during the reproductive season

atoll - a horseshoe or circular array of reef islets, capping a coral reef system that encloses a lagoon, and perched around an oceanic volcanic seamount



A small Pacific atoll. Note the coral reef encircling the calm and shallow lagoon.

atom - the smallest component of an element, made up of neutrons, protons, and electrons

ATPase - an enzyme that functions in producing or using adenosine triphosphate (ATP)

atresia - an abnormal condition in which a normal opening or tube in the body is closed or absent

atrial siphon - in tunicates, the opening that carries water, wastes, and gametes from the organism. Also called the excurrent or exhalent siphon/canal

atrichous - in Cnidaria, lacking spines or barbs

atrichous isorhiza - in hydrozoans, a small cnidocyst (nematocyst) with a smooth tubule. These are only type of cnidocysts found in all the classes of Hydrozoa. they are never very common, but all the classes have some species with them. This type of cnidocyst occurs also in the Anthozoa, Cubozoa and Scyphozoa

atrium - a cavity or passageway; a heart chamber which receives blood

atrophy - a wasting or decrease in size of a tissue or organ because of a reduction in the size or number of its cells. Atrophy may result from cellular death, reduced cellular division, pressure, ischemia, malnutrition, decreased activity or hormonal changes

atrous - jet black color

attachment stage - a stage in an animal's life cycle when it ceases being free swimming or motile, and becomes attached to a substrate

attendant male - a male fish which is not a member of a spawning pair, but hovers close by; often a sneaky male

attitude - in animal behavior, the posture or expression assumed by an organism

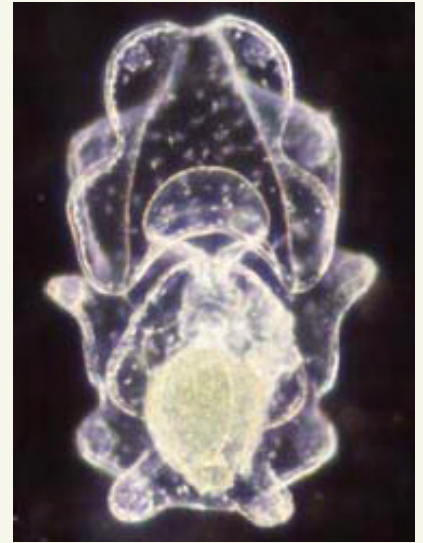
attribute - a measurable component of a biological system; a particular feature or character possessed by an organism

auditory ossicle - one of a series of bones conducting sound in some fishes

aulostomatous - having a tubular-shaped mouth, such as a cornetfish

aureate - golden yellow in color

auricularia larva - larva of a sea cucumber; an early bipennaria larva of a starfish



Late-stage auricularia of *Stichopus californicus* - ca. 17-18 days old, raised in culture by T.H.J. Gilmour. (Photo: University of Saskatchewan Archives)

austral - relating to or coming from the south; of the south temperate region, between the antarctic and tropical regions

Australian Centre of Excellence for Innovative science for sustainable management of coral reef biodiversity - the primary goal of this Australian Research Council Centre of Excellence is to undertake research programs of international significance (through the establishment of new collaborative teams of Australia's leading coral reef researchers) that transcend traditional disciplinary, institutional and geographic boundaries. The Centre of Excellence cements Australia's leading contribution to coral reef sciences, and fosters stronger collaborative links between James Cook University, The Australian National University, University of Queensland, and 28 other leading institutions in nine countries. Collectively, the JCU-led Centre creates the world's largest concentration of coral reef scientists. The aim is to add focus, scale and scope to build an enduring program of innovative research development, leading to world leadership in coral reef science. A key outcome of the Centre of Excellence is to actively transfer scientific knowledge to industry partners and end-users, to increase their capacity and effectiveness, and provide benefits to all Australians

autapomorphy - an apomorphy (derived character differing from the ancestral condition) possessed by a species or clade that is shared with no other species or clade, i.e., a derived character found only in a terminal taxon

autecology - the ecology of a single species

author - in taxonomy, the person(s) to whom a work, a scientific name, or a nomenclatural act is attributed

authority - in taxonomy, the name of the author of a taxonomic name, cited after the name

autochory - the process of seeds and fruits dispersal by means of some kind of explosive physical expulsion. The fruit "explodes", propelling its seeds some distance to the ground surrounding the parent plant; also called "discharge dispersal"

autochthonous - native; indigenous; originating or occurring naturally in the place specified

autoepizooism - settlement and growth of hydrozoan colonies on older animals of the same species

autoevisceration - ejection of intestines and associated organs, in animals such as sea cucumbers, caused by adverse environmental conditions. Regeneration of the organs may occur within weeks

autoimmune disease - a disease in which the organism produces antibodies against its own tissues

autoimmunity - a condition in which an organism mounts an immune response against one of its own organs or tissues; i.e., an organism's immune system attacking its own body

autologous cells - cells that are taken from an individual, cultured, and possibly genetically manipulated before being infused back into the original donor

autolysis - the spontaneous disintegration of cells or tissues by the organism's proteolytic enzymes and macrophage activity, as occurs after death and in some pathologic conditions

automated bleaching early warning system - automated bleaching alerts/warnings directly from satellite and/or in situ derived indices

automyxis - obligatory self-fertilization

autoployploid - a polyploid formed from the doubling of a single genome

autoradiography - a technique that uses X-ray film to visualize radioactively labeled molecules or fragments of molecules; it is used in analyzing length and number of DNA fragments after they are separated by gel electrophoresis

autoskeleton - the endoskeleton of sponges, comprised of spicules or spongin fibers

autosome - any chromosome that is not a sex chromosome; distinguished from a sex chromosome

autotomy - the voluntary shedding of an appendage by snapping it off the base; in corals, some, reproduce asexually by autotomy (fragmentation), for example, *Fungia sp*

autotrophic - relating to organisms that have a type of nutrition in which organic compounds used in metabolism are obtained by synthesis from inorganic compounds

autozoecium - a tube that encloses a bryozoan autozoid

autozoid - a feeding polyp of a bryozoan (Ectoprocta). Autozooids compose the majority of a bryozoan colony

autumnal equinox - the equinox at which the sun approaches the Southern Hemisphere and passes directly over the equator. It occurs around September 23

auxesis - to grow; growth resulting from increase in cell size without cell division

auxotroph - a polyploid formed from the doubling of a single genome

auxotroph - an organism which is unable to synthesize a particular organic compound required for its growth. An auxotrophic alga, for example, is one which requires a few organically derived substances, such as vitamins, along with dissolved inorganic nutrients for photosynthesis; in microbiology, a mutant strain that requires a new nutrient for growth

available name - in taxonomy, any name which conforms to all mandatory provisions of the Code. There are general requirements of publication and date, language, name formation etc. An available name is not necessarily a valid name, as an available name may be in synonymy. Conversely a valid name must always be an available one

aversive stimulus - a noxious stimulus in its immediate environment that an organism tends to remove or avoid

Aves - the name of the class of vertebrates that consists exclusively of birds; the Latin word for "bird"

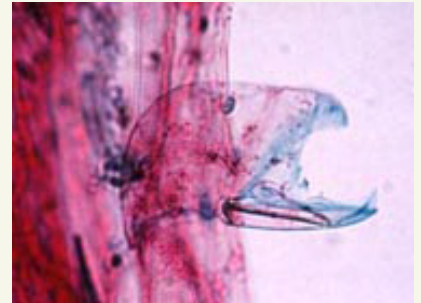
AVHRR (Advanced Very High Resolution Radiometer) - a broad-band, four or five channel (depending on the model) scanner, sensing in the visible, near-infrared, and thermal infrared portions of the electromagnetic spectrum. This sensor is carried on NOAA's Polar Orbiting Environmental Satellites (POES). AVHRR is used for studying and monitoring vegetation conditions. Applications include agricultural assessment, land cover mapping, producing image maps of large areas and tracking regional and continental snow cover. AVHRR data are also used to retrieve various geophysical parameters such as sea surface temperatures (SST) and energy budget data



Artist's rendition of POES satellite.

avian - of, relating to, or characteristic of birds

avicularium - a small bryozoan heterozoid in which the zooecium and operculum form a beak-like, snapping structure that deters small predators



A magnified view of an avicularium from the marine colonial bryozoan *Bugula* sp. (Photo: Dr. Rick Gillis, Biol. Dept., Univ. of Wisconsin)

avifauna - the birds of a specific region or period

avirulent - unable to cause disease

Avogadro's number - a large constant used in chemistry and physics. It is the number of molecules (6.02214×10^{23}) in one mole of substance; also called "Avogadro's Constant"

AVTAS (AIMS Video Transect Analysis System) - video transects are systematically sampled by identifying the benthos occurring at fixed points along the transect to the highest taxonomic level possible. The AVTAS software is used to analyse the video transects. During analysis the data are saved into a Microsoft Access¼ database. In order to eliminate confounding in data analyses due to observer biases, transects from each site are analysed by two observers. The observer who actually surveyed the reef in the field analyses transect one from site one and then every alternate transect. A second observer analyses the remaining transects

axenic - a culture containing only one type of microorganism; not contaminated by or completely free of the presence of other organisms; a pure culture

axial - refers to the head and trunk of an individual

axial corallite - a corallite which forms the tip of a branch

axial cortex - the layer around the central core of the axis of an octocoral

axial polyp - the longest polyp of a group of polyps which produces secondary polyps by budding

axial sheath - the coenenchyme which surrounds the axis on the Gorgonacea and Pennatulacea

axial skeleton - in a vertebrate skeleton, the skull, vertebral column, ribs, and sternum

axial swimming - the predominant swimming mode of fishes. This swimming movement involves lateral bending of the body caused by contractions of the lateral body musculature and oscillating movements of the caudal fin

axis - the internal, usually calcium carbonate skeletal rod of sea fans (Gorgonacea) and sea pens (Pennatulacea)

axis epithelium - the layer of ectodermally-derived cells which consists of corticocytes, which produce the axis, and desmocytes, which attach tissues to the axis

axocoel - the most anterior of three coelomic spaces that appear during larval development of echinoderms

axon - the single motor branch of a neuron that passes the nervous impulse away from the cell body to another neuron or effector organ

axoneme - a bundle of microtubules and other proteins forming the core of each cilium or flagellum

azooxanthellate coral - a coral which does not have symbiotic zooxanthellae in its tissues

azure - light or sky blue color

[\(Top\)](#)



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This Site
All of NOAA

Glossary of Terminology: B

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

B lymphocyte - a type of white blood cell which produces antibodies

bacillus - a bacterium with a rod-like shape



Image of rod-shaped bacterium, *Bacillus infernus*, collected from deep (20-2800 meters) terrestrial subsurface. (Photo: U.S. Dept. of Energy/Subsurface Microbial Culture Collection)

back reef - the shoreward side of a reef, including the area and sediments between the reefcrest/algal ridge and the land. It corresponds to the reef flat and lagoon of a barrier reef and platform margin reef systems



Emergent coral heads in a back reef zone. (Photo: Great Barrier Reef Marine Park Authority)

backcross - crossing an organism with one of its parents, or with the genetically equivalent organism. The offspring of such a cross are referred to as the backcross generation or backcross progeny

background extinction - the continuous, low-level extinction of species that has occurred throughout much of biological history

background level - the concentration or level of a substance or other factor in an environment that is not the result of human activities, e.g., background levels of chemicals, light, sound, etc

background noise - noise coming from sources other than the noise source being monitored

backscatter - the deflection of acoustic radiation in a scattering process through an angle greater than 90 degrees. Backscatter is the term commonly used to describe the return of energy from the seabed to the receiver in an active sonar

bacteria - a major group of living organisms in the kingdom Monera. They are microscopic and mostly unicellular, with a relatively simple cell structure lacking a cell nucleus, cytoskeleton, and organelles such as mitochondria and chloroplasts. Bacteria are genetically distinct from protists, fungi, plants, and animals. Many species of bacteria are pathogenic to other organisms, including humans

bacterial bleaching - loss of zooxanthellae with resultant bleaching caused by a specific bacterial infection, as opposed to environmental stress. The bacteria (*Vibrio sp.*) produce a toxin which cause lysis of the zooxanthellae. For additional information and illustrations, see: http://www.coral.noaa.gov/coral_disease/bacterial_bleaching.shtml

bacterial chlorophyll - chlorophylls (bacteriochlorophylls a, b, c, d, e, and g) found in photosynthetic bacteria. They differ from plant chlorophyll in chemical construction and absorption spectra characteristics

bacterial generation time - the time interval required for a bacterial cell to divide, or for a population of bacterial cells to double. Generation times for bacterial species growing in nature may be as short as 15 minutes or as long as several days

bactericide (bacteriocide) - a substance that kills bacteria

bacteriocyte - a cell which harbors symbiotic bacteria in animals as diverse as insects and marine tube worms living around hydrothermal vents

bacteriophage (phage) - a virus that attacks and infects bacterial cells. Phages consist of a protein coat enclosing the genetic material, DNA or RNA, that is injected into the bacterium. Upon infection, synthesis of host DNA, RNA and proteins ceases and the phage genome is used to direct the synthesis of phage nucleic acids and proteins using the host's transcriptional and translational apparatus

bacteriophagous - feeding on bacteria

bafling - to impede the force or movement of flowing water, such that sediment particles may settle from suspension

bailer - an exopod of the maxilla of decapod crustaceans, such as lobsters, that functions in regulating the flow of water in the gill chamber

balanced polymorphism - a type of polymorphism in which the frequencies of the coexisting forms do not change noticeably over many generations

balanoid - acorn shaped

Baldwin effect - a hypothesis in which a characteristic, such as individual learning, significantly affects the evolution of the species with respect to that characteristic. The Baldwin effect functions in two steps. First, phenotypic plasticity (the ability of an organism to adjust to its environment during the course of its lifetime) allows an individual to adjust to a partially successful mutation, which might otherwise be utterly useless to the individual. If this mutation adds to inclusive fitness, it will succeed and proliferate in the population

ballast - a weight at the bottom of the boat to help keep it stable. Ballast can be placed inside the hull of the boat or externally in a keel. Water picked up as ballast in one location may be released in another, and in doing so, may introduce non-native species

bamboo coral - an octocoral found in both warm, shallow-water and cold, deep-water marine habitats throughout the world's oceans. Bamboo corals possess a skeletal arrangement which resembles bamboo. The skeleton is composed of calcareous plates and proteinaceous gorgonin. They can live for centuries

band - a thick, pigmented vertical marking that encircles the circumference of an organism's body



Chaetodon striatus, the banded butterfly fish, has two black bands of pigment encircling its body. (Image: NOAA)

bank - a broad elevation of the sea floor around which the water is relatively shallow but not a hazard to surface navigation

bank reef - large reef growths, generally having irregular shape, which develop over submerged highs of tectonic or other origin and are surrounded by deeper waters

bank/shelf - deepwater area extending offshore from the seaward edge of the fore reef to the beginning of the escarpment where the insular shelf drops off to the deep, oceanic water. If no reef crest is present, it is the flattened platform between the fore reef and the deep ocean waters or between the intertidal zone and open ocean

bar - a thick, pigmented vertical marking that does not encircle the body of an organism; an elongate submarine shoal



The royal gramma, *Gramma loreto*, has a darkly pigmented bar across its eye.

bar - unit of pressure of one million dynes per square centimeter

bar and spit - a low accumulation of sand or sediments forming an intertidal or subtidal extension of a reef islet

bar-built estuary - an estuary formed when a barrier island or sand bar separates a section of the coast where fresh water enters

barb - a type of spine armed with teeth pointing backwards



Stingrays have whip-like tails, defensively armed with a venomous barb which can inflict a serious wound on another animal (Photo: Peter Piermarini, Ph.D.)

barbel - a slender elongate sensory structure protruding from the lips or jaws of certain fishes, such as catfishes, goatfishes, drums, cods, and many deep-sea fishes. Barbels may appear singly or in groups. They are primarily tactile in function but may also bear tastebuds, allowing the fish to taste its environment



A yellow goatfish with two prominent barbels protruding from its chin. (Photo: NOAA)

Barcode of Life Data System (BOLD) - an online system that aids in the collection, management, analysis, and use of DNA barcodes. BOLD was created and is maintained by the University of Guelph in Ontario

barcode; barcoding - a technique for characterizing species of organisms using a short DNA sequence from a standard and agreed-upon position in the genome. The cytochrome c oxidase subunit 1 mitochondrial region is emerging as the standard barcode region for higher animals. It is 648 nucleotide base pairs long in most groups

baroreceptor - a sensory organ perceiving changes in pressure; also called "baroreceptor"

barometer - an instrument for measuring air pressure

barophile - a microorganism which grows best (or can only grow) in high-pressure environments, such as deep-sea environments

barotrauma - an injury that results from rapid or extreme changes in pressure. Scuba divers may experience ear barotrauma, a condition of discomfort in the ear caused by pressure differences between the inside and the outside of the eardrum

barotropism - a response to pressure stimuli

barren zone - the region of a coral reef seaward of the lower palmata zone and just landward of the buttress or mixed zone

barrier island - a long, usually narrow accumulation of sand, that is separated from the mainland by open water (lagoons, bays, and estuaries) or by salt marshes



Cape Lookout National Seashore currently consists of 4 barrier islands. (Photo: U.S. National Park Service)

barrier net - a small-mesh net used to capture coral reef or coastal pelagic fishes

barrier reef - a long, narrow coral reef, roughly parallel to the shore and separated from it by a lagoon of considerable depth and width. It may lie a great distance from a continental coast. It is often interrupted by passes or channels



Healthy *Acropora* coral in Australia's Great Barrier Reef. (Photo: Ray Berkelmans/Great Barrier Reef Marine Park Authority)

basal - of, at or forming a base

basal bud - in bryozoans, the bud arising from the basal wall of the parent zooid

basal plate - lower part of the coral cup, separating the polyp from the substratum. A synonym of pedal disc

basalt - a dark, fine-grained igneous rock composed of minerals rich in ferromagnesian silicates

base - a substance that reduces the hydrogen ion concentration in a solution

base - in genomics, a key component of DNA and RNA molecules. Four different bases are found in DNA: adenine (A), cytosine (C), guanine (G) and thymine (T). In RNA, uracil (U) substitutes for thymine; also known as nitrogenous bases; a base, a phosphate molecule and a sugar joined together constitute a nucleotide

base pair - two nitrogenous bases which form a "rung of the DNA ladder." A DNA nucleotide is made of a molecule of sugar, a molecule of phosphoric acid, and a base molecule. The bases are the "letters" that spell out the genetic code. In DNA, the code letters are A, T, G, and C, which stand for the chemicals adenine, thymine, guanine, and cytosine, respectively. In base pairing, adenine always pairs with thymine, and guanine always pairs with cytosine. In RNA, thymine is replaced by uracil

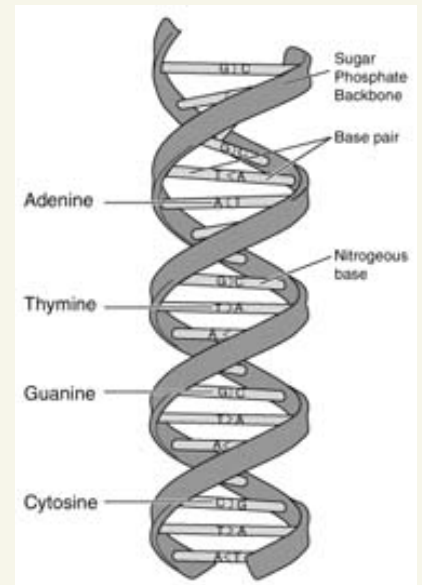


Diagram of a DNA molecule. (Diagram: U.S. NIH/Human Genome Project)

base sequence - the order of nucleotide bases in a DNA molecule

baseline data - a quantitative level or value from which other data and observations of a comparable nature are referenced

basement rock - a complex of metamorphic and igneous rocks that underlies sedimentary deposits. These are the oldest rocks in a given area

basic research - research conducted with the sole goal of obtaining knowledge; in contrast with applied research

basicaudal - on the base of the caudal fin of fishes

basicaudal spot - a spot on the base of the caudal fin, common in many unrelated fish species

basilar - forming a foundation

basin - any large depression in which sediments are deposited

basionym - In taxonomy, the first name published for a taxon. It remains the defining name for the taxon even when the taxon has been transferred to a new combination. According to priority rules of biological nomenclature, after a taxonomic revision that results in a species being reclassified in another genus, the specific epithet must remain the same as the one in the basionym

basipinacocyte - a pinacocyte that adheres a sponge to a substrate by the external secretion of a collagenous matrix

basitrichous isorhiza - an isorhizal cnidocyst (nematocyst) with spines at the base of the tube only; also called "basitrich"

basket star - a basket star is a specialized type of brittle star (Echinodermata). It has a series of complexly branched arms which are used to capture plankton



The spiny arms of this basket star branch repeatedly to form a coiled mass. Unlike other brittle-stars, basket stars are suspension feeders, trapping large particles in their extended arms. (Photo: NOAA ocean Explorer/ L. Mullineaux)

Batesian mimicry - a type of mimicry in which a harmless species resembles a different species that is unpalatable, poisonous, or otherwise noxious or harmful to a predator

bathyal zone - region of the seafloor from the shelf edge (200m) to the start of the abyssal zone (2,000m)

bathymetric map - a map which delineates the form of the bottom of a body of water by the use of depth contours (isobaths)

bathymetry - the science of measuring ocean depths to determine the topography of the sea floor

bathypelagic zone - a layer (zone) of the ocean which lies just beneath the mesopelagic zone. It extends from 1000-4000 meters. Because no light (except for bioluminescence) penetrates this zone, it is also called the midnight zone. The temperature in the bathypelagic zone remains fairly constant at about 4 degrees C

battery - a group of nematocysts on the tentacles of hydras and some other hydroid polyps

baud - unit of data transmission speed of one bit per second

BCD (buoyancy control device) - the BCD is a mandatory piece of equipment for SCUBA diving. It is an expandable bladder, most commonly worn as an expandable vest, that can be inflated with air from the tank to increase buoyancy while diving. To decrease buoyancy, the BCD is deflated through special air-dump valves or hoses. It provides positive buoyancy for resting, swimming or lending assistance to others under water. The BCD allows maintenance of neutral buoyancy at any depth simply by adding or releasing air. It is also called a buoyancy compensator (BC)



A buoyancy control device (BCD). It is a vest-like expandable bladder that can be inflated with air to increase or decrease a scuba diver's buoyancy while diving.

beach - an aggregation of unconsolidated sediment, usually sand, that covers the shore

beak - in cephalopods, one of two chitinous mandibles (jaws) used primarily to cut prey tissues during feeding

beam - the widest part of a vessel

Beaufort scale - a scale used to classify wind speeds, devised in 1805 by Admiral Francis Beaufort of the British Navy

beche-de-Mer - commercially harvested sea cucumbers (Class Holothuroidea). In Asia, it is considered to be a delicacy



Image of the commercially harvested -beche de mer+.

bedload - sedimentary material subject to transport by flowing water, e. g. currents. The size of particles moved is proportional to the strength of the water movement

bedrock - the solid rock of the earth's crust that lies under the soil and other unconsolidated earth materials

behavioral isolating mechanism - a difference in behavior (usually reproductive behavior) that prevents genetic exchange between members of different populations or species

bel - unit of noise intensity equal to ten decibels

Belau - traditional (native) name for Palau (Republic of Palau)

belt transect - a linear or circular transect with the observation area being a specified distance on either side of the transect line

benchmark - a measurement or standard that serves as a point of reference by which process performance is measured

benign introduction - the purposeful introduction of members of a species into an appropriate habitat, foreign to the "home" habitat or area, for the purposes of conservation of that species

benthic - bottom dwelling; living on or under the sediments or other substrate

benthic carbon dioxide flux - the amount of carbon dioxide (CO₂) released from a unit area of sediment over a specific time interval, during the decomposition of organic matter. Part of the benthic CO₂ flux may also result from the dissolution of calcium carbonate

benthic chamber - an open-bottom container (usually constructed of acrylic) that encloses an area of sediment/substratum and overlying water. The chamber is deployed to capture gas (e.g., efflux of CO₂ from sediments) and solute movement between the sediment and the water column

benthic organism (benthos) - an organism whose habitat is on or near the bottom of a stream, lake, or ocean

benthic region - the bottom layer of a body of water



A benthic crab (phylum Arthropoda).

benthic-pelagic coupling - the cycling of nutrients between bottom sediments and the overlying water column

berm - a low, incipient, nearly horizontal or landward-sloping area, or the landward side of a beach, usually composed of sand deposited by wave action; a mound of earth formed to control the flow of surface water; a sloped wall or embankment used to prevent the inflow or outflow of materials into/from an area

beta animal - in animal behavior, the subordinate or second animal in a social group

beta particle - a high-speed particle, identical to an electron, emitted from an atomic nucleus

beta taxonomy - in taxonomy, the process of arranging taxa into higher categories which reflect the evolutionary history of a group of organisms.

bicarbonate - any salt containing the HCO₃ anion

bicentric distribution - the presence of a species (or other taxonomic unit) in two widely separated geographic areas

bicornate - having two horns or horn-shaped structures

bicuspid - having two cusps or points

biennial - occurring once every two years

bifacial - having like opposite surfaces; describes plates which have corallites on both sides

bifid - divided or cleft into two parts or lobes

bifurcate - a coral branch that divides into two equal branches

bigeminal - occurring in pairs

bigeye - any species of bony fishes in the family Priacanthidae. Bigeyes (also called "catalufas") are most typically colored bright red, but other coloration patterns exist. The common name of "bigeye" refers to their unusually large eyes which are adapted their



The short bigeye,
Pristigenys alta,
photographed at Pulley
Ridge (Photo: U.S.
Geological Survey)

bight - an indentation of the coast forming a large open bay

bilateral symmetry - a bilaterally symmetric organism is one that is symmetric about a plane running from its frontal end to its caudal end (head to tail), and has nearly identical right and left halves. Most animals are bilaterally symmetrical. The exceptions are sponges (no symmetry), cnidarian polyps and medusae, and ctenophores (radial symmetry), and echinoderms (partial radial symmetry).

Bilateria - group containing all multicellular animals with bilateral symmetry; the name has no taxonomic status

bilineate - having two lines

bimaculate - having two spots

bimodal - a distribution in which the frequency curve has two peaks. A single peak is called a mode

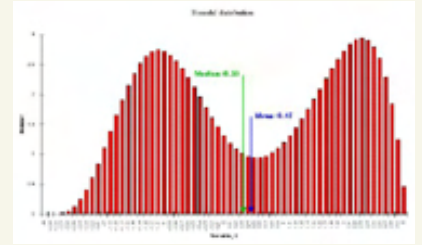
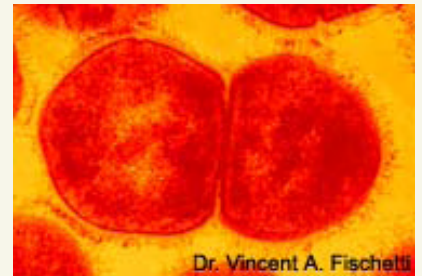


Chart showing a population of data having a bimodal distribution.

bimodal curve - a frequency curve characterized by two peaks

binary fission - type of cell division found in prokaryotic cells, in which dividing daughter cells each receive a copy of the parental chromosome



A bacterial cell reproducing by binary fission. The two resultant daughter cells are genetically identical. (Photo: Dr. Vincent A. Fischetti, Laboratory of Bacterial Pathogenesis and Immunology, Rockefeller University)

binding - the ability of molecules to stick to each other because of the exact shape and chemical nature of parts of their surfaces

binding site - the reactive part of a macromolecule that directly participates in its specific combination with another molecule

binomen - a two-part name given to a species in which the first part is the name of the genus and the second is the specific name

binomial nomenclature - a system of nomenclature where each animal has a dual name consisting of genus and species, e.g., the boulder coral, *Montastrea annularis*

bioaccumulation - the buildup of chemical substances in the cells or tissues of an organism

bioacoustics - a discipline of zoology that is concerned with sounds of biological origin: their mechanisms of production, physical properties, receptors and reception physiology, and the role of the sounds in behavior

bioassay - an assay for the activity or potency of a substance that involves testing its activity on living materials

biochemical - a product produced by chemical reactions in living organisms

biochemical cycle - the flow of an element through the living tissue and physical environment of an ecosystem, e.g., the carbon, hydrogen, oxygen, nitrogen, sulfur, and phosphorus cycles

biochemical genetics - the study of the relationships between genes and enzymes, specifically the role of genes in controlling the steps in biochemical pathways

biochemical oxygen demand (BOD) - the amount of oxygen taken up by microorganisms that decompose organic waste matter in water. It is therefore used as a measure of the amount of certain types of organic pollutant in water. A high BOD indicates the presence of a large number of microorganisms, which suggests a high level of pollution

biochip - an electronic device that uses organic molecules to form a semiconductor; a microchip that uses tiny strands of DNA to latch onto and quickly recognize thousands of genes at a time; collection of miniaturized test sites (microarrays) arranged on a solid substrate that permits many tests to be performed at the same time in order to achieve higher throughput and speed. A biochip can perform thousands of biological reactions, such as decoding genes, in a few seconds. Biochips can also be used to rapidly detect chemical agents used in biological warfare so that defensive measures can be taken

biochore - a group of similar biotopes

bioclastic sediment - a sediment type composed of fragments of organic skeletal materials

biocoenose - an assemblage of diverse organisms inhabiting a common biotope

biocoenosis - a community or natural assemblage of organisms. The term often is used as an alternative to ecosystem, but strictly it is the fauna/flora association excluding physical aspects of the environment

biocriteria (biological criteria) - as defined by the U.S. Environmental Protection Agency (EPA), biocriteria are powerful management tools because biological communities are dependable indicators of the health of an aquatic ecosystem. The criteria are generated as narrative descriptions or numeric values that represent the biological condition of the community. Rigorous biological assessments are needed to identify metrics for a monitoring program and to set expectations for the water body. These are used to develop a scoring system to indicate the health of the water body and to develop biocriteria for each class or designated use

biocycle - a subdivision of the biosphere, e.g., a biochore

biodegradable - capable of undergoing rapid decomposition by microorganisms under aerobic and/or anaerobic conditions. Most organic materials are biodegradable

biodiversity - the total diversity and variability of living things and of the systems of which they are a part. This includes the total range of variation in and variability among systems and organisms at the bioregional, ecosystem and habitat levels, at the various organismal levels down to species, populations and individuals and at the level of the population and genes



A coral reef contains a great variety of species of all major kingdoms of living forms. (Photo: Dr. Anthony Picciolo)

Biodiversity Conservation Information System (BCIS) - The purpose of the BCIS Framework for Information Sharing is to support BCIS Members and others making decisions on the conservation and sustainable use of living resources. BCIS is a consortium of ten international conservation organizations and programs of IUCN—The World Conservation Union. BCIS Members collectively represent the single greatest global source of biodiversity conservation information in the world. BCIS is a framework within which the Members' networks work together toward a common goal: to support environmentally sound decision-making and action by facilitating access to biodiversity data and information

biodiversity hot spot - an area that features exceptional concentrations of species, including many endemics. Many such hot spots also experience large habitat losses, putting these ecosystems at risk

biodiversity indicators - in conservation biology, sets of species or taxa whose presence may indicate areas of high species richness

bioenergy - energy made available by the combustion of materials derived from biological sources

bioerosion - erosion of the physical/geological environment by organism activities such as boring, scraping, etching, etc.

biogenesis - a central concept of biology that all living organisms are descended from predecessor living organisms

biogenic - refers to things which came about as a result of the activities of living organisms

biogenic reef - a mound-like layered structure built by and predominantly composed of organic remains such as shells and skeletons of sedentary organisms

biogenic rock - an organic rock produced by the physiological activities of plants or animals

biogenous - produced by living organisms

biogenous sediment - sediment that is composed of the skeletons and shells of marine organisms, primarily plankton

biogeochemical cycle - the chemical interactions among the atmosphere, biosphere, hydrosphere, and lithosphere

biogeographical filter - a geographic or ecological barrier that restricts some dispersal between regions and blocks passage of certain forms but not others

biogeography - a branch of biology that deals with the geographical distribution of organisms

bioherm - a body of rock built up by or composed mainly of sedentary organisms, e.g., hard corals, calcareous algae or mollusks, and enclosed or surrounded by rock of different origin

bioinformatics - the analysis of biological information using computers and statistical techniques; the science of developing and utilizing computer databases and algorithms to accelerate and enhance biological research. Bioinformatics is particularly important as an adjunct to genomics research, because of the large volume of complex data generated

biolimiting - relating to the environmental factors determining or restricting the growth of a particular life form

biolistics - a technique to insert DNA into cells. The DNA is mixed with small metal particles, usually tungsten or gold, a fraction of a micrometer across. These are then fired into a cell at very high speed.

biological clock - an internal biological mechanism which controls certain biological rhythms and biocycles, such as metabolism, sleep cycles, and photosynthesis

biological control - the use of living organisms, such as parasites, disease agents, and predators, to control or eliminate other unwanted living organisms, rather than by using toxic chemicals or other means of elimination

Biological Data Profile of the Content Standard for Digital Geospatial Metadata - provides a common set of terminology and definitions for the documentation of biological data through the creation of extended elements and a profile of the FGDC Content Standard for Digital Geospatial Metadata. Its purpose is to provide a user-defined or theme-specific profile of the FGDC Content Standard for Digital Geospatial Metadata to increase its utility for documenting biological resources data and information. This standard can be used to specify metadata content for the full range of biological resources data and information. It also serves as the metadata content standard for the National Biological Information Infrastructure (NBII)

biological half-life - the time required for one-half of the total amount of a particular substance in a biological system to be consumed or broken down by biological processes when the rate of removal is approximately exponential. Toxic chemicals with a long biological half-life will tend to accumulate in the body and are more likely to be harmful. A substance with a short biological half-life may still accumulate if a portion of it it becomes tightly bound to bone or other tissues, even if most of it is quickly eliminated from the body

biological indicator - an organism, species or community whose characteristics show the presence of specific environmental conditions. Other terms used are indicator organism, indicator plant and indicator species

biological marker - a measurable and quantifiable biological parameter which serves as an index for health and physiology related assessments, such as disease risk, environmental exposure and its effects, disease diagnosis, metabolic processes, and epidemiologic studies; also called "biomarker"

biological navigation - the ability of certain animals to navigate by instinct to specific sites. Depending upon the species, the cues involved may be related to star patterns, sun angle, polarized light, chemical scents or tastes, or the Earth's magnetic field

biological productivity - the amount of organic matter, carbon, or energy content that is accumulated during a given time period

biological rank - in animal behavior, when a hierarchy of dominance exists between different species which compete for food, water or space

biological rhythm - an overt, measurable activity generated by some internal oscillator (or 'clock')

biological survey - collecting, processing, and analyzing a representative portion of the resident aquatic community to determine its structural and/or functional characteristics

bioluminescence - light produced by organisms as a result of conversion of chemical energy to light energy



A bioluminescent comb jelly of the phylum Ctenophora.

biomagnification - the accumulation and amplification of chemical substances at each succeeding trophic level

biomarker - a molecular marker associated with a biological function; a physical, functional, or biochemical indicator (eg, the presence of a particular metabolite) of a physiological or disease process; a chemical compound produced by a specific organism that can be used as an indicator for the presence of that organism

biomass - an estimate of the amount of living matter per some unit volume or area

biome - a community of animals and plants occupying a climatically uniform area on a continental scale

biometrics - the use of statistics for the study of biological events

biopharming - to genetically engineer an organism to produce a pharmaceutical drug, vaccine or industrial substance

biophysics - the scientific study of the physics of organisms, their biological structure and processes

biopolymer - a macromolecule, including nucleic acids, proteins, and polysaccharides, which is formed by a living organism

bioregion - any geographical region characterized by a distinctive biota

bioremediation - the use of organisms such as plants or microorganisms to aid in removing hazardous substances from an area

Biorock™ - Biorock Technology, or mineral accretion technology is a method that applies safe, low voltage electrical currents through seawater, causing dissolved minerals to crystallize on structures, growing into a white limestone similar to that which naturally makes up coral reefs. This material has a strength similar to concrete. It can be used to make robust artificial reefs on which corals grow at very rapid rates. The Biorock Process is owned by Biorock, Inc; see also "mineral accretion" in this glossary

biosphere - the thin region surrounding the Earth that is capable of supporting life

biosynthesis - a metabolic process where chemical compounds are produced from simpler reagents. Biosynthesis is a cellular process which occurs within living organisms and is generally catalyzed by enzymes. The process is a vital part of metabolism

biota - all life forms of a given area

biotechnology - biological techniques used in applied research research and product development. In particular, the use by industry of recombinant DNA, cell fusion, and new bioprocessing techniques; any technology that is applied to living organisms to make them more valuable to humans

biotic potential - the maximum rate a population can increase under ideal conditions

biotope - an area of relatively uniform environmental conditions, occupied by a given plant community and its associated animal community

biotoxin - any poisonous or venemous substance produced by any living organism

bioturbation - the rearrangement of sediments by organisms that burrow through them and ingest them

bioturbator - an organism, mainly a worm or crustacean, that disturbs sediments by burrowing or feeding. Its activities mix the sediment layers and may cause substantial resuspension

biotype - a physiological variety or a group of individuals having distinctive genetic characters in common

biparental - the situation where the young are raised by both parents

bipectinate - having two margins which are toothed, like a comb; descriptive of the gills (ctenidia) of aquatic mollusks

bipectinate gill (ctenidium) - in mollusks, refers to having gill lamellae on both sides of the ctenidial axis

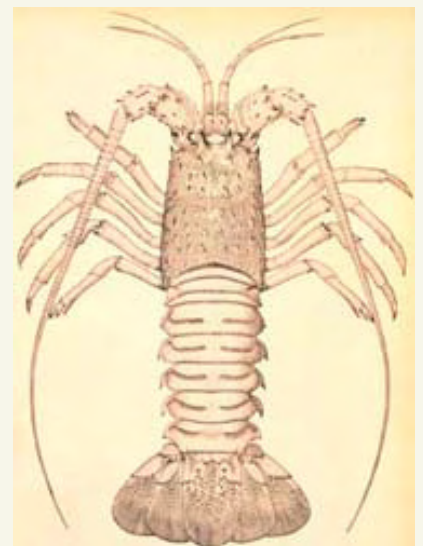
bipinnaria larva - an early starfish larva with ciliated bands running about the periphery



Mature bipinnaria of *Pisaster ochraceus*, ca 24 days old, raised in culture by T.H.J. Gilmour. (Photo: University of Saskatchewan Archives)

biradial symmetry - a body plan in some cnidarians that has two planes of symmetry rather than the several planes of a radially symmetrical animal, or the single plane of a bilaterally symmetrical one. Both planes of symmetry are longitudinal and are at right angles to each other. Both include the aboral-oral axis, which is the axis of symmetry

biramous appendage - a type of appendage that is characteristic of crustaceans. It forks from the basal protopodite to form two branches, the inner endopodite and the outer exopodite. Each of these branches can be composed of either one or more segments. There are many variations on this generalized structure; the branches often possess highly specialized extensions



Note the biramous antennules of the spiny lobster.

bit - the smallest unit of information that a computer can store and process. A bit has two possible values, 0 or 1, which can be interpreted as yes/no, true/false, or on/off

bitmap - a format for storing graphics in an uncompressed manner

bitmap image - also called raster or paint images. They are made of individual dots called pixels (picture elements) that are arranged and colored differently to form a pattern. Compared to a vector image, bitmap images are great for photographs because they tend to offer greater subtleties for shading and texture but require more memory and take longer to print. Vector images are best for drawings that need sharper lines, more detail, and easy modification. Vector images require far less printing resources than bitmap images

Bivalvia (Pelecypoda) - a class of Mollusca that includes clams, oysters and mussels. Bivalves are laterally compressed and possess a shell composed of two valves that hinge dorsally and enclose the body. They are common inhabitants of coral reefs



A scallop (class Bivalvia) displays its rows of light-sensitive eyespots.

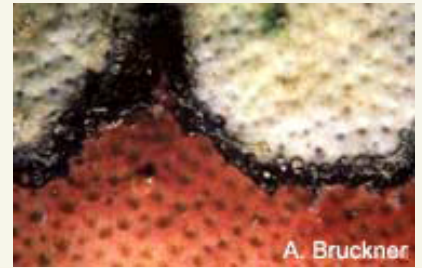
black coral - black corals are colonial cnidarians in the Order Antipatharia. They are found throughout the world's oceans, but are most common in tropical deep water habitats from 30-80 m depth. These species of black coral have rigid, erect skeletons that form branched, bush-like colonies. Black coral is commercially harvested primarily for jewelry, and may be globally threatened in many parts of the world as a result of over-harvesting



Black coral isn't really black. The name refers to the black color of their proteinaceous skeletons. The living colonies are made up of thousands of

tiny coral polyps whose colors may be yellow, green or orange. (Photo: Dr. A. Bruckner, NOAA)

black-band disease - a world-wide disease of corals that is characterized by a dark ring, or band, that separates apparently healthy coral tissue from freshly exposed coral skeleton. It migrates across coral colonies and completely degrades coral tissue. The infecting agent is a synergistic assortment of photosynthetic and non-photosynthetic bacteria. For more details and illustrations, see: http://www.coral.noaa.gov/coral_disease/black_band.shtm



Black band disease. (Photo: Dr. A. Bruckner, NOAA)

bladder - any sac or cavity used to store liquids or gases

blade - a leaf-like structure

blastocoel - the fluid-filled cavity formed within the mass of cells of the blastula of many animals during the later stages of cleavage

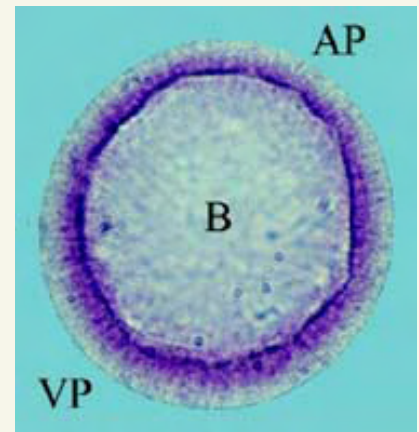
blastocyst - a preimplantation embryo. The blastocyst consists of a sphere made up of an outer layer of cells (trophectoderm), a fluid-filled cavity (blastocoel), and a cluster of cells on the interior (inner cell mass)

blastomere - an undifferentiated cell of a cleaving embryo, and of the morula and blastula stages of embryonic development

blastopore - the opening into the archenteron (primitive gut) of a gastrula. In some animals it develops into the mouth and, in others, into the anus

blastostyle - the axial portion of a modified gonangium, upon which medusoid buds are developed

blastula - a stage of embryonic development of animals near the end of cleavage (cell division), but before gastrulation. In animals where cleavage involves the whole egg, the blastula usually consists of a hollow ball of cells (blastomeres) surrounding a fluid-filled central cavity, the blastocoel



A late blastula characterized by a single layer of cells surrounding the central hollow area - the blastocoel (B). The blastomeres at the vegetal pole (VP) are taller than those at the animal pole (AP), making the vegetal pole appear slightly thicker. (Photo: Cell and Developmental Biology Online website (University of Guelph); URL: <http://www.uoguelph.ca/zoology/devobio/>)

bleach - to make or become white or colorless by means of chemicals, by exposure to solar radiation, etc. In corals, the reduction in intensity or complete absence of coloration within living coral tissues, due to expulsion of symbiotic algae (zooxanthellae)

bleaching index - index based on the strength and duration of local HotSpots to monitor bleaching events

bleaching outbreaks - development of bleaching events

bleaching stressors - environment-induced stress that results in bleaching, e.g., disease, excessive or insufficient light, increased levels of ultraviolet radiation, sedimentation, pollution, salinity changes, and increased temperatures

blenny - the common name of a large group of over 800 species within seven families of bony fishes in the suborder Blennioidei. Blennies are small, usually scaleless fishes with comb-like teeth living in coastal and coral reef areas, including seagrass beds and tidepools. At least one species lives in fresh water. Most are characterized by possessing blunt foreheads, elongated, tapering bodies, and a continuous long dorsal fin. The pelvic fins are usually anterior to the pelvic fins, and in the jugular in position. Many species are cryptic or inhabit the surge zone. Most are herbivores

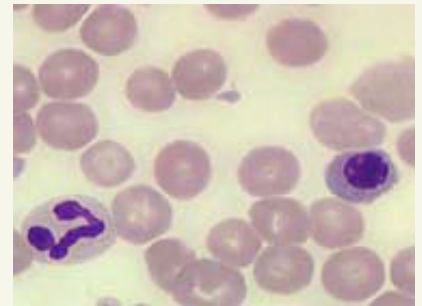


The blenny, *Blenniella gibbifrons*, is common on Hawaiian shallow reefs living in empty vermetid tubes (Photo: Keoki and Yuko Stender)

blind test - a method of testing or experimentation, in which an independent observer records the results of any test, drug, placebo, or procedure without knowing the identity of the samples or what result might be expected

blog (weB LOG) - basically a journal that is available on the web. The activity of updating a blog is "blogging" and someone who keeps a blog is a "blogger"

blood - a circulating tissue composed of a fluid portion (plasma) with suspended formed elements (red blood cells, white blood cells, and platelets) that delivers nutrients and hormones to cells and removes wastes; In some invertebrates, the blood is called the haemolymph



Red and white blood cells. The white blood cells are the larger ones with irregular nuclei. The small particles are platelets. (Photo: U.S. National Institutes of Health)

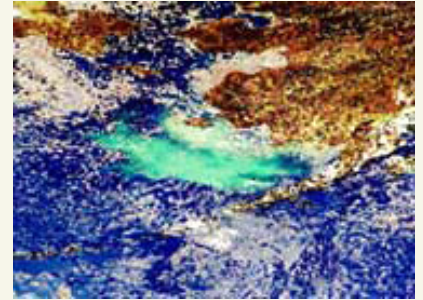
blood pigment - a pigment used by an organism to transport oxygen efficiently, usually in a circulatory system (e.g., hemoglobin, hemocyanin)

blood sinus - in invertebrates, a space among the muscles and viscera through which blood returns to the blood-pumping organ (heart)

blood sinus - a channel, not a blood vessel, which permits the passage of blood

bloodworm - a marine polychaete worm used as bait in angling

bloom - a sudden increase in the biomass of phytoplankton or benthic algae in a given area



A SeaWiFS (Sea-viewing Wide Field-of-view Sensor) image of a coccolithophore bloom in the Bering Sea.

blotch - a patch or a spot of pigment with irregular edges



The blotch-necked moray (*Gymnothorax margaritophorus*) from American Samoa bears darkly pigmented blotches along its body. (Photo: NPS, Copyright Richard C. Wass)

blue coral - the blue coral, *Heliopora coerulea*, is an octocoral that has a massive aragonite skeleton and is an important reef builder in some areas

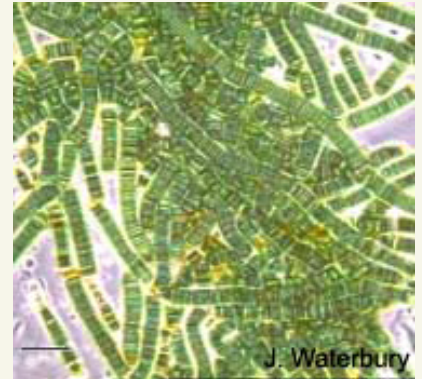


Blue coral (*Heliopora coerulea*) from American Samoa. (Photo: NPS, Eva DiDonato)

Blue List species - registers of those Red List species that show an overall stabilization or increase in abundance in the region considered; Blue List species are considered to be vulnerable and "at risk", but not yet endangered or threatened. Populations of these species may not be in decline, but their habitat requirements are such that they are vulnerable to further disturbances; Blue Lists are mostly a subset of the Red Lists

Blue Ventures - a not-for-profit organization (UK) which facilitates projects and expeditions that enhance global marine conservation and research. It coordinates expeditions consisting of scientists and volunteers working with local biologists, governmental departments, NGOs and local communities, to carry out research, environmental awareness, and conservation programs at threatened marine habitats around the world

blue-green algae - the former name for the blue-green bacteria, now classified as Cyanobacteria. A group of prokaryotic cells that use chlorophyll on intracytoplasmic membranes for photosynthesis. The blue green color is due to the presence of phycobiliproteins. they occur as single cells, colonies or simple filaments



Blue-green algae (Cyanobacteria). (Photo: J. Waterbury, Woods Hole/ NASA Astrobiology Institute)

BOD (Biological (or Biochemical) Oxygen Demand) - the oxygen used in meeting the metabolic needs of aerobic microorganisms in water rich in organic matter (as water polluted by sewage)

body wall - the layers of tissue (epidermis, mesoglea, and gastrodermis) that make up the body of a cildarian polyp. The body wall surrounds the gastrovascular spaces

bond - a physicochemical association between atoms

bond energy - the energy required to form a particular chemical bond

booby - the common name for large, streamlined sea birds of the family Sulidae. Tropical and subtropical members of the family are called boobies; those of northern waters are called gannets. Gannets have strong migration tendencies, while the boobies do not

booties - short "boots" usually made of neoprene, worn inside open-heelled fins. they protect a scuba diver's feet from rubbing against the fins while swimming, as well as protecting the entire foot while walking to and from a dive site. Booties also provide warmth



A pair of booties worn by scuba divers under an open-heelled fin.

bootstrapping - a statistical technique based on repeated random sampling with replacement from an original sample to provide a collection of new pseudoreplicate samples, from which sampling variance can be estimated

borer - an invertebrate that bores into wood, stone, coral, or another animal's shell

boring sponge - a sponge that chemically digests the limestone skeletons of corals during its search for food and living space, which breaks down the structure of the reef

boss - a columnar, flat-topped coral-algal growth or erosion structure usually found on the upper surfaces of spurs and buttresses

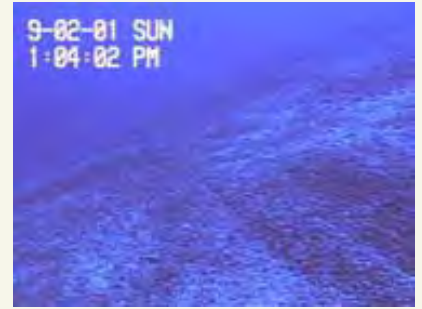
bosselated - covered with small, knob-like projections

BotCam (bottom camera station) - a deep water camera station system that can be used as a cost-effective and non-extractive method to assess and monitor the abundance and size composition of bottomfish populations in deepwater habitats. This Bottom Camera ("BotCam") system includes programmable control functions which allow for the activation of imaging systems, bait release mechanisms, image scaling indicators, and acoustic release to enable recovery of the camera

bottlebrush branching - describes a branch with compact radial sub-branches

bottleneck - in evolutionary biology, a bottleneck is a brief reduction in the size of a population which usually leads to random genetic drift which leads to a loss in genetic (allelic) variation

bottom trawl - a method of fishing in which a large bag-shaped net is dragged along the bottom, behind the vessel. The mouth of the net is kept open by various methods, such as a wooden beam (beam trawl) or large flat boards (otter trawl). Bottom trawling has been very destructive to deep water corals



This image shows the likely impact of bottom trawling on the Oculina Banks. Note the linear feature at the lower right. On this type of bottom, small linear mounds of coral rubble are created immediately adjacent to the track of the trawl. (Photo: NOAA)

bottom trawler - a fishing vessel that uses an open-mouthed fishing net drawn along the sea bottom. This type of fishing is destructive to shallow water and deep sea coral reef communities



Small stern trawler fishing. (Photo: David Comb/New England Biolabs)

boundary - in ecology, the edge between different habitat types. If distinctive, a boundary can be considered a separate edge habitat or ecotone. Boundaries that are readily crossed by an organism are called permeable, those that are crossed reluctantly are called semipermeable, and those that are not crossed are called impermeable

boundary current - a large-scale water stream in the upper ocean which separates water masses

bow - the front part of a vessel



The Facing the bow of the NOAA Ship Ronald H. Brown (Photo: NOAA)

Boyle's Law - if the temperature is kept constant, the volume of a given mass of gas is inversely proportional to the absolute pressure

bp (base pairs) - pairs of nucleotide bases in DNA

brachial - pertaining or belonging to the arm

brachial canal - a canal in the oral arms of scyphozoan medusae

brachidium - in brachiopods (lamp shells), the internal skeleton (a long ribbon or loop-shaped calcified brachial support) for the lophophore

brachiolaria larvae - a starfish larval stage following the bipinnaria stage. It has projecting arms and a developed stomach

Brachiopoda - a phylum of marine invertebrates that superficially resemble bivalve mollusks because of their hinged bilaterally symmetrical shells. They are commonly known as "lampshells"



General view of the external features of a brachiopod. The valves (shells) are positioned dorsal and ventral. In bivalve mollusks, the valves are positioned right and left. (Photo: BIODIDAC)

brachy- - a prefix from the Greek, meaning "short"

brackish - mixed fresh and salt water



A brackish water area showing a mix of salt and freshwater marsh species in the Weeks Bay National

brady - a prefix meaning "slow"

bradyauxesis - a form of heterauxesis in which the growth process of a part is less than that of the whole

bradycardia - an unusually slow heart rate

bradytelic - an exceedingly slow rate of evolution manifested by slowly evolving lineages which survive much longer than would be expected. Possibly the best example of bradytelic evolution is the brachiopod, *Lingula*, which arose in the Cambrian and persists today

brain coral - species of scleractinian (hard or stony) corals which are characterized by their spherical shape and human brain-like appearance, with furrows and grooves. Brain corals are found in warm-water coral reefs in all the world's oceans. There are several species of brain corals found in two families

branchia - a respiratory organ, such as a gill; a ctenidium

branchial - pertaining to gills

branchial aperture - the exterior opening of a gill chamber

branchial chamber - in crustaceans, the area between the body and carapace which encloses the respiratory organs (gills)

branchial cleft - a gill slit, such as is found in sharks, skates, and rays

branchial crown - in marine polychaete worms, a structure surrounding the mouth composed of ciliated, bipinnate filaments which function in suspension filter feeding and respiration

branchial plume - a respiratory structure or external gills, usually located on the dorsal side toward the posterior of dorid nudibranchs. This plume surrounds the anus and in some species, it may be retracted. The branchial plume is the major respiratory structure in nudibranchs; in marine polychaete worms, a structure surrounding the mouth composed of ciliated, bipinnate filaments which function in suspension filter feeding and respiration



The feathery structure toward the posterior of this nudibranch gastropod (marine sea slug) is its respiratory organ.

branchial siphon - the incurrent siphon in some mollusks

branchiform - gill-shaped

branching colony - a coral growth pattern where branches are formed

branchiocardiac groove - in decapod crustaceans, a groove on each side of the carapace which separates the branchial and cardiac regions

branchiopallial - pertaining to the gill and mantle of mollusks

branchiostegal - one of the dermal bony or cartilaginous struts that support the branchiostegal membranes of fishes. Sometimes called branchiostegal rays, but not to be confused with the fin rays

branchiostegal area - in crustaceans, the part of the carapace which extends laterally and ventrally over the gills

Braun-Blanquet method - a method for estimating seagrass and other plant species composition. It involves identifying all species represented in a specific quadrat, then assigning each a code based on its contribution to the total area. An example of Braun-Blanquet codes is: 0: species not present; 1: species <5% of total; 2: species=5-10% of total; 3: species=10-25% of total; 4: species=25-50% of total; 5: species=50-90% of total; 6: species>90% of total

Bray-Curtis similarity coefficient - a similarity coefficient used to determine site similarities based on organism abundances. It is widely employed in multivariate analysis of assemblage data. It reflects differences between two samples due both to differing community composition and/or differing total abundance

breaker - a wave that approaches shallow water, causing the wave height to exceed the depth of the water, in effect tripping it. The wave changes from a smooth surge in the water to a cresting wave with water tumbling down the front of it; a wave breaking on the shore

breaker zone - the area of a coral reef most exposed to breaking waves

breast - in fishes, the anterior ventral surface under the head

breed - a group of organisms, usually infrasubspecific, related by descent from common ancestors and visibly similar in most characteristics. A species can have numerous breeds; a population of a species that has distinct characteristics that differentiate them from other populations in that species. Reproduction within the population produces offspring which are recognizable as members of that population. Breeds can further be subdivided into varieties based on differences within the breed

breeding season - the time of the year during which mating occurs

breeding season - that period of a year in which organisms are sexually active

brevilingual - having a short tongue

brine - water that contains a high concentration of salt

brine pool - concentrations of water on the ocean floor which have an extremely high salinity relative to the surrounding water. Brine pools are caused by salt tectonics, which is the process by which large deposits of salt are moved by geological forces. Cold seep activity often coincides with the location of a brine pool

bristle - a stiff, coarse, hair-like structure

brittle star - brittle stars are echinoderms (class Ophiuroidea) which are closely related to sea stars (starfish). They possess radial symmetry with a central body disc from which five highly flexible snake-like arms protrude. There is no replication of internal organs, as in the arms of sea stars, just one set in the central disc. Compared to starfish, brittle stars have a much smaller central disc and no anus. Wastes are eliminated through the mouth, which is situated on the underside of the disc. The name is derived from their arms breaking off as a means of defense. New arms are easily regenerated. They are also called serpent stars because of the snakelike movements of the five arms



This black brittle star (*Ophiomastix variabilis*) is an inhabitant of Indo-Pacific coral reefs. (Photo: Teresa (Zubi) Zuberbühler (www.starfish.ch))

broadcast spawner - an organism that releases gametes directly into the sea for external fertilization

brood - all of the offspring that hatch from a single clutch of eggs or the offspring of a single birth that normally mature at about the same time; to incubate eggs

brood pouch - a sac-like cavity in the parent's body in which eggs are deposited and fertilized and larvae develop, such as in seahorses; marsupium; brood chamber

brooder - a coral which harbors or broods developing larvae within its polyps

brooding - the development of larvae within the gastrovascular cavity of an adult coral polyp

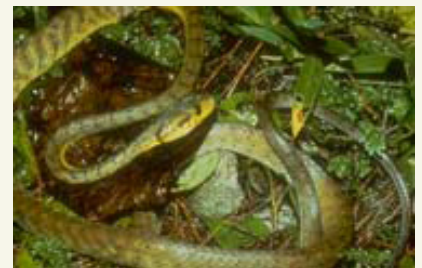
brooding - parental care of young

brown algae - brown algae belong to the Division Phaeophycophyta, whose approximately 1,500 species are almost exclusively marine. They include the largest of the seaweeds and the kelps. The brown algae have chlorophyll a and c, as well as carotenes and xanthophylls, but the green chlorophyll coloration is masked by the brown and yellow pigments. Brown algae are among the largest photosynthetic organisms on earth. The largest kelps may grow to more than 60 meters in length, forming dense underwater forests in colder waters. Many microscopic brown algae grow as epiphytes on underwater vegetation, forming networks of branched filaments, or broad encrustations. All species are multicellular and do not form colonies. Their life cycles are complex, involving alternation of generations. In general, they are not free-floating organisms, but are attached to rock, coral, or other firm surfaces. Sargassum weed, however, is a floating brown algae that stays afloat by producing gas-filled bladders



Brown algae. (Photo: NOAA)

brown tree snake - the mildly venomous brown tree snake (*Boiga irregularis*) is an introduced species on some Pacific islands that has become a serious pest, especially on Guam. In the absence of natural population controls and with vulnerable prey on Guam, the snakes have become an exceptionally common pest causing major ecological and economic problems. The snakes probably arrived on Guam hidden in ship cargo from the New Guinea area. By 1968, they had dispersed throughout the



The brown tree snake (*Boiga irregularis*) is an invasive species that has caused great ecological and economic damage on

island and caused havoc by virtually wiping out Guam's native bird species and helped decimate their fruit bat populations. In addition to Guam, brown tree snakes have been sighted on Saipan, Tinian, Rota, Kwajalein, Wake, Oahu, Pohnpei, Okinawa, and Diego Garcia. To date, this snake is not known to be established on any of these islands except Guam

Guam. (Photo: U. S. Geological Survey)

browser - a software program, such as Netscape Navigator or Microsoft Internet Explorer, that allows one to view pages on the Internet

brumation - a long period of torpor or rest induced by cold temperatures in reptiles and other cold-blooded animals. Brumation is similar to hibernation in warm-blooded animals

brunneous - dark brown color

brush - a cluster of bristles

bryostatin - a marine pharmaceutical, isolated from bacteria living in the bryozoan *Bugula neritina*, having anti-cancer and immune system modulating properties

Bryozoa - an animal phylum synonymous with Ectoprocta that contains approximately 5,000 living species. They are all sessile colonial forms composed of zooids. Zooids are tubular, oval or box-like structures that contain a lophophore, which is a circular or horseshoe-shaped fold of the body wall that encircles the mouth and bears numerous ciliated tentacles. Most species form erect or encrusting colonies. They occur in many different habitats, including coral reefs



Bryozoa colony.

bubblegum coral - a deep water gorgonian, *Paragorgia arborea*, found in the North Pacific and North Atlantic Oceans at depths that may exceed 1400m. It can grow to 5m in height and 8 m in width. It is called the bubblegum coral because it is usually orange or pink in color, and has a lumpy surface texture



Bubble gum coral on Gulf of Alaska Seamounts. (Photo: NOAA Ocean Explorer)

buccal - pertaining to the cheek or oral cavity

buccal cavity - the mouth or oral cavity

buccal siphon - in tunicates, the opening through which water enters into the pharyngeal basket. It is also called the incurrent, inhalant, or oral siphon/canal

buccopharyngeal - pertaining to the oral cavity and pharynx

budding - a type of asexual reproduction in which new individuals develop from the parent organism, forming a swelling similar in appearance to a bud, which separates from the parent as it grows; budding is a form of asexual reproduction in corals where a parent corallite forms daughter corallites

buddy - a scuba diving partner. For safe diving, a pair of divers (buddies) stay close to each other in order to offer assistance if needed



NOAA divers working in buddy pairs. (Photo: NOAA/National Undersea Research Program)

buddy breathing - two scuba divers sharing air from one second stage regulator



Scuba divers practicing buddy breathing. (Photo: John Buchanan)

buffer - a solution or liquid whose chemical makeup neutralizes acids or bases without a great change in pH

buffer species - a species which may serve as an alternate food supply for a predator or consumer

buffer zone - the region near the border of a protected area; a transition zone between areas managed for different objectives

buffered solution - a chemical solution that resists changes in pH despite the addition of small amounts of acids or bases

bulb - a rounded dilation or expansion in a canal, vessel, or organ

bulbous - a rounded or swollen shape

bullate - describes a blistered or puckered surface



A leaf with bullate appearance (Photo: Shaun L. Winterton)

bulliform - blister or boil-shaped

bulwark - the side of a ship above the deck

buoy - a floating platform for navigational purposes or supporting scientific instruments that measure environmental conditions

buoyancy - the tendency of object to float or sink when placed in a liquid. Positively buoyant objects float, negatively buoyant objects sink, and neutrally buoyant objects stay in place

burrow - a hole or excavation dug in the substrate by an animal, usually for shelter, habitation, refuge, or to rear young

burrower - an animal that makes a hole or burrow in the substratum and lives in it. For example, a fiddler crab



A male fiddler crab (*Uca pugnax*) lives and mates in a burrow on the beach (Photo: NOAA)

bursa - a sac or sac-like cavity

butterflyfish - any species of colorful, oval-shaped, deep-bodied and strongly compressed spiny-rayed fishes in the family Chaetodontidae. They have small mouths with flexible, brush or comb-like teeth. They resemble the closely related angelfishes. They feed on a variety of foodstuffs from zooplankton to tiny crustaceans and mollusks, soft and hard corals, anemones, segmented worms, and other soft and encrusting invertebrates associated with coral reefs. Some species are omnivores that primarily feed on marine algae as well as animals, while others are obligate corallivores



The butterflyfish, *Chaetodon vagabundus*, photographed in the Solomons Islands (Photo: Tom Doepner/ Brown University)

buttress - see spur and groove

buttress zone - the seaward-sloping area of a coral reef (just beneath the algal ridge) that consists of alternating ridges and furrows

bycatch - organisms taken in a fishery which are not of the species intended for harvest. For example, mammals or turtles captured in trawl or seine fishing

bycatch reduction devise - equipment attached to commercial fishing equipment to reduce the amount of bycatch taken

byssal thread - one of many thin, hairlike filaments secreted by certain mollusks for attachment to a substrate



The byssal gland is located within the foot of the mussel. It produces secretions which are used to form byssal threads for attachment to substrates. (Photo: Great Lakes Sea Grant Network Exotic Species Library, Ontario Ministry of Natural Resources)

byte - a memory and data storage unit composed of contiguous bits, usually eight. For example, file sizes are measured in bytes or megabytes (one million bytes). Bytes contain values of 0 to 255 and most often represent integer numbers or ASCII characters

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: C

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

c-card - a scuba diving certification card from scuba certifying agencies, such as NAUI, BSAC, NOAA, PADI, etc.

CaCO₃ (calcium carbonate) - a molecule consisting of calcium, carbon and oxygen secreted by corals to their skeleton. It is also secreted by mollusks to form their protective shells



This Queen Conch (*Strombus gigas*) utilizes calcium carbonate in forming its protective shell. (Photo: Andy Bruckner)

cacophonous - having a harsh, unpleasant sound

cacospongionolide B - an antiinflammatory drug derived from the marine sponge *Fasciospongia cavernosa*

cadastral survey - a survey which creates, marks, defines, retraces or reestablishes the boundaries and subdivisions of the public land of the United States. It is derived from the word cadastre, meaning a public record, survey, or map of the value, extent, and ownership of land as a basis of taxation

caecum - a blindly ending sac arising from the gut or some other hollow organ

calathiform - cup-shaped

Calcarea - a class of exclusively marine calcareous sponges (phylum Porifera) that possesses spicules composed of calcium carbonate. They are predominantly found in shallow, temperate and tropical waters, though at least one species is known from a depth of 4,000 meters. Some inhabit coral reefs. The Calcarea is thought to be most primitive group of sponges. It is the only class with asconoid and syconoid grades of construction, though some species are leuconoid. Generally, they are small in size. The different shapes are relatively simple, either purse, vase, pear or cylindrical



The Calcarea is a class of small, delicate, marine sponges whose spicules are made up of calcium carbonate. Most are tubular or vase-shaped, and they can have asconoid, syconoid, or leuconoid organizations. (Photo: P. Madl and M.Yip)

calcareous - composed of or containing a substance made of calcium carbonate

calcareous algae - algae which deposit calcium carbonate in its tissues. When they die and decompose, their calcium carbonate skeletons are left behind to form or contribute to the growth of a reef. Calcareous algae also provide an adhesive function, cementing reef components together; see "coralline algae"

calcareous ooze - a biogenous sediment that is made of the calcium carbonate shells and skeletons of marine organisms

calcariform - spur-like

calceolus - complex sensory organelles on the antennules of some decapod crustaceans

calcification - the process by which corals and calcareous algae extract calcium from seawater and produce it as calcium carbonate

calcite - a mineral made up of a crystalline form of calcium carbonate

calcite skeleton - a skeleton composed of the calcite form of calcium carbonate

calibrate - to check or adjust the graduations of a quantitative measuring instrument

calice - the oral surface of the corallite

calice relief - the height of a corallite or corallite series

calicle - one of the small cuplike cavities, often with elevated borders, covering the surface of most corals. Each is formed by a coral polyp; the calyx

calicoblastic epithelium - a thin squamous epithelial layer of cells in stony (hard) corals which deposits the white calcium carbonate skeleton; also called "calicodermis"

caliculate - cup-shaped

calipee - a fatty, gelatinous substance in green turtles, traditionally used in the preparation of green turtle soup

callyspongynic acid - a bioactive compound, isolated from the marine sponge *Callyspongia truncata*, interferes with glycogen hydrolysis thereby keeping glucose concentrations in the blood at low levels. It can be used in the treatment of diabetes

calm - the condition of the water surface when there are no winds, waves or swell

calorie - a unit of measurement defined as 4.184 absolute joules or the amount of energy it takes to raise the temperature of one gram of water from 15 to 16 degrees Celsius (or 1/100th the amount of energy needed to raise the temperature of one gram of water at one atmosphere pressure from 0 degrees C to 100 degrees C). Food calories are actually equal to 1,000 calories (1 food calorie = 1 kilocalorie)

calorimetry - measurement of the amounts of heat absorbed or given out; measurement of heat flow

Calvin cycle - a series of biochemical reactions that take place in the stroma of chloroplasts during photosynthesis. It's main result is the assimilation of carbon. Environmental carbon dioxide is reduced and incorporated into organic molecules, including sugars. It is one of the light-independent reactions (dark reactions) of photosynthesis; also called the Calvin-Benson cycle

calyciform - goblet or cup-shaped

calyculus - a cavity in a coral which contains polyps

calypto - a prefix meaning "covered"

calyptoblastic - in hydrozoans, hydroids with complete gonothecal cups around the polyps

calyx - the upper or open end of the corallite or coral polyp cup; the central body of entoprocts (goblet worms) or crinoids (sea lilies and feather stars)

Cambrian - a major division of the geologic timescale that extended from at least 580 million years ago to 500 million years ago. It marks the beginning of the Paleozoic Era. The name comes from the Cambrian Mountains in Wales, where the strata of the Cambrian were first defined

Cambrian explosion - a burst of evolutionary origins when most of the major body plans of animals suddenly appeared in a relatively brief time in geological history, approximately 530 to 570 million years ago; the seemingly rapid appearance of most major groups of complex animals in the fossil record, around 530 million years ago, accompanied by a major diversification of other organisms

camouflage - the use of color patterns, shape, texture, and/or behavior that allows an animal to blend in with its surroundings and thus remain concealed from predators or prey

CaMPAM (Caribbean Marine Protected Area Management) - a network of managers of marine and coastal protected areas in the wider Caribbean organized to achieve goals of conservation and sustainable use of Caribbean coastal and marine environmental resources. General activities conducted through CaMPAM's membership include sharing experiences and addressing management challenges by facilitating training opportunities, information exchange, communication, and problem solving

campaniform - bell-shaped

campanulate - bell-shaped

canal - a groove, tube, or duct

canaliculus - a very small canal

cancellous - possessing a spongy or porous surface

cancellous - reticular, spongy, or lattice-like structure; usually pertains to bone

cancriform - crab-shaped

cancroid - resembling a crab

canine tooth - a pointed, conical tooth that is located at the front or edge of the jaw. Canine teeth are used for piercing and grabbing prey



Moray eels are armed with sharp canine teeth used for capturing prey and also for defense. (Photo: Dr. Tom Doeppner, Brown University)

cannibalism - predation of an animal by a member of its own species

canopy - the more or less continuous cover of branches and foliage formed collectively by the tops, or crowns, of adjacent trees

cape - a piece of land that that projects out into a large body of water

capillary - a minute blood vessel that connects the arteries and veins. Capillary walls are one-cell thick (endothelium) and act as semipermeable membranes for the interchange of various substances, including fluids, between the blood and tissue fluids; a tube of small internal diameter which holds liquid by capillary action

capillary action - the means by which liquid moves through the porous spaces in a solid, such as soil, plant roots, and capillary blood vessels due to the forces of adhesion, cohesion, and surface tension. Capillary action is essential in carrying substances and nutrients from one place to another in plants and animals

capsid - the protein coat of a virus particle

captaculum - a filamentous tactile organ with an adhesive, sucker-like end near mouth of a tusk shell (mollusks in the class Scaphopoda). The captacula are used to gather small particles of food in the sand and pass them to the mouth

captive breeding - raising animals (or plants) in controlled conditions to produce stock for subsequent release into the wild

capture-recapture method - a procedure involving the distinctive marking of individuals and their subsequent recapture (or sighting) to estimate population size and other population parameters; also known as "mark-recapture"

carapace - a hard shield, or shell covering, found over all or part of the anterior dorsal portion of an animal. In lobsters, shrimps, crayfish, and crabs, the carapace is the part of the exoskeleton that covers the head and thorax and protects the dorsal and lateral surfaces. In many crustaceans, the term carapace is also used to describe the hard, protective covering of the cephalothorax, as that of the horseshoe crab. The carapace of a turtle's shell is composed of expanded ribs and vertebrae overlain by dermal plates and horny scales



The carapace is the hard shell covering of the cephalothorax of this spiny lobster.

carbohydrase - an enzyme that acts upon a carbohydrate

carbohydrates - organic compounds composed of carbon, oxygen, and hydrogen; includes the simple sugars, double sugars, and complex sugars (starches)

carbon cycle - the cycling of carbon in the form of carbon dioxide, carbonates, organic compounds, etc., between various reservoirs, e.g., the atmosphere, the oceans, land and marine biota and, on geological time scales, sediments and rocks

carbon fixation - the conversion of inorganic carbon into organic carbon, usually by photosynthesis

carbon-14 - a radioactive isotope of carbon with a half life of $5,730 \pm 40$ years that is particularly useful for dating carbonaceous materials; also called ^{14}C or radiocarbon

carbonate - a mineral composed mainly of calcium (Ca) and carbonate (CO_3) ions. Carbonates may also include magnesium (Mg), iron (Fe) and others; rock or sediments derived from debris of organic materials composed mainly of calcium and carbonate (e.g., shells, corals, etc.) or from the inorganic precipitation of calcium (and other ions) and carbonate from solution (seawater). For example, limestone or dolomite

carbonate bank - a narrow, fairly flat, shallow, submarine plateau (measured in tens of meters) of composed of limestone (carbonate rock), e.g., the Bahama Banks

carbonate compensation depth - the depth in the ocean below which material composed of calcium carbonate (CaCO_3) is dissolved and does not accumulate on the sea floor

carbonate mound - a seabed feature usually constructed from carbonate-producing organisms and current-controlled sedimentation. Carbonate mounds are a unique combination of cold-water coral framework and rubble, sediment deposition, and local hydrodynamic influences

carbonate platform - a broad, flat, shallow, submarine expanse of carbonate rock. Its size is measured in hundreds of meters

carboxyl group - the $-\text{COOH}$ functional group, acidic in nature, found in all amino acids; the acid group of organic molecules

carcinogen - a chemical substance that causes cancer

carcinology - the study of crabs and other crustaceans

cardinal - deep scarlet red color

cardinalfish - any species of bony fishes in the family Apogonidae. Cardinal fishes are often brightly colored with attractive patterns, usually in shades of red or brown. Most are small tropical marine species, although some live in brackish and even fresh water waters



The cardinalfish, *Apogon dammermani*. (Photo: Richard C. Wass/National Park service)

Caribbean Coral Reef Institute (CCRI) - NOAA's Caribbean Coral Reef Institute (CCRI), inaugurated in May, 2005, is located at the the University of Puerto Rico-Mayaguez. The CCRI focuses exclusively on the acute problems of Caribbean coral reefs. Its main objective is to aid in the management and conservation of Puerto Rico's coral reefs by providing timely, relevant information to the Puerto Rico Department of Natural and Environmental Resources and the scientific community at large. CCRI projects include conducting habitat mapping of the western shelf of Puerto Rico, assessing the status of reef resources, and assessing fishery impacts

Caribbean Decision Support System (CDSS) - a tool developed by the Nature Conservancy and its partners to improve the linkage between biodiversity conservation objectives and human development-related programs such as disaster mitigation/response/planning, economic growth (especially tourism and fishing), and land and water use planning. It represents a comprehensive database of biodiversity and socio-economic information in existence for the Greater Caribbean basin

Caribbean Regional Association (CaRA) - the National Oceanic and Atmospheric Administration, NOAA, has provided funding to the CaRA to establish and administer a sustained observing system for the northeastern Caribbean region, the Caribbean Regional Integrated Coastal Ocean Observing System (CaRICOOS) to provide observations and products for the purposes of detecting and predicting climate variability and consequences, preserving and restoring healthy marine ecosystems, ensuring human health, managing resources, facilitating safe and efficient marine transportation, coastal Hazard Management Response, and predicting and mitigating against coastal hazards

CARICOMP (Caribbean Coastal Marine Productivity) - a regional coral reef, seagrass and mangrove monitoring program and network involving a number of Caribbean laboratories, parks and reserves to study land-sea interaction processes in the wider Caribbean region. Twenty-seven institutions in 17 countries participate in CARICOMP

caridean shrimp - caridean shrimps can be distinguished from other shrimp-like creatures by the way in which the plate of the second abdominal segment overlaps the segments both in front and behind, forming a saddle. They are found in marine, brackish and freshwater habitats from the tropics to the polar regions. Carideans are taxonomically and ecologically diverse, with many remarkable adaptations for survival and reproduction. These crustaceans are placed in the infraorder Caridea, order Decapoda, and class Malacostraca

carina - any elevated ridge or keel-like structure

carinate - shaped liked a keel or ridge

cariniform - keel-shaped

carnivore - an organism that feeds upon animals



A carnivore (barracuda) caught in the act.

carotene - a red, orange, or yellow pigment belonging to the group of carotenoids; a precursor of vitamin A

carotenoid - any of a group of red, orange, and yellow accessory pigments of plants or algae

carpogonium - the female gamete-producing reproductive organ in red algae, consisting of a single cell and its extension, the trichogyne

carposporangium - a single-celled structure in red algae that produces diploid carpospores on the carposporophyte

carpospore - a non-motile diploid spore formed on the carposporophyte stage of the red algae life cycle which germinates to form the tetrasporophyte stage

carposporophyte - the diploid stage of red algae which develops after fertilization of the carpogonium

carrageenan - a water-soluble polysaccharide extracted from red seaweed, mainly *Chondrus crispus* (Irish moss). It is used in both cosmetic and food applications as a stabilizer and emulsifier capable of controlling viscosity, maintaining product integrity, and for giving an improved mouthfeel and body to foods. Carrageenan is a commonly used ingredient in toothpaste, ice cream, dry mixes, desserts, milk products, tomato sauces, salad dressings, and cheese products

carrier cell - in sponges, a migratory choanocyte that transports sperm to the oocyte

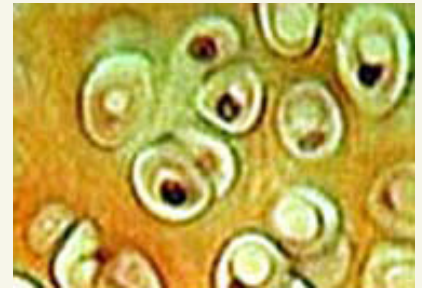
carrion - the dead and rotting body of an animal; carrion is food for scavenging animals

CARRUS Alliance (Comparative Analysis of Reef Resilience Under Stress Alliance) - the CARRUS Alliance was organized at the 2004 International Coral Reef Symposium held in Okinawa. Its objective is to provide a basis for better understanding of coral reefs at the scale of the whole reef system. The Alliance consists of researchers conducting independently-supported long-term, interdisciplinary research on whole reef systems, including associated social and economic systems, united through agreements for the exchange of information, methods, expertise, and software. One focus of the Alliance will be on developing common research objectives, including the development of decision support systems to facilitate reef management. The Alliance will be linked to a variety of international efforts

carrying capacity - the maximum population size that can be regularly sustained by an environment; the point where the population size levels off in the logistic growth model

Cartagena Convention: Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region - the "Convention area" means the marine environment of the Gulf of Mexico, the Caribbean Sea and the areas of the Atlantic Ocean adjacent thereto, south of 30 deg north latitude and within 200 nautical miles of the Atlantic coasts of the States referred to in article 25 of the Convention. The Cartagena Convention was adopted on 24 March 1983 and entered into force on 11 October 1986 as the legal instrument for the implementation of the Caribbean Action Program. It is a regional framework agreement negotiated under the auspices of the Regional Seas Program of the United Nations Environment Program (UNEP). It sets out general legal obligations to protect the marine environment of the Gulf of Mexico, Straits of Florida, Caribbean Sea, and immediately adjacent areas of the Atlantic Ocean -- collectively known as the Wider Caribbean Region. The United States became a Party to the Cartagena Convention in 1984. The Convention and its three Protocols constitute a legal commitment by the participating governments to protect, develop and manage their common waters individually or jointly. The Convention is a framework agreement setting out the political and legal foundations for actions to be developed. These actions are directed by a series of operational Protocols designed to address special issues and to initiate concrete actions. The three protocols supporting the Convention are the Oil Spill Protocol, the Specially Protected Areas and Wildlife Protocol (SPAW), and the Land Based Spills Protocol (LBS). RAC/REMPEITC-Carib is the Regional Activity Center established under the Oil Spill Protocol

cartilage - a type of connective tissue where the functional component is the rubbery intercellular matrix that is secreted by cartilage-producing cells called chondrocytes. Cartilage exists in several forms, from glassy to fibrous in appearance



A microscopic section of hyaline cartilage. The cartilage cells (chondrocytes) exist in little cavities (lacunae) in the smooth, glassy cartilaginous matrix. (Photo: NIH/National Cancer Institute)

cartilagenous - pertaining to or composed of cartilage; of the consistence of cartilage or gristle

cartography - the science, technology, and art of making maps and charts. Cartography includes all the steps necessary to produce a map: planning, aerial photography, drafting, editing, color separation, and multicolored printing

caruncle - a fleshy outgrowth

CASI (Compact Airborne Spectrographic Imager) - a digital airborne multispectral sensor

cast net - a circular net with weights attached to the perimeter

catabolism - a destructive metabolic process by which organisms convert substances into excreted compounds

catadromous species - a species that spawns in the ocean but lives parts of its life in fresh water, e.g., American eel



The American eel is a catadromous species that spawns in the ocean, near the Sargasso Sea, but grows to maturity in freshwater streams.

catalysis - the acceleration of a chemical reaction by a catalyst.

catalyst - a substance that accelerates a chemical reaction, but is not consumed or changed in the process

catamaran - a type of boat consisting of two hulls joined by a frame. Catamarans can be sail or motor powered

catastrophe - an event that causes sudden decreases of population size or the entire elimination of subpopulations

catch per unit effort - the number of fish caught by an amount of effort. Typically, effort is a combination of gear type, gear size, and length of time the gear is used. Catch per unit of effort is often used as a measurement of relative abundance for a particular fish; the total catch divided by the total amount of effort used to harvest the catch

catchment - the area drained by a river or body of water

categorical excusion - a category of actions that do not individually, collectively, or cumulatively have a significant effect on the environment and that have been found to have no such effect in procedures adopted by a federal agency in implementation of these regulations and for which, therefore, neither an environmental assessment nor an environmental impact statement is required

category - in taxonomy, any rank within the classification hierarchy, e.g., family, subfamily, subspecies

catenation - linking of multiple copies of a macromolecule to each other

cation - a particle that carries a positive electrical charge. The cation gets this positive charge from losing negatively charged electrons

caudal - pertaining to the tail; denoting a position more toward the tail of an animal, e.g., the tail fin of a fish is called the caudal fin. Caudal vertebrae are the vertebrae which extend into the tail of an animal



Caudal fin of a shark. The dorsal lobe of the caudal fin is elongated. (Photo: Copyright Corel Corporation)

caudal fan - in crustaceans, a fan-shaped structure formed by the laterally expanded uropods and telson. The caudal fan functions in swimming, steering and balancing; also called "tailfan"

caudal peduncle - the narrowest portion of a fish's body, located just posterior to the anal fin and just anterior to the caudal fin



The caudal peduncle of the spotted unicorn fish (*Naso brevirostris*) is located between the anal and caudal fins. (Photo: Copyright Richard C. Wass)

cavate - cave-like

cay - a small, low coastal island or emergent reef of sand or coral; flat mound of sand and admixed coral fragments built upon a reef flat or just above high tide level. A synonym of **key**, as in the Florida Keys

CD-ROM (Compact Disk-Read Only Memory) - an optical medium. A CD-ROM 5.25-inch disk can hold about 650 megabytes of information

CDHC (Coral Disease and Health Consortium) - in response to the dramatic increase of coral diseases observed over recent years, the U.S. Coral Reef task force (2002) recommended the creation of the CDHC from a cross-section of internationally recognized experts in coral diseases, biomedical and veterinary sciences, pathology, chemistry, biology, biotechnology, and marine management. It organizes and coordinates the scientific resources of the U.S. and its territories to meet the challenge of globally declining coral reefs

cDNA (complementary DNA) - a strong, cloned DNA copy of otherwise fragile mRNA, made using reverse transcriptase. A cDNA is so-called because its sequence is the complement of the original mRNA sequence. However, when double-stranded cDNA is synthesized, it contains both the original sequence and its complement

cDNA library - a collection of cDNA clones that were generated *in vitro* from the mRNA sequences isolated from an organism, or a specific tissue or cell type, or population

cell - the smallest unit of living matter. All organisms are composed of cells and cell products (Cell Theory). Organisms exist either as single cells (unicellular) or as multicellular units



This example of a single-celled organism, the dinoflagellate *Gambierdiscus toxicus*, produces toxins including ciguatoxin and maitotoxin. The toxins are associated with ciguatera fish poisoning.

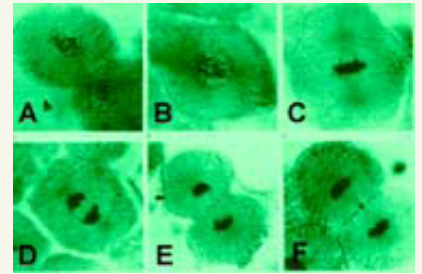
cell adhesion - adherence of cells to surfaces or to other cells

cell body - the enlarged portion of a neuron which contains most of the organelles

cell culture - the *in vitro* growth of cells derived from multicellular organisms. The cells are usually of one type

cell cycle - the period between the formation of a cell by the division of its parent cell and the formation of two new cells by cell division

cell division - the separation of one cell into two daughter cells, involving both nuclear division (karyokinesis) and subsequent cytoplasmic division (cytokinesis). Genetically, the daughter cells are identical to the mother cell (mitosis); however, in gametogenesis (meiosis), the resultant daughter cells (gametes) have the chromosome number reduced by one-half



Cell division by mitosis. A-B: Prophase - the replicated (daughter) chromosomes (chromatids) undergo extensive condensation. They are greatly thickened and shortened but are still contained within the nuclear membrane. Prophase ends with the sudden breakdown of the nuclear membrane. C: Metaphase - the replicated chromosomes converge toward the center of the cell. D: Anaphase - sister chromatids split at their centromeres. These daughter chromosomes then begin to separate from each other, and move toward one of the two spindle polar regions. E-F: Telophase/ Cytokinesis - Chromatids arrive at opposite poles of cell, and new membranes form around the daughter nuclei. The chromosomes disperse and are no longer visible. Cytokinesis or the partitioning of the cell may also begin during this stage. In animal cells, cytokinesis results when a fiber ring composed of a protein (actin) around the center of the cell contracts and pinches the cell into two daughter cells, each with one identical nucleus. Chromosomal replication occurs during the interphase between mitotic activities. (Photo: Dept. of Biology, University of New Mexico)

cell fusion - the formation of a hybrid cell produced by the fusion of two different cells

cell line - cells that have been extracted from human or animal tissue and now grow and replicate continuously outside the living organism

cell membrane - the structure enveloping a cell, enclosing the cytoplasm and forming a selective permeability barrier which permits the passage of solvents and solutes into and out of cells. It consists of lipids, proteins and some carbohydrates

cell wall - an extracellular material that forms the outer surface of plant, fungus, and certain bacterial cells. It is external to the cell membrane and serves in a structural and supporting role. The cell wall is composed primarily of cellulose and lignin in plants, chitin in Fungi, and peptidoglycans in bacteria

cellular differentiation - genetically-induced divergence in the structure and function of cells as they become specialized during a multicellular organism's development

cellular respiration - the transfer of energy in cells by the catabolism of molecules to produce ATP, during which oxygen is consumed and carbon dioxide produced. It occurs in the mitochondria of eukaryotes

cellulolytic enzyme - an enzyme that acts upon cellulose

cellulose - a polysaccharide that is composed of unbranched chains of glucose. It is the major structural carbohydrate of plants

cement - the chemically precipitated calcium carbonate present in spaces within skeletons or between grains of internal sediment

cenospecies - species that can interbreed

Cenozoic - the current geologic era, which began 66.4 million years ago and continues to the present

census - the enumeration of all the individuals in a population

Census of Marine Life (CoML)/Census of Coral Reefs (CReefs) Project - a research initiative to conduct a taxonomically diversified census of coral reef ecosystems throughout the globe. This international partnership, led by NOAA's Pacific Islands Fisheries Science Center, the Australian Institute of Marine Science, Scripps Institution of Oceanography, and the Hawai'i Institute of Marine Biology, will expand tropical taxonomic knowledge (with a particular focus on understudied species), increase the exchange of coral reef ecosystem data dispersed throughout the globe, and develop new and innovative technology and sampling strategies, as well as contribute to the CoML barcode initiative. CReefs plans to work closely with the NOAA Coral Reef Conservation Program (CRCP) and other organizations on outreach and education, collaboration with other existing coral reef efforts, and collection and unification of data into the Ocean Biogeographic Information Center for research, management, and preservation purposes

center line - the imaginary line running from bow (front) to stern (rear) along the middle of a vessel

center of genetic diversity - a region where a particular taxonomic group of organisms exhibits greater genetic diversity than it does elsewhere

center of origin - the area in which a given taxonomic group of organisms originated and from which it has subsequently spread

Centigrade Temperature Scale - a thermometric scale in which 0 degrees C (Celsius) marks the freezing point of water and 100 degrees C indicates the boiling point of water at sea level

centiMorgan - the unit of genetic map distance between two loci that show one (1) percent recombination

centrad - toward the center or interior

centradenia - a spongy mass formed by the coenosarc in some types of siphonophore colonies, which is partly hepatic in function, and partly excretory

central chord - the central part of the axis of an octocoral composed of gorgonin or gorgonin permeated with calcareous material

Central Dogma (of molecular biology) - the principal statement of the molecular basis of gene action. Genetic information is stored in and transmitted as DNA. Genes are expressed by being copied as RNA (transcription), which is processed into mRNA (messenger RNA) via splicing and polyadenylation. The information in mRNA is translated into a protein sequence using a genetic code to interpret three-base codons as instructions to add one of twenty amino acids, or to stop translation; or more simply put, DNA carries the genetic information which is transcribed to RNA and subsequently translated to protein. Francis Crick, the co-discoverer of the double helix structure of DNA, coined the term "Central Dogma" in 1958 to characterize the all-important cellular processes whereby DNA is "transcribed" into RNA and RNA is "translated" into protein

centrifugation - the spinning of a mixture at very high speeds to separate substances of different densities



A centrifuge used to "spin down" materials.

centriole - one of two small cylindrical cell organelles composed of nine triplet microtubules. They form the asters during cell division

centrolecithal - a type of egg cell that has its yolk in the very center of the cytoplasm, such that the initial meroblastic cleavage of the zygote happens all around the embryo. Most arthropods have centrolecithal eggs

centromere - the center part of a chromosome that appears 'pinched', in between the short arm (p) and the long arm (q). The centromere holds the two chromatids together, and during cell division (mitosis) it is the site of attachment for the spindle fibers

centrosome - a granular region of a cell which contains two centrioles and is a center of microtubule organization during the division of the nucleus

centrum - a center or central mass

cephalic - pertaining to the head

cephalization - the localization of neural coordinating centers and sensory organs at the anterior end of the body

Cephalopoda - a class of the phylum Mollusca that includes squids, octopods, cuttlefishes and nautili. Many species are inhabitants of coral reefs

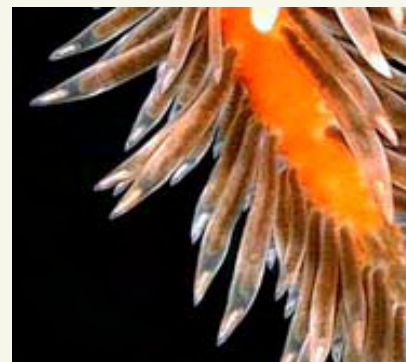


Squid (class Cephalopoda) with egg mass.

cephalopodium - in cephalopods (octopi, squids) the head region, consisting of head and tentacles; a muscular mass enabling the mollusk to move, with brain and sense organs at the front end, which evolved into a foot for gastropods and bivalves, or into tentacles and funnel for cephalopods

cephalothorax - the region of the body in decapod crustaceans that is covered by the carapace, with the boundary between the fused head and thorax indicated by the cervical groove. In lobsters, the cephalothorax is called the "body"; in shrimps, it is called the "head"

ceras - one of many multifunctional horn or lobe-shaped or leaf-like process on the back or side of a nudibranch mollusk (sea slug). It has a major function as a respiratory organ (a gill), and with a branch of the digestive gland, it also serves as an organ for the exchange of gases and other molecules with the blood. The ceras also stores stinging nematocysts in a structure called the cnidosac, from the cnidarians upon which they feed, which gives it a defensive function. Its ability to change color also gives it a protective camouflage function



Cerata (plural of ceras) of *Aeolidiella foulisi* showing the brown duct of the digestive gland and the whitish cnidosac at the tip.

cerebral ganglion - in invertebrates, one of a pair of ganglia (or fused median ganglion) situated in the head or anterior portion of the body; also called the the "dorsal ganglion" or "cerebroganglion"

cerioid growth form - a coral growth form in which the coral colony is composed of corallites united directly to one another by fused walls. The corallites are juxtaposed

cerulean - dark blue color

cetacean - a marine mammal of the Order Cetacea. The Cetacea includes whales, dolphins and porpoises



The killer whale is actually a dolphin in the cetacean family, Delphinidae

cf - an abbreviation for the Latin word 'confer', meaning "compare"

chaeta - a stiff hair or bristle, made of chitin, characteristic of annelid worms. In the earthworm they occur in small groups projecting from the skin in each segment and function in locomotion. The chaetae of marine polychaete worms are borne in larger groups on paddle-like appendages called parapodia

Chaetodontidae - a family of fishes (butterfly fish) whose number and behavior may serve as indicators of reef health



A pair of butterfly fishes (Chaetodontidae). Their presence and behavior serve as biological indicators of reef health.

chain transect - a linear transect where a chain is used to mark the line under study. By following the surface contour of the reef, chain transects provide data that may be used to calculate the estimated spatial index (the ratio of reef surface contour to linear distance of the reef)

CHAMP (Coral Health And Monitoring Program) - a NOAA program whose mission is to provide services to help improve and sustain coral reef health throughout the world. Long term goals are: establish an international network of coral reef researchers for the purpose of sharing knowledge and information on coral health and monitoring; provide near real-time data products derived from satellite images and monitoring stations at coral reef areas; provide a data repository for historical data collected from coral reef areas; and add to the general fund of coral reef knowledge

channel - a deep and relatively narrow body of water (as in a river, harbor, or a strait linking two larger bodies) that allows the best passage for vessels; an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. River, creek, run, branch, and tributary are some of the terms used to describe natural channels. Canal and floodway are some of the terms used to describe artificial channels.

character - in taxonomy, any attribute of organisms used for recognizing, differentiating or classifying taxa

character displacement - the process by which two closely related species, with overlapping ecological requirements, interact so as to cause one or both of them to diverge evolutionarily in one or more traits. They differ more when they co-occur than when they do not

charismatic megafauna - large animals (usually vertebrates) that evoke sentimental support from the general public, for example, porpoises, seals and sea lions, marine turtles, and manatees

Charles Law - under conditions of constant pressure and quantity, there is a direct relationship between the volume and absolute temperature for an ideal gas

chela - a pinching claw of a decapod crustacean, composed of a moveable finger, the dactylus, and a fixed finger, a distal extension of the propodus



The large pinching claw of this crustacean is the chela. The entire leg bearing the chela is termed the cheliped. (Photo: NOAA)

Cheliceramorpha - an order of arthropods that includes horseshoe crabs, daddy-longlegs, and extinct "sea-scorpions, spiders and scorpions, mites and ticks, " Most of its marine representatives are extinct, but were prominent in the Paleozoic



The horseshoe crab is an arthropod in the order Cheliceramorpha

cheliform - pincer-shaped

cheliped - one or more pairs of thoracic legs of decapod crustaceans that terminate in a chela, or claw. The entire cheliped is often referred to as a claw



A cheliped of this American lobster (*Homarus americanus*) is a leg bearing a pinching claw.

Cheloniidae - a family of hard-shelled turtles that include the green turtle, loggerhead turtle, hawksbill turtle, leatherback turtle, kemp's ridley turtle, olive ridley turtle, and flatback turtle. The leatherback turtle is the only sea turtle not in this family

chemical bond - the link between two atoms within a molecule. Different types of chemical bonds include hydrogen bonds, covalent bonds, and ionic bonds

chemical equilibrium - the state in which a chemical reaction proceeds at the same rate as its reverse reaction; the rates of the forward and reverse reactions are equal, and the concentration of the reactants and products stop changing. When this condition is met, there is no change in the proportions of the various compounds involved, and the reaction ceases to progress

chemical evolution - the chemical changes that transformed simple atoms and molecules into the more complex chemicals needed for the origin of life

chemiluminescence - a chemical reaction that gives off energy in the form of light instead of heat



Commercially available light sticks contain a solution in a glass vial. When the vial is broken, a second solution mixes with the first and light (chemiluminescence) is generated. Different dyes give off different colors when they are caused to fluoresce by the light of the chemiluminescent reaction. (Photo: American Chemical Society)

chemoautotroph - an organism that utilizes oxidation of inorganic chemicals for its energy and carbon from inorganic carbon dioxide for cell growth; these organisms are also called chemolithotrophs

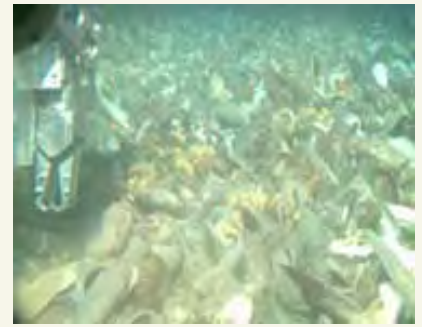
chemocline - a sharp gradient in chemical concentration

chemokinesis - the response by a motile cell to a soluble chemical that involves an increase or decrease in speed, or frequency of movement, or a change in the frequency or magnitude of turning behavior

chemoorganotroph - an organism that obtains energy from the oxidation of organic compounds and cellular carbon from preformed organic compounds

chemoreceptor - a receptor that is stimulated by the presence of certain chemical substances

chemosynthesis - the process whereby chemical energy is used to synthesize organic compounds from inorganic compounds, e.g., the oxidation of ammonia to nitrite by nitrifying bacteria



The deep-sea hot-spring environment supports abundant and bizarre sea life, including tube worms, crabs, giant clams, all of which depend upon chemosynthesis for their nutrition. (Photo: USGS)

chemotaxis - a unidirectional response of motile cells or organisms in which the direction of movement is affected by the gradient of a diffusible substance

chemotrophs - organisms (usually bacteria) that derive energy from inorganic reactions; also known as chemosynthetic organisms

chi-square - a statistical technique whereby variables are categorized to determine whether a distribution of scores is due to chance or experimental factors

chi-square distribution - a distribution in which a variable is distributed like the sum of the the squares of any given independent random variable, each of which has a normal distribution with a mean of zero and a variance of one

chi-square test - a statistical test based on the comparison of a test statistic to a chi-square distribution. It is used to reject or not reject the hypothesis that two or more population distributions do not differ from one another

chimaera - a cartilagenous fish that has a compressed body and rodent-like teeth. Chimaeras are closely related to sharks and rays (class Chondrichthyes, subclass Holocephali), but have larger heads and eyes, the mouth is more towards the front of the head, the gills are protected by a gill cover, the skin is smooth, and most species have a whip-like tail; also called ghost sharks or ratfish

chimera - the individual produced by grafting an embryonic part of one individual onto an embryo of either the same or of a different species

chimeric protein - a human-engineered protein that is encoded by a nucleotide sequence made by splicing together two or more complete or partial genes

chitin - a polysaccharide made up of chains of N-acetyl-D-glucosamine, a derivative of glucose. Chitin is structurally very similar to cellulose and serves to strengthen the supporting structures of various invertebrates. It also occurs in fungi

chiton - a marine mollusk of the Subclass Polyplacophora, which contains about 600 species of sedentary animals commonly known as chitons. They are found from shallow waters to depths of about 400 m. A chiton has a broad foot and a shell consisting of eight overlapping plates



A dorsal view of a chiton shell. Chitons are distinguished from all other mollusks by the presence of their convex shell, which is divided into eight articulating plates (valves). (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

chlorocruorin - a greenish iron-containing respiratory pigment dissolved in the blood plasma of certain marine polychaete worms. It may give the green color to the blood of these worms

chlorofluorocarbons (CFC) - gases that can be dissociated by solar radiation, which release chlorine, which in turn destroys ozone

chlorophyll - a green pigment present in green plants and cyanobacteria. Chlorophyll is essential in the transformation of light energy to chemical energy in photosynthesis

chlorophyll a - the major photosynthetic pigment found in all oxygen-evolving photosynthetic organisms (higher plants, and red and green algae)

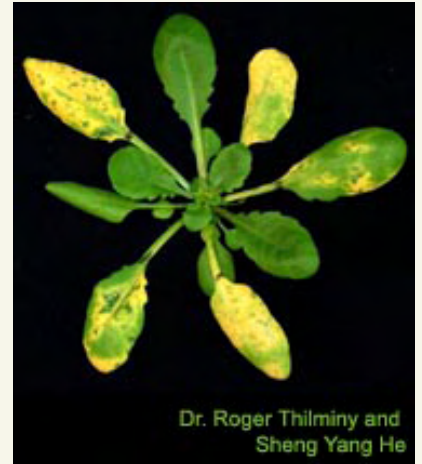
chlorophyll b - the chlorophyll generally characteristic of higher plants and green algae. It is absent in other types of algae

chlorophyll c - the chlorophyll present in brown algae, diatoms, and flagellates

chlorophyll d - the chlorophyll present in red algae, together with chlorophyll a

chloroplast - a disk-like organelle with a double membrane, found in some protists and all green plant cells, that contains chlorophyll and is the site of photosynthesis

chlorosis - the yellowing or bleaching of plant tissues due to the loss of chlorophyll or failure of chlorophyll synthesis. It can be caused by insufficient light or nutrients, and also by certain diseases



Disease symptoms (necrotic lesions surrounded by chlorosis) caused by a bacterial infection. (Photo: Dr. Roger Thilminy and Sheng Yang He, Michigan State University)

choanocyte (collar cell) - a flagellated cell that lines the interior of the central cavity (spongocoel) of a sponge. Choanocytes have a tubular collar with an extended flagellum that faces the spongocoel and creates currents that force water into the interstices of the sponge. Suspended food particles, such as plankton, are trapped by the choanocytes and passed to an amoebocyte that carries the food to other cells

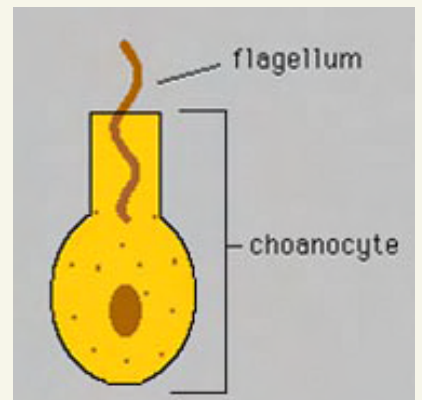


Diagram of choanocyte. The flagella create water currents that bring nutrients into the interior of a sponge. (Diagram: U. S. Environmental Protection Agency)

choanocyte chamber - in sponges, a cavity lined with choanocytes and located between incurrent and excurrent systems

choanoderm - in sponges, a surface lined with choanocytes

choanosome - the internal region of a sponge, including the choanocyte chambers

Chondrichthyes - the class of cartilaginous fishes that includes sharks, rays, skates, and chimaeras. Their skeleton is composed of cartilage, not bone



A manta ray, a member of the class Chondrichthyes. (Photo: NOAA)

Chordata - an animal phylum that includes sea squirts (tunicates), lampreys and hagfishes, fishes, amphibians, reptiles, birds and mammals. Many species of marine chordates play prominent roles in the ecology of coral reef ecosystems



The phylum Chordata includes the mammals such as this large humpback whale (*Megaptera novaeangliae*).

chorion - a thick, vascularized extra-embryonic membrane of amniote embryos that forms around the entire undersurface of the eggshell in birds and reptiles, and in direct contact with the uterine wall in mammals. It unites with the allantois to form the major structure for exchange between the embryo and the outside (birds and reptiles) or the maternal circulation (mammals)

chorology - the study of the spatial distribution of organisms

chory - a suffix meaning plant dispersal by a specified agency (animals, wind, water, etc)

Christmas tree coral - a recently discovered (2002) deep water black coral (*Antipathes dendrochristos*) observed on deep rocky banks off southern California. The species, which was described in 2005, forms bushy colonies that grow up to to three meters in height and width, and resembles ornamented Christmas trees. Like many other deep water corals, Christmas tree corals support a diverse biological assemblage



Christmas tree coral (*Antipathes dendrochristos*) photographed during surveys of deepwater rocky banks off southern California. (Photo: Mark Amend/NOAA)

chromatid - each of a pair of identical DNA molecules after DNA replication, joined at the centromere

chromatin - replicated DNA and associated proteins; highly folded ribbon-like complexes of deoxyribonucleic acid (DNA) and a class of proteins called histones; protein/DNA complex making the chromosome

chromatophore - a cell whose cytoplasm contains pigment granules that can be rapidly concentrated or dispersed, producing an overall effect of altering the color, color pattern or tone of the whole or part of an animal



This flounder is rarely noticed unless disturbed because of its remarkable ability to change color to match the substrate, by concentrating or dispersing pigment granules in its chromatophores.

chromocyte - a pigmented cell

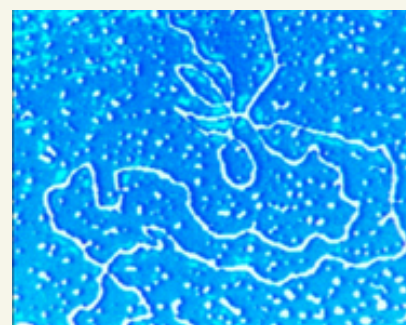
chromoplast - a plastid containing pigments other than chlorophyll, usually yellow or orange carotenoids

chromosomal aberration - any change in chromosome structure or number. Although chromosomal aberrations can be mechanisms for enhancing genetic diversity, such alterations are usually deleterious or ill-adaptive; includes deficiency, duplication, inversion, translocation, aneuploidy, polyploidy, or any other change from the normal pattern

chromosomal deletion - a mutation resulting from the loss of a small segment of DNA

chromosomal mutation - a mutation involving a long segment of DNA. These mutations can involve deletions, insertions, or inversions of sections of DNA. In some cases, deleted sections may attach to other chromosomes, disrupting both the chromosomes that loses the DNA and the one that gains it; any type of change in the chromosome structure or number

chromosome - one of the threadlike "packages" of genes and other DNA in the nucleus of a cell. Different species of organisms have different numbers of chromosomes. In sexually reproducing species, each parent contributes one chromosome of each pair, so offspring get half of their chromosomes from the maternal parent and half from the paternal parent. Bacterial cells do not possess a nucleus, therefore their chromosomes are located in the cellular cytoplasm



Highly magnified view of cell chromosomes.

chromosome aberration - changes in chromosome structure or chromosome number

chronic - long term or frequently recurring

chronobiology - the field of biology concerned with the timing of biological events, especially repetitive or cyclic phenomena in individual organisms.

chronograph - an instrument for recording the moment of an event

chronology - the age-depth relationship in ice, sediment, or another deposit. Ages are usually measured for discrete samples, and the ages of intermediate samples are interpolated between samples with measured ages

chronometer - an instrument for measuring time

chub - any species of bony fishes in the family Kyphosidae. Chubs have compressed oval bodies with small heads. They have small mouths with fine teeth and feed mainly on algae; some are carnivorous, feeding on benthic invertebrates. They congregate in great numbers for pelagic spawning. Kyphosids are distributed in the temperate and tropical inshore waters of the Atlantic, Indian and Pacific Oceans, where they are also known as sea chubs, pilotfishes, rudderfishes, drummers, and by other common names



The grey chub, *Kyphosus sandwicensis*, is a schooling species that is usually found in shallow rocky areas throughout the Indo-Pacific. (Photo: James Watt)

ciguatera - a food poisoning of humans caused by eating some species of tropical fishes whose flesh is contaminated with toxins obtained through the food chain



Ciguatera food poisoning may be contracted by eating the flesh of a contaminated barracuda.

ciguatoxin - a toxin found in flesh of marine animals, especially some fishes, at some times, in some localities. It is probably of algal origin and causes paresthesia, gastrointestinal symptoms, neuromuscular blockade, and respiratory paralysis due to interference with membrane function



Barracuda (*Sphyraena sp.*) are often the culprits in ciguatera food poisoning, caused by ciguatoxin. (Photo: Copyright Corel Corporation)

cilia - short, motile, generally microscopic, hairlike projections found on many protists and larvae of some invertebrates. Cilia are used for locomotion, the generation of a current, or filter feeding; A cilium is made up of microtubules and has basically the same internal structure as a flagellum. Movement is caused by the interactions of the microtubules. In higher animals, cilia are found projecting from cells that line certain tubes and passages, such as the tracheae (windpipe) of mammals

ciliary - relating to any cilia or hairlike processes; can relate to muscles concerned with visual focusing

ciliated epithelium - any epithelium having motile cilia on the free surface



Pseudostratified ciliated columnar epithelium - the ciliated epithelium that lines the trachea (windpipe) of mammals. (Photo courtesy of Dr. Franklin S. Carman III, donated from URL: <http://tooldoc.wncc.edu>)

Ciliophora - a group of protists bearing cilia



The stalked ciliate, *Stentor*. (Photo: Jon Houseman/BIODIDAC)

cinclide - one of many blister-like openings in the lower part of the body column of some anemones, through which the animal expels long, thread-like acontia

circa - about; around

circadian - being, having, characterized by, or occurring in approximately 24 hour periods or cycles

circadian rhythm - the regular recurrence, in cycles of about 24 hours, of biological processes or activities

circinate - ring-shaped

circulatory system - the system that contains the heart and the blood vessels (arteries, capillaries, veins) and moves blood and other circulating fluids throughout an organism's body. This system delivers oxygen and nutrients to the cells, and it helps rid them of waste products. Circulatory systems can be open or closed. Open systems lack capillaries and the blood perfuses through the tissues of the animal's body. Closed systems have capillary beds which connect arteries and veins. The blood is always contained in a vessel.

circum - a prefix meaning "around"

circumesophageal - pertains to structures encircling the esophagus

circumesophageal commissure - the major commissure (junction) of the nervous system of many invertebrates to which are connected anteriorly and posteriorly directed nerves and nerve chords. It is composed largely of nerve fibers and associated ganglia. This structure encircles the esophagus; also called "nerve ring"

circumesophageal connective - one of the nerve strand connectives on each side of the esophagus connecting the supraesophageal ganglia and subesophageal ganglia of arthropods, annelids and brachiopods

circumesophageal nerve ring - anterior concentration of nervous tissue in several invertebrate groups, such as mollusks, annelid worms, sipunculids (peanut worms), and echiurans (spoon worms or innkeeper worms)

cirrus - a slender, flexible appendage or part of an organism, usually having a tactile function

cistron - a DNA sequence that codes for a specific polypeptide; an alternate name for a gene

CITES (Convention on International Trade in Endangered Species)

- the 'Washington' Convention on International Trade in Endangered Species of Wild Fauna and Flora, more commonly known as CITES, aims to protect certain plants and animals by regulating and monitoring their international trade to prevent it reaching unsustainable levels. There are more than 150 Parties to the Convention. The CITES Secretariat is administered by the United Nations Environment Programme (UNEP). CITES regulates international trade in over 30,000 species, of which approximately 25,000 are plants

citreous - lemon color

citric acid cycle - see: Krebs cycle

clade - a group of species with a common evolutionary ancestry

cladist - a systematist who attempts to classify life forms according to their evolutionary relationships, not just overall similarity

cladistic distance - the number of branching points between any two nodes on a phylogenetic tree

cladistic species - the concept of species in which a species is a lineage of populations between two phylogenetic branch points (speciation events)

cladistics - the systematic classification of groups of organisms on the basis of the order of their assumed divergence from ancestral species

cladogenesis - the evolutionary process whereby one species evolves into two or more species

cladogram - a tree-like diagram, resulting from a cladistic analysis, which depicts a hypothetical branching sequence of lineages leading to the taxa under consideration. The points of branching within a cladogram are called nodes. All taxa occur at the endpoints of the cladogram

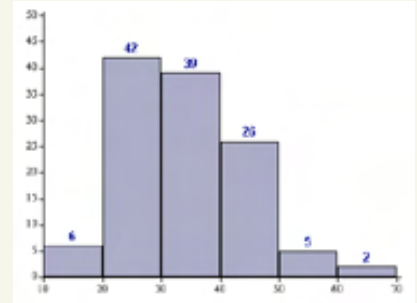
clasper - a rod-like modification of the pelvic fin of a male elasmobranch that is used to transfer sperm into the female during mating



NOAA scientist measuring the length of a ray's clasper.

class - in taxonomy, a category just beneath the phylum and above the order; a group of related orders

class interval - one of the ranges into which data in a frequency distribution table (or histogram) are binned. The ends of a class interval are called class limits, and the middle of an interval is called a class mark. In plotting a histogram, begin by dividing the range of all values into non-overlapping class intervals, in such a way that every piece of data is contained in some class interval



A histogram in which the population of data are grouped into non-overlapping class intervals.

classical conditioning - a form of associative learning, in which an animal recognizes that two or more events are related. The animal performs a behavior in response to a substitute stimulus rather than the normal stimulus

classification - a system of nested hierarchical categories used to efficiently store information about biological diversity

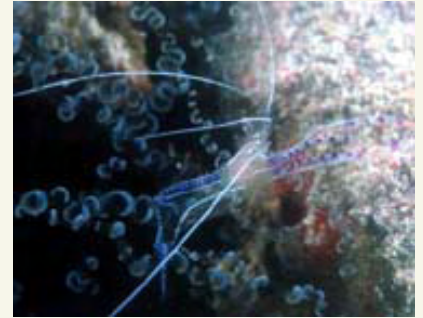
clathrate - resembling an open latticework; a chemical substance consisting of a lattice of one type of molecule trapping and containing a second type of molecule. For example, a clathrate hydrate involves a special type of gas hydrate that consists of water molecules enclosing a trapped gas, such as methane

clavate - club-shaped

Clean Water Act (CWA) - an act passed by the U.S. Congress to control water pollution. Growing public awareness and concern for controlling water pollution led to enactment of the Federal Water Pollution Control Act Amendments of 1972. As amended in 1977, this law became commonly known as the Clean Water Act. The Act established the basic structure for regulating discharges of pollutants into the waters of the United States. It gave EPA the authority to implement pollution control programs such as setting wastewater standards for industry. The Clean Water Act also continued requirements to set water quality standards for all contaminants in surface waters. The Act made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. It also funded the construction of sewage treatment plants under the construction grants program and recognized the need for planning to address the critical problems posed by nonpoint source pollution

cleaner wrasse - a small reef fish of the wrasse family (Labridae) that feeds on ectoparasites of larger "host" fishes. It establishes a "cleaning station" at a specific location on the reef where a variety of host fishes assemble and await the cleaner wrasse's services

cleaning behavior - mutualistic behavior in which larger animals, usually fishes, permit smaller animals, usually other species of fishes or invertebrates, to clean them of external parasites



Pederson's Cleaning Shrimp (*Periclimenes pedersoni*) on a reef in the Virgin Islands. This small (to 1 inch) shrimp favors habitat and a steady food supply offered by Ringed and Giant Caribbean anemones.

cleaning station - a site visited by fishes where, in a mutually symbiotic relationship, cleaning shrimp or fish remove parasites from their bodies

cleavage - the early mitotic cellular divisions of the fertilized egg (zygote)



A four-cell stage of a cleaving sea urchin embryo. (Photo: Copyright Dr. Leland Johnson, Augustana College, Illinois)

CLEO (Coral Literature, Education & Outreach) - the CLEO project is designed to provide easy access to gray literature and pre-1990's literature on the coral reef environments near the Coral Reef Early Warning System (CREWS) monitoring stations to support education, research and management objectives. The Education modules leverage techniques developed at NOAA/AOML in the Explorer of the Seas, Coral Health and Monitoring and CREWS programs under which knowledge transfer of oceanographic instrumentation and coral reef processes have been developed. Education modules for middle school students engage the students in oceanographic instrumentation, classroom experiments and use of data, and the live Coral Cam observations

client - a software program that is used to contact and obtain data from a server software program on another computer, often across a great distance. Each client program is designed to work with one or more specific kinds of server programs, and each server requires a specific kind of Client. A web browser is a specific kind of client

climate - long-term characteristics of weather

climate change - the long-term fluctuations in temperature, precipitation, wind, and all other aspects of the Earth's climate. It is also defined by the United Nations Convention on Climate Change as "change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods"

climate variability - changes (variability/trends) in the long-term characteristics of weather

climate-induced bleaching - coral bleaching as a result of changing climate patterns, e.g., temperature

climax - the final stage in ecological succession that is able to persist in the absence of environmental change

clinal speciation - a form of allopatric speciation in which a vicariant event interrupts gene flow in a former cline

cline - the gradual variation, in a character of a species, in geographical space

cloaca - the common passage for fecal, urinary and reproductive discharge in most lower vertebrates

CLOD (Coralline Lethal Orange Disease) - a disease which infects coralline algae

clone - an individual genetically identical to the parent organism, created by the splitting off or budding of cells from the parent organism

clone cells - a group of genetically identical cells all descended from a single common ancestral cell by mitosis in eukaryotes, or by binary fission in prokaryotes. Clone cells also include populations of recombinant DNA molecules all carrying the same inserted sequence of bases

cloned DNA - exact copies of DNA segments prepared by using recombinant DNA technology

cloning - the process of asexual reproduction in an otherwise multicellular organism

cloning vector - DNA molecule originating from a virus, a plasmid, or the cell of a higher organism into which another DNA fragment of appropriate size can be integrated without loss of the vector's capacity for self-replication; vectors introduce foreign DNA into host cells, where the DNA can be reproduced in large quantities. Examples are plasmids, cosmids, and yeast artificial chromosomes; vectors are often recombinant molecules containing DNA sequences from several sources

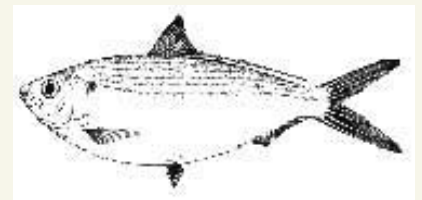
closed circuit scuba - a diving apparatus which allows divers to re-breathe exhaled air after removal of carbon dioxide and addition of supplemental oxygen. It is not generally used by recreational scuba divers

closed circulatory system - a circulatory system in which blood flows through blood vessels at all times. Blood flows from arteries to capillaries and through veins, but the tissues surrounding the vessels are not directly bathed by blood. Some invertebrates and all vertebrates have closed circulatory systems

closed system - a system in which no matter or energy can leave or enter from the outside

Clostridium - a genus of Gram positive anaerobic spore-forming bacteria. *Clostridium* includes common free-living bacteria as well as important pathogens of humans and marine animals

clupeoid fish - any soft-rayed, bony fish species belonging to the order Clupeiformes. These include herrings, shads, wolf herrings, sardines, and anchovies



A clupeoid fish, the Atlantic thread herring *Ophisthonema oglinum* (Photo: NOAA)

clupeoid fish poisoning - a very serious form of fish poisoning caused by eating clupeotoxic fishes; also called clupeotoxism

clupeotoxic fish - fishes in the orders Clupeiformes (herrings and herring-like fishes), and Elopiformes (ladyfishes and tarpons) whose flesh might contain a toxin, clupeotoxin, by ingesting certain dinoflagellates which contain the toxin

clupeotoxin - the poison in clupeotoxic fishes. It is a neurotoxin, palytoxin, found in marine dinoflagellates and presumably ingested by the fish

cluster analysis - a multivariate statistical technique for solving classification problems. The object is to sort items into groups such that the degree of association is strong between members of the same cluster and weak between members of different clusters

clutch - a group of eggs laid at the same time

cnida - an organelle located in cnidocytes that is capable of eversion. There are three types of cnidae: nematocysts, spirocysts, and ptychocysts.

Cnidaria - a multicellular animal phylum, with a tissue grade of construction, that contains the stony (hard) corals, anemones, sea fans, sea pens, hydroids, and jellyfish



An Atlantic coast
cnidarian, a dahlia sea
anemone (*Tealia sp.*)
(Photo: Andy Bruckner)

cnidocyte - a stinging cell of jellyfish, hydroids, sea anemones and corals. The cnidocyte contains the eversible cnida. The most common type of cnidocyte is the stinging structure also known as the nematocyst or cnidocyst. Cnidocytes are located throughout the epidermis, but are especially abundant on the tentacles

cnidoglandular band - the distal rim or free margin along a cnidarian mesentery

cnidosac - a sac located in a ceras of a nudibranch gastropod which contains undischarged nematocysts (obtained through feeding upon cnidarians) passed from the slug's digestive system. When a predator attacks the nudibranch, the nematocysts may discharge as a defensive mechanism



Section through the ceras of *Aeolidiopsis ransonii* showing the cnidosac with three nematocysts. (Photo: Dr. Bill Rudman)

co-adaptation - development and maintenance of advantageous traits benefiting one or both parties in a two-species interaction; evolution of characteristics of two or more species to their mutual advantage; predator-prey and cleaning symbioses are examples of such evolving interactions in marine communities

co-management - the sharing of authority, responsibility, and benefits between government and local communities in the management of natural resources

coacervate - an aggregate of colloidal droplets held together by electrostatic forces. Coacervate droplets may contain a mixture of organic compounds. One theory of the evolution of life is that the formation of coacervates in the primeval soup was a step towards the development of cells

coalesce - to come together so as to form one whole; to fuse

coarse sediment - a sediment made up of coarse-grained materials, such as sand or gravel particles

coastal area - the areas of land and sea bordering the shoreline and extending seaward through the breaker zone. Coastal areas throughout the world are under enormous environmental stress, which is caused by a wide range of factors, including pollution and the destruction and deterioration of marine habitats



Rainbow over Hawaii, HI coast (Photo: Dr. James P. McVey, NOAA Sea Grant Program)

coastal flooding - flooding that occurs from storms where water is driven onto land from an adjacent body of water



A coastal storm leaves flooded streets in its wake. (Photo: U.S. Army Corps of Engineers)

coastal margin - the boundary line between land and sea

coastal morphology - the form and configuration of a coast

coastal reef - a coral reef occurring near and parallel to a coastline

coastal waterway - a body of water situated on or near a coast, with some association with the ocean. Includes embayments, wave- and tide-dominated estuaries, wave- and tide-dominated deltas, coastal lagoons, and tidal creeks

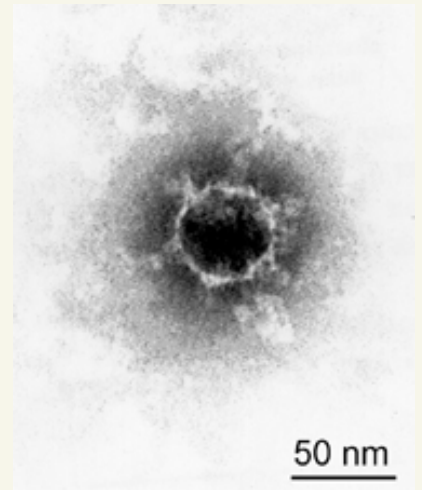
coastal zone - coastal waters and adjacent lands that exert a measurable influence on the uses of the oceans and their living and nonliving resources



Spectacular Oregon coastline. (Photo: Rear Admiral Harley D. Nygren, NOAA Corps)

Coastal Zone Management Act - passed in 1972, the CZMA provides for management of shoreline areas that may include coral reefs

coat protein - the coating protein that encloses the nucleic acid core of a viral particle; the capsid

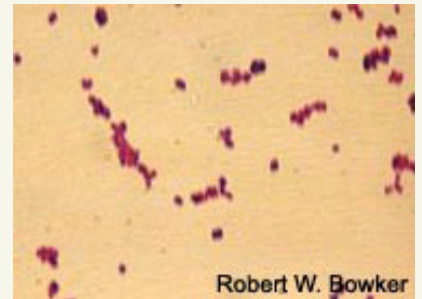


A single coat protein (capsid) of a cypovirus surrounded by a loose polyhedrin matrix. (Photo: Dr. Hans Ackermann, Medical Faculty, Laval University, Quebec, Canada)

Coccidea - a class of parasitic single-celled organisms in the protistan phylum, Apicomplexa

coccoid - spherical in shape

coccus - a bacterium with a spherical shape



Coccus bacteria. (Photo: Robert W. Bowker, Glendale Community College Glendale, AZ)

COD (Chemical Oxygen Demand) - a measure of the chemically oxidizable material in water which provides an approximation of the amount of organic and reducing material present. The determined value may correlate with biochemical oxygen demand (BOD) or with carbonaceous organic pollution from sewage or industrial wastes

cod end - the terminal, closed end of a trawl net

Code - in taxonomy, the International Code of Zoological Nomenclature. An authoritative document containing a system of rules and recommendations to be followed in giving a scientific name to an animal or animal group

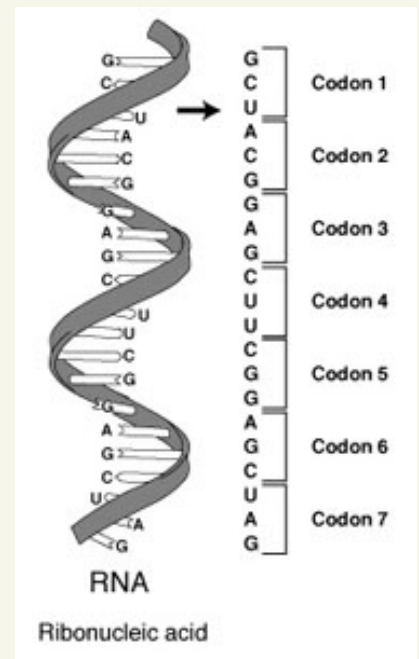
coding - the specification of a peptide sequence by the code contained in DNA molecules

coding region - a sequence of DNA, bounded by start and stop codons, which consists of a series of nucleotide bases that gives rise to mRNA (messenger RNA) that will be translated into the specific amino acids of the protein product

coding sequence - that portion of a gene which directly specifies the amino acid sequence of its protein product

coding strand - the strand of duplex DNA which contains the same base sequence (after substituting Uracil for Thymine) found in the mRNA molecule resulting from transcription of that segment of DNA., known as the sense strand. The mRNA molecule is transcribed from the other strand, known as the template or antisense strand

codon - three bases in a DNA or RNA sequence which specify a single amino acid



RNA codons. A = adenine;
C = cytosine; G =
guanine; U = uracil.
(Diagram: NIH/Human
Genome Project)

coefficient - a number expressing the amount of some change or effect under certain conditions

coefficient of faunal similarity (CFS) - The CFS compares the fauna of one area with that of another. $CFS = 2C/(a+b)$, where C = the number of species in common between two areas, a = the number of species in the first area, and b = the number of species in the second area. The higher the CFS, the greater the resemblance

coefficient of variation - in statistics, it refers to the standard deviation of a distribution divided by the distribution's mean, providing a standardized measure of the variation in a distribution, which does not increase simply because the mean itself increases or because the units of measurement change

Coelenterata - an older name for the phylum Cnidaria

coelenteron - the gastrovascular (digestive) cavity of a cnidarian or ctenophore

coelobite - an organism that lives in pores and spaces within a reef

coeloblastula - a larval form associated with oviparous development, with a cytologically undifferentiated central region, and an even distribution of small flagella. Coeloblastulae are found in sponges, brachiopods and other invertebrate groups

coelom - an internal fluid-filled body cavity within a coelomate organism. It lies between the gut and the outer body wall, and is lined entirely with tissue (peritoneum) derived from the mesoderm. Most internal organs are located within the coelom. The structure and development of the coelom is an important taxonomic character for recognizing major groups of animals

coelozoic - living in the lumen of a hollow organ, such as the intestine, gall bladder, urinary tract, etc

coenecium - a branching tubular network inhabited by pterobranch (Hemichordata) colonies that is secreted from glands in the oral shields of the zooids

coenenchyme - all of the mesenchymal tissue, perforated with channels, that is common to all polyps of a colonial cnidarian

coenocline - a sequence of communities along an environmental gradient

coenosarc - the living tissue of a cnidarian polyp, consisting of the outer, nonciliated epidermis and the inner, ciliated gastrodermis with the thin, acellular mesoglea in between. The coenosarc connects the coral polyps of a coral colony. It spreads along the surface of the calcareous exoskeleton

coenosteum - the common surface of corallum between calices

coenosteum pit - the point of insertion or commencement of septa in some corals

coenzyme - an organic nonprotein molecule that binds with the protein molecule to form the active enzyme

coevolution - a change in the genetic composition of one species (or infraspecific group) in response to a genetic change in another, i.e. two or more species evolving, each in response to the other

cofactor - a nonprotein substance required for certain enzymes to function. Cofactors can be co-enzymes or metallic ions

cohort - individuals all of the same age

cohort - in taxonomy, a taxonomic rank between infraclass and superorder

cold front - in meteorology, a mass of cold air moving toward a mass of warm air. Strong winds and rain typically accompany a cold front

cold seep - an area of the ocean floor where hydrogen sulfide, methane, and other hydrocarbon-rich fluid seepage occurs. Cold seeps are distinct from hydrothermal vents. Cold seep's emissions are of the same temperature as the surrounding seawater, whereas hydrothermal vent's emissions are super-heated. Cold seeps constitute a biome which support several endemic species

cold water - temperature regime usually between 4° – 13° C, and not exceeding 20° C. This is not an exact definition, and is meant only to distinguish between cold-water and tropical warm-water coral environments

cold-water coral ecosystem - a large aggregation of cold-water corals with their associated fauna in terms of spatial coverage at a given locality

coliform bacteria - bacteria whose presence in water is an indicator of pollution and of potentially dangerous contamination



A coliform-caused fish kill. Fecal coliforms originate from sewer overflows, septic tank seepage and animal defecation. They are indicators of fecal

contamination which could also contain bacteria and viruses responsible for cholera and typhoid infections, hepatitis and gastroenteritis. (Photo: Pine River Shire Environmental Services, Australia)

collagen - the protein substance of the collagenous fibers (white fibers) of skin, tendon, bone, cartilage and all other connective tissue. Collagen also serves as skeletal support in some sponges

collagenous - producing or containing collagen

collagenous fiber - white connective tissue fiber that occurs in bundles. They possess a high tensile strength and make up the principal element of irregular connective tissue, tendons, and aponeuroses, and occur in the matrix of cartilage and bone tissue

collar cell - any of the flagellated cells in sponges having a collar of cytoplasm around the flagellum; they maintain a flow of water through the body; a choanocyte; also, a specialized cell found in epithelia of cnidarian mesenterial filaments and the actinopharynx

collection - an assemblage of specimens compiled and maintained for purposes of study and/or display

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collenchyme - in cnidarians, mesenchyme with sparse cellular components

collencytes - a contractile, collagen-secreting amoebocyte in sponges

collinear - lying on the same line

collinear points - three or more points on the same line in a plane or in space

colloblast - a cell that discharges a sticky filament upon contact with a prey organism. Colloblasts are found in the tentacles of ctenophores (comb jellies). As the tentacles are dragged through the water, the colloblasts discharge and capture prey



Colloblast discharge organ of ctenophorans (comb jellies). (Image: Livingstone, Copyright BIODIDAC)

colloid - a stable suspension of particles that, though larger than in a true solution, do not settle out

colonial - a level of cellular organization intermediate between unicellular and multicellular; refers to organisms that occur in a fixed location, with one generation growing on top previous generations, as in coral reefs; types of animal that are organized into associations of incompletely separated individuals; eg, Portuguese man o' war, sponges and corals; in plants, describes cloning by asexual reproduction in which seemingly separate plants grew from rhizomes, stolons, or roots of a single or neighboring parent plant

colonial coral - a coral composed of many individuals

colonial nester - a species that nests in colonies

colonization - a movement of individuals or propagules of a species to a new territory

colonized hardbottom - a substrate formed by the deposition of calcium carbonate by reef building and other organisms. Habitats within this category have some colonization by live coral

colony - a group of the same kind of animals, plants, or one-celled organisms living or growing together

color - a quality of light, depending on its wavelength. Perceived color (or visual color) is the quality of light emission as conveyed by the eye, i.e., the visual perception of light that enables humans and other organisms to differentiate between wavelengths of the visible spectrum

color card - the CoralWatch program (University of Queensland, Brisbane, Australia) developed a method of coral health monitoring which uses simple color charts, like paint color matching charts. The color charts are based on the actual colors of bleached and healthy corals. Each color square corresponds to a concentration of symbiotic zooxanthellae contained in the coral tissue. The concentration of symbionts is directly linked to the health of the coral. The color of the coral is matched with one of the colors in the coral health monitoring chart, then the the matching color codes, along with coral type (species if possible) is recorded on a website data sheet (www.coralwatch.org)



The diver is matching the color of the coral with a color on the CoralWatch color chart. This healthy brain coral is dark brown and has a color score of E6. (Photo: University of Queensland, Australia)

colorimeter - an instrument for measuring and determining color

coloumb - unit of electrical charge of one ampere over period of one second

columella - any small column-like structure in various plants and animals, often forming the central axis of development for the organism as a whole, or an anatomical structure; the thickened axial pillar around which the whorls of gastropods are constructed; the central axis of a corallite; the central structure of the calyx formed by fusion of the septa



The columella inside a *Strombus* oyster drill. (Photo: Jesuit Dallas Museum)

column - the cylindrical body of an anthozoan polyp

columnar - column-shaped

columnar colony - a coral colony formed into one or more columns

comb row - a longitudinal line of ctenes on the epidermis of ctenophores (comb jellies)

comb teeth - paddle-shaped projections on the oral pinnules of crinoids

CoML (Census of marine Life) - a global network of researchers in more than 45 nations engaged in a ten-year initiative to assess and explain the diversity, distribution, and abundance of marine life in the oceans past, present, and to explain how it changes over time

commensal - having benefit for one member of a two-species association but neither positive nor negative effect on the other

commercial extinction - the decline in the population of a wild species, used as a resource, to a level where it is no longer profitable to harvest the species

commercial fishing - a term related to the whole process of catching, processing and marketing fishes and shellfish. It also refers to and includes fisheries resources, fishermen, and related businesses directly involved in harvesting, processing or sales

Commission - refers to the International Commission on Zoological Nomenclature (ICZN)

commissure - a juncture or seam; the juncture where two sides of a nervous system are joined

common ancestor - the most recent ancestral form or species from which two different species evolved

common name - a colloquial or vernacular name. For example, "crown-of-thorns starfish" is the common name of *Acanthaster planci*

commonwealth - an organized United States insular area, which has established with the Federal Government, a more highly developed relationship, usually embodied in a written mutual agreement. Currently, two United States insular areas are commonwealths, the Northern Mariana Islands and Puerto Rico. A United States insular area from April 11, 1899, the Philippine Islands achieved commonwealth status on March 24, 1934 (Public Law 73-127), and remained as such until the United States recognized the Philippine Islands' independence and sovereignty as of July 4, 1946

communication network - telecommunications infrastructure that transfers data from observing systems to data centers, and then to end users

community - a naturally occurring assemblage of organisms that live in the same environment and are mutually sustaining and interdependent; a group of populations that interact in time and space

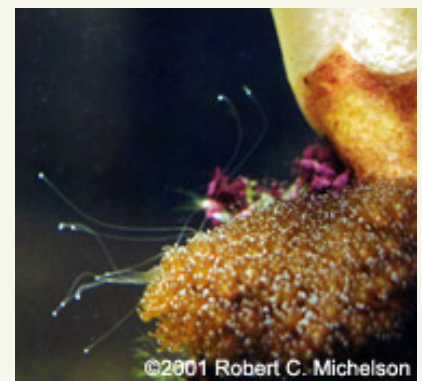
community-based ecosystem management - a process whereby non-government organizations, community groups, or individuals participate in long-term management of selected species, habitats, or ecosystem processes with the ultimate goal of improving management of ecosystems and natural resources

compact branching - a growth pattern where the coral branches are close together

Compact of Free Association - the status of free association recognizes an island government as a sovereign, self-governing state with the capacity to conduct foreign affairs consistent with the terms of the Compact. The Compact places full responsibility for military defense with the United States. The basic relationship of free association continues indefinitely; the economic provisions of the Compact are subject to renegotiation at the end of 15 years

compensation depth - the depth in the ocean at which the difference between the oxygen produced by algae through photosynthesis and that consumed by them through respiration is zero, i.e., net oxygen production is zero

competition - a biological interaction that can limit population growth. Competition occurs when two or more populations vie for the same limited resource



Sweeper tentacles from a *Galaxia* colony. The stinging cells kill neighboring "non-self" corals in the competition for space. Mesenterial filaments which dissolve neighboring non-self corals are another means of competitive tactics by scleractinian corals. (Photo: Copyright 2001 Robert C. Michelson)

competitive exclusion - the principle that when the populations of two species compete for resources, one will use the resources more efficiently, therefore outcompete and eventually eliminate the other population

competitive release - the expansion of a species' ecological niche, associated with the lack of competition with other species

complement - the complement of a nucleic acid sequence replaces each base by its complementary base: adenine (A) by thymine (T), cytosine (C) by guanine (G), and vice versa. In RNA, adenine is paired not with thymine but with uracil (U)

complementarity - the relationship between the two strands of a double helix of DNA. Thymine in one strand pairs with adenine in the other strand, and cytosine in one strand pairs with guanine in the other strand

complementary base pair - the specific matching of purine and pyrimidine base pairs in nucleic acids. This matching occurs because the structure of one base precisely fits with, and bonds to, another specific base. In DNA, adenine and thymine are complementary and form a base pair, as do cytosine and guanine. In pairing between DNA and RNA, adenine and uracil are complementary, and cytosine and guanine are complementary

complementary nucleotide - a member of the pairs adenine-thymine, adenine-uracil, and guanine-cytosine that have the ability to hydrogen bond to one another

complementary resources - a pair of resources for which consumption by the consumer of one resource reduces its requirement for the other

complete protein - a protein that has all of the essential amino acids and in the correct proportions

complex life cycle - a life cycle that consists of several distinct stages (e. g., larva and adult)

complexity - in ecology, the number of species at each trophic level and the number of trophic levels in a community; in molecular genetics, used to describe a DNA molecule or a mixture of DNA molecules. It is the length of the nucleotide sequence without including any sequence repetition

compound - a material made up of two or more elements combined in a fixed ratio

compound chromatophore - a chromatophore that contains more than one kind of pigment

compound eye - the eye of arthropods, most highly developed in insects and crustaceans. It consists of a group of functionally related visual elements (ommatidia), each having its own refractive system and each forming a portion of an image

compressed - a body shape which is flattened laterally, bringing the right and left sides closer together, e.g., a butterfly fish or a flounder



The compressed body shape of a garibaldi.
(Photo: Copyright Corel Corporation)

compressed air - air compressed to a pressure higher than the surrounding atmospheric pressure (ambient pressure)

compression - in information technology, decreasing the size of stored information by reducing the representation of the information without significantly diminishing the information itself, usually by removing redundancies. The information requires decompression upon retrieval. Lossless compression allows the original data to be recreated exactly. Lossy compression sacrifices some accuracy to achieve greater compression

conchiform - shell-shaped

conchology - the study of shells

conciliatory behavior - behavior directed toward other organisms that tends to diminish or eliminate aggression and promote harmonious social relationships

confidence interval - the probability, based on statistics, that a number will be between an upper and lower limit

confluent - joined together

congener - a member of the same genus

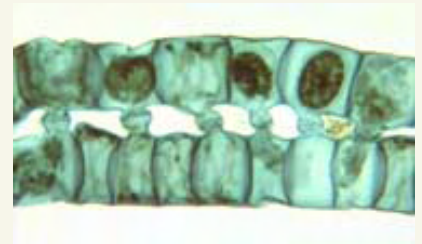
conger eel - any species of eel in the family Congridae. Conger eels have a thick cylindrical body and tapering snout. They possess a smooth and scaleless skin and large pectoral fins. They are much less common than moray eels in coral reef communities. During the day they tend to hide in crevices and holes under rocks or coral, or burrow into sand. They emerge at night to feed



The conger eel, *Conger cinereus*, is uncommon in Hawaiian waters. It hides under rocks or in caverns and emerges at night (Photo: Keoki and Yuko stender)

conjugated protein - a protein complex combining amino acids with other substances

conjugation - a process of sexual reproduction whereby two cells come in contact and exchange genetic material. In prokaryotes and unicellular algae, the transfer is a one-way process. The union of two bacterial cells, during which chromosomal material is transferred from the donor to the recipient cell. Conjugation in protozoans is a two-way process, genetic material is passed between each conjugant



Spirogyra is a filamentous green alga. Certain filaments in a loose parallel bundle of *Spirogyra* assume the female role, and others the male. The cells of adjacent filaments develop tubular extensions which grow towards one another and eventually fuse to form a continuous tube between the cells. Meanwhile the contents of each cell have formed a round sphere. The spheres from the male filament squeeze their way down the connecting tubes to fuse with a sphere of the female cell in the other filament. The result of this sexual union is the formation of a zygote (zygospore) within the chambers of the female

filament. After a dormant period, the zygotes undergo meiosis and germinate, resulting in new filaments. (Photo: Wappinger Schools)

connectivity - natural linkages among reefs including currents, larval dispersal, spawning patterns, and movements of adult organisms. Connectivity is an important part of dispersal and the replenishment of biodiversity on reefs damaged by natural or human-related agents; a qualitative term describing the degree to which ecosystems are linked to one another to form an interconnected network; the movement of organisms from place to place through dispersal or migration

conoptide - a family of molecules found in the venom of species of marine cone shell snails (*Conus* sp) that can act as an analgesic and alleviate pain. One particular group, the omega-conopeptides, blocks channels on nerve cells that transport calcium ions and thereby interfering with the production of neurotransmitters. Synthetic copies of conopeptides from the magician's cone shell, *Conus magus*, are used to make the drug Prialt, generally known as ziconotide

Conservation - under the NOAA Coral Reef Conservation program, the term 'conservation' means the use of methods and procedures necessary to preserve or sustain corals and associated species as diverse, viable, and self-perpetuating coral reef ecosystems, including all activities associated with resource management, such as assessment, conservation, protection, restoration, sustainable use, and management of habitat; mapping; habitat monitoring; assistance in the development of management strategies for marine protected areas and marine resources consistent with the National Marine Sanctuaries Act (16 U.S.C. 1431 et seq.) and the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.); law enforcement; conflict resolution initiatives; community outreach and education; and that promote safe and ecologically sound navigation

conservation - the political/social/economic process by which the environment is protected and resources are used wisely

conservation biology - a multidisciplinary science that deals with the conservation of genes, species, populations, communities, and ecosystems that make up the Earth's biodiversity. Its goals are to investigate human impacts of biodiversity and to develop approaches to prevent extinction of species through stewardship of entire biological communities

Conservation Commons - an approach under the World Conservation Union (IUCN) designed to improve the management of data, information, and knowledge related to conservation. It is a collaborative effort to improve open access to data, information, and knowledge related to the conservation and sustainable use of biodiversity with the belief that this will contribute to improving conservation outcomes. Support for this initiative is presently drawn from governments, international and multi-lateral organizations, non-governmental organizations, academia, the private sector, and many other interested parties who share similar goals of ensuring the sustainable use of biodiversity while conserving the integrity of biodiversity for future generations (www.conservationcommons.org)

Conservation International (CI) - a nonprofit, U.S.-based, international organization that applies innovations in science, economics, policy and community participation to protect the Earth's richest regions of plant and animal diversity in the biodiversity hotspots, high-biodiversity wilderness areas, as well as important marine regions around the globe. With headquarters in Washington, D.C., CI works in more than 40 countries on four continents

conserved name - in taxonomy, a name otherwise unavailable or invalid that the International Commission on Zoological Nomenclature, by the use of its Plenary Power, has enabled to be used as a valid name by removal of the known obstacles to such use

consexual - of the same sex

conspecific - of the same species

consumer - an organism which must consume other organisms (living or dead) in order to satisfy its energy needs

contaminant - an undesirable substance not normally present, or an usually high concentration of a naturally occurring substance in the environment; a substance in water that might adversely affect the health and welfare of the biota

Content Standard for Digital Geospatial Metadata - provides a common set of terminology and definitions for the documentation of digital geospatial data. The standard establishes the names of data elements and compound elements (groups of data elements) to be used for these purposes, the definitions of these compound elements and data elements, and information about the values that are to be provided for the data elements

contiguous - sharing an edge or boundary; touching; neighboring; adjacent

contiguous habitat - a habitat which shares a boundary with an adjacent habitat

continental margin - the water-covered edges of continents consisting of the continental shelf, the continental slope, and the continental rise

continental rise - the enormous wedge of sediment deposited at the base of the continental slope

continental shelf - the shallow, near-horizontal sea floor extending from the coast to the upper continental slope

continental slope - the sloping sea bottom of the continental margin that begins at a depth of about 100 to 150 m at the shelf edge and ends at the top of the continental rise or in a deep-sea trench

continuum - a continuous set of data for which each data point is related to the adjacent point; a gradual or imperceptible intergradation between two or more extreme values

contour - on a map or chart, a line connecting points of equal surface value

contour interval - the difference in surface values between contours

controlled environment - the environment in which parameters, such as light, temperature, salinity, etc., are fully controlled

controlled experiment - a scientific experiment, in which results from an experimental group with variable conditions, is compared with a control group with nonvariable conditions

conule - an empty, somewhat conical elevation on the surface of some sponges

convection - vertical air circulation in which warm air rises and cool air sinks, resulting in vertical transport and mixing of atmospheric properties; transfer of heat by the movement of air or water; the rise of an air mass caused by warming over land or sea that often causes the formation of clouds

convection current - a movement of air or water caused by changes in density or thermal gradients

convection precipitation - precipitation which occurs from convective clouds. It falls as showers with rapidly changing intensity. Convective precipitation falls over a certain area for a relatively short time, as convective clouds have limited horizontal extent. Most precipitation in the tropics appears to be convective

convergence - come together and meet at a point

convergence zone - the line where two oceanic water masses meet, resulting in the sinking of the denser one

convergent evolution - the development of superficially similar structures in unrelated organisms, e.g., the wings of insects and birds

convivium - a population differentiated within a species and isolated geographically, usually subspecies and/or ecotypes; a population or group of organisms that is set apart from other related groups by factors other than interfertility and are maintained by some isolating mechanism other than intersterility. Convivia are usually equivalent to a subspecies or variety

coordinate taxon - in cladistics, a group within a monophyletic lineage at the same branching level as another. Therefore, it requires equivalent taxonomic rank in the Linnean classification hierarchy

Coordinating Body on the Seas of East Asia (COBSEA) - the Coordinating Body on the Seas of East Asia (COBSEA) was established in 1981 under the framework of the UNEP Regional Seas Programme with the East Asian Seas (EAS) Action Plan that is basically aimed at establishing a comprehensive strategy to protect the marine and coastal environment of the EAS region and to promote its sustainable development

copepod - any of a large subclass (Copepoda) of usually minute freshwater and marine crustaceans that form an important element of the zooplankton in the marine environment and in some fresh waters. A common feature uniting all the copepod orders is a single simple eye in the middle of the head, at least in the larval stage. The cephalosome, a shield over the head and some thoracic segments distinguishes the free living forms from parasitic ones. Some species are ectoparasites of marine fishes



Copepods are very important components of the zooplankton community. This illustration show a copepod carrying a number of eggs (in blue) (Photo: NOAA)

copepodid - postnaupliar developmental stages of copepods

coprophagous - pertains to feeding on fecal matter

copulation - the physical act of mating; sexual intercourse

coral - a general term used to describe a group of cnidarians; indicates the presence of skeletal material that is embedded in the living tissue or encloses the animal altogether



Finger coral (*Porites compressa*) in Hawaii (Photo: M. White)

coral assemblage - a group of corals

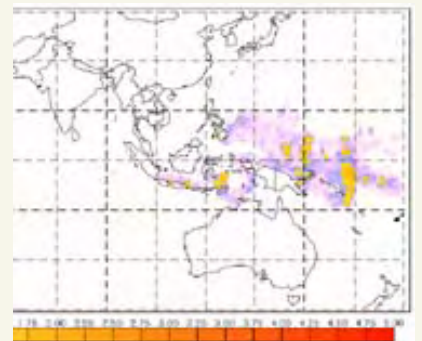
coral bank - an undersea mound or ridge that rises above the surrounding continental shelf or slope and is formed in part from the carbonate skeletons of corals

coral bleaching - the process in which a coral polyp, under environmental stress, expels its symbiotic zooxanthellae from its body. The affected coral colony appears whitened



Bleached *Acropora* coral in Florida Keys (Photo: Larry Benvenuti)

coral bleaching hotspot - a region of sea surface temperature (SST) that exceeds the climatological maximum for a region by 1 deg C or more. These conditions may cause sufficient stress to coral reefs to result in coral bleaching



Section of a graphic depicting areas of elevated ocean temperatures that may result in coral bleaching events.

Coral Bleaching HotSpot monitoring program - a NOAA program that uses satellite and in situ monitoring stations to monitor high sea surface temperature events and to analyze conditions that may lead to coral bleaching

coral growth line - a minute growth line on the outer surfaces of corals that have a calcified outer wall. The carbonate is produced by zooxanthellae which create a series of diurnal growth increments

coral holobiont - see "holobiont"

coral mining - Corals are mined mainly for the construction of houses and buildings, groins, solid jetties, breakwaters, sea walls, jewelry, decorative ornaments, household furnishings, and aquarium displays. The common species of corals mined are massive corals, such as Porites, which are crushed by manual labor into smaller pieces and used as building materials. Another major use of mined coral is in the making of lime. For many in the tropics, it is cheaper to produce lime locally than buying imported cement. Coral mining methods and techniques are usually manual and labor intensive. Having chosen a suitable reef, miners travel to the site where the corals are dug and broken up with iron bars to manageable sizes, carried to shore, and are left for a period of time to dry and clean. In addition to reducing the number of coral colonies, coral mining reduces the wave absorbing properties of coral reefs. Destruction of the reef exposes the shoreline and coastal communities to storm surges and erosion. Many countries have banned coral mining due to its negative impact on coastlines



Coral stones and blocks have been used for house construction in many parts of the tropical world. (Photo: Bluepeace/Maldives)

Coral Parks Program (CPP) - a global initiative that supports existing Coral Parks, assists in the establishment on new Coral Parks, and engages divers and the dive industry in coral reef protection. CPP is an initiative of The Coral Reef Alliance, a non-profit organization dedicated to keeping coral reefs alive around the world

Coral Point Count with Excel extensions (CPCe) - a software program that provides a tool for the estimation of benthic habitat cover using underwater images. The coverage can be analyzed using the random point count method, and areas can also be traced, digitized, and calculated via image calibration

coral probiotic hypothesis - a concept which posits that a dynamic relationship exists between symbiotic microorganisms and environmental conditions which brings about the selection of the most advantageous coral holobiont (Reshef et al., 2006). Corals exposed to some type of stress, such as unusually high water temperatures, expel their zooxanthellae and then regain a new mixture of zooxanthellae (or other symbiotic microorganisms) that are better suited to the stress conditions

coral product - any living or dead specimens, parts, or derivatives, or any product containing specimens, parts, or derivatives, of any species of coral in the cnidarian Orders: Antipatharia (black corals), Scleractinia (stony corals), Gorgonacea (horny corals), Stolonifera (organpipe corals and others), Alcyonacea (soft corals), and Coenothecalia (blue coral), of the Class Anthozoa; and all species of the Order Hydrocorallina (fire corals and hydrocorals) of the Class Hydrozoa

coral recruit - a coral larva which settles onto a suitable substrate to become an addition to the population

coral reef - a wave-resistant structure resulting from cementation processes and the skeletal construction of hermatypic corals, calcareous algae, and other calcium carbonate-secreting organisms

Coral Reef Alliance (CORAL) - CORAL promotes coral reef conservation around the world by working with the dive industry, governments, local communities and other organizations to protect and manage coral reefs, establish marine parks, fund conservation efforts, and raise public awareness with the mission to keep coral reefs alive for future generation

coral reef bleaching monitoring product - near real-time information derived from data either from satellite images or in situ monitoring stations at coral reef areas to help improve and sustain coral reef health throughout the world

Coral Reef Ecosystem Conservation Amendments Act (CRECAA) of 2007 - CRECAA reauthorizes the Coral Reef Conservation Act (CRCA) of 2000 and adds greater protections for coral reefs while enhancing marine debris removal and increasing the government's ability to work through cooperative partnerships

Coral Reef Ecosystem Research Plan (NOAA) - the NOAA Research Plan (FY 2007-2011) provides coastal and ocean managers, scientists, and policy makers with the most up-to-date scientific information to address the complex nature of the threats facing coral reef ecosystems, and identifies priority research needed to advance management action. The Research Plan is NOAA's first agency-wide coral reef ecosystem research plan. Covering all coral reef ecosystems under the jurisdiction of the U.S. and Pacific Freely Associated States, the plan provides a national perspective on the research needed to address the range of stresses affecting the health of coral reef ecosystems, summarizes the management and other issues that will drive research at the regional level, and focuses on the use of research to guide effective implementation of ecosystem-based management strategies

Coral Reef Ecosystems Studies- Caribbean Program (CRES) - CRES is a core component of NOAA's Coral Reef Conservation Program. It was initiated in FY 2002 as a science-based, integrated approach to understand coral reef dynamics and processes, and to provide tools, ecosystem forecasts and options for coral reef management strategies in the U.S. Caribbean (Puerto Rico and U.S. Virgin Islands)

Coral Reef Targeted Research & Capacity Building for Management (CRTR) Project - The GEF-World Bank Coral Reef Targeted Research and Capacity Building Project has been developed to establish an applied investigative framework to support coral reef management and policy. This project has been designed to coordinate investigations, within a limited number of sites around the world, so that priority unknowns can be systematically addressed with the intent of applying the results to management and policy. This project will coordinate investigations over an appropriate time-frame (i.e. 15 years) along major themes of inquiry and then work to appropriately sequence involvement and improve the capacity of how to use such information in meaningful ways, especially within developing countries and small island states. The project supports six thematic working groups (Bleaching and Local Ecological Factors, Connectivity and Large-scale ecological processes, Disease, Restoration and Remediation, Remote Sensing for Coral Reefs, and Modeling and Decision Support), and the project's guiding Synthesis Panel. The Project is executed by a dedicated Project Executing Agency (or PEA) headquartered at the University of Queensland, Australia. However, the project involves a broad range of international partners, such as The World Bank, The Intergovernmental Oceanographic Commission (IOC), NOAA, The WorldFish Center, and a number of academic institutions from around the world

Coral Reef Watch - see CRW (Coral Reef Watch) Program

Coral Reef Watch experimental doldrums product - NOAA Coral Reef Watch (CRW) developed an Experimental Doldrums Product that identifies and tracks regions of sustained low wind speed to help coral reef managers and scientists better assess conditions that may lead to coral bleaching. Wind is an important physical factor influencing conditions conducive to coral bleaching. Wind-driven mixing reduces temperature stress and wind generated waves can scatter harmful levels of incoming solar radiation. Periods of sustained low wind may therefore promote environmental conditions adverse to corals experiencing thermal and/or UV stress

coral rock - products used in the aquarium trade. Coral rock is consolidated material, greater than 3 cm in diameter, formed of fragments of dead coral and which may also contain cemented sand, coralline algae and other sedimentary rocks. 'Live rock' describes pieces of coral rock to which are attached live specimens of invertebrate species and coralline algae



Coral rock for sale in the marine aquarium trade. (Photo: Shell Horizons, Inc.)

coral rubble - fragments of hard coral

Coral Stress Index - an index that indicates the relative accumulated thermal stress experienced by a given coral reef

Corallimorpharia - an order of the subclass Zoantharia (Hexacorallia) of the phylum Cnidaria. They are mostly solitary species (some are colonial) that resemble true corals, but lack a calcareous skeleton

coralline algae - algae that form solid calcium carbonate accretions



Coralline algae remove calcium from water. This calcium carbonate gives them a coral-like look. As they die, they turn white. (Photo: Nancy Sefton)

corallite - a coral cup; the skeleton of an individual polyp

corallivore - an organism that eats coral



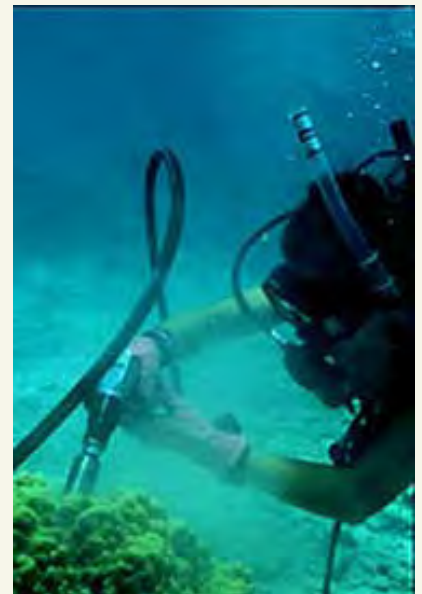
Parrotfish are often corallivorous, scraping the coral polyps with beaklike jaws.

corallum - a complete coral colony; a coral head

cordate - heart-shaped; in the form of two rounded lobes

CORDIO (Coral Reef Degradation in the Indian Ocean) - CORDIO is an international program created to respond to the degradation of coral reefs throughout the Indian Ocean. In the western Indian Ocean region coral reefs are key ecosystems that support large sectors of the countries' populations and economies, through artisanal fisheries, tourism and large-scale investments. Projects within CORDIO focus on determining a) the biophysical impacts of coral degradation as a result of bleaching and other disturbances, and the long term prospects for recovery, b) the socio-economic impacts of coral mortality and options for mitigating these through management and development of alternative livelihoods, and c) the prospects of restoration and rehabilitation of reefs to accelerate the ecological and economic recovery.

core - a cylindrical sample, obtained with a hollow drill, extracted from, inter alia, a seabed, lake bottom, or coral to investigate the composition and depths of layers



A scientist is taking a coral core using a 1/2 inch pneumatic drill equipped with a 50 cm long hollow

steel cutting cylinder. A concrete plug is then tapped into the core hole to seal off the hole.
(Photo: Daria Siciliano/UCSC)

core (geology) - the innermost layer of the Earth, consisting primarily of pure metals such as iron and nickel. The core is the most dense layer of the Earth, and is divided into the outer core, which is believed to be liquid, and the inner core, which is believed to be solid

COREMO 2 - a data entry and analysis program developed by the southern Indian Ocean Global Coral Reef Monitoring Program (GCRMN) node. It is based on ARMDES (AIMS Reef Monitoring Data Entry System) but has been extensively modified from COREMO to suit the needs of the GCRMN

cornetfish - any species of spiny-rayed fishes in the family Fistulariidae. Cornetfishes are elongated, depressed-bodied fishes with a greatly extended tubular snout, a very small mouth, and a long thin filament extending from the middle of the caudal fin. They are closely related to the trumpetfishes (Aulostomidae) which are more robust and lack the caudal filament. At present there are approximately five known species of cornetfishes



The red cornetfish, *Fistularia petimba*, inhabits coastal areas, usually at depths greater than 10 m. It feeds on small fishes and shrimp.
(Photo: Marine Biological laboratory, Woods Hole.)

cornute - horn or cup-shaped

correlate - to show a relationship between entities

correlation - a relation between a variable and one or more related variables

correlation coefficient - a measure of the relationship between variables

correlogram - a graph illustrating the auto-correlations between members of a time series (vertical axis) for different separations in time (horizontal axis)

corridor - a route that allows movement of individuals or taxa from one region or place to another; in terms of conservation biology, a connection between habitat fragments in a fragmented landscape

corrugated - having a surface with alternating parallel ridges and grooves

cortex - the outer portion (layer) of an organ

corticocyte - in octocorals, a cell that secretes gorgonin, which forms the axis of a gorgonian

CoRViL (Coral Reef Virtual Laboratory) - a joint venture of the National Oceanic and Atmospheric Administration (NOAA), the Great Barrier Reef Marine Park Authority (GBRMPA), and the Australian Institute of Marine Science (AIMS). This venture will provide an automated, cooperative exchange of electronic data, computer processing power and remote sensing tools for the purpose of monitoring the coral reef environment on the Great Barrier Reef. It is anticipated that this effort will eventually provide a model for monitoring physical processes at other sensitive coral reef areas throughout the world

corymbose - describes coral colonies with horizontal interlocking branches and short upright branches

cosmid - a DNA vector that allows the insertion of long fragments of DNA (up to 50 kbases)

cosmopolitan - having a global distribution

cosmopolitan distribution - worldwide distribution within habitat limits

cost-benefit analysis - an assessment of the short-term and long-term costs (losses) and benefits (gains) that arise from an economic decision. If the calculated benefits exceed the calculated costs, the decision to buy an economic good or provide a public good is considered profitable

costa - the extension of the septa outside the calyx into the coenosteum

coulombmeter - an instrument for measuring electric charge

Coulter counter - an instrument that measures particle size distribution from the change in electrical conductivity as particles flow through a small opening



A Coulter counter is an instrument used to measure the distribution of particle size.

counter current - a secondary current flowing in a direction opposite to that of the main current

counter shading - protective body coloration where the dorsal surface (above) is dark and the ventral surface (below) is lighter



Counter shading in a white shark. The darker dorsal surface and lighter ventral surface allows the shark to blend in with the environment when viewed from above or below. (Photo: NOAA)

counter-illumination - a condition in which an animal has bioluminescent structures concentrated on its ventral surface so as to increase the effect of countershading

courtship behavior - specialized behavior patterns which contribute to the psychological and physiological synchronization of potential mating partners

covalence - the number of pairs of electrons an atom can share with other atoms

covalent bond - a bond between two or more atoms that is provided by electrons that travel between the atoms' nuclei, holding them together but keeping them a stable distance apart

cove - a small sheltered indentation in the shoreline. A cove is smaller than a bay

CRAG (American Samoa Coral Reef Advisory Group) - CRAG administers American Samoa's Coral Reef Initiative (CRI) and is an interagency task force representing five agencies in the Territory, all of which have some link to the coral reef environment. CRAG member agencies work together by mutual consensus to manage coral reefs in American Samoa by planning achievable programs, identifying and collaborating with other partners, obtaining funding for projects, tracking project compliance, promoting public awareness, and developing local capacity for eventual self-sustainability

craggy - a surface which is rocky and steep

craterform - massive shape with a broad base and a large, central depression

crateriform - cup-shaped

crawl - tracks and other signs left on a beach by a sea turtle

Creefs (Census of Coral Reefs) - a global census of coral reefs, CReefs is one of 17 projects of the Census of Marine Life, an international network of over 1,700 researchers in more than 70 nations engaged in a 10-year initiative to assess and explain the diversity, distribution, and abundance of marine life in the oceans and how it changes over time

creel survey - a survey of anglers in a particular area to discover the types and numbers of fish caught

CREIOS (Coral Reef Ecosystems Integrated Observing System) - NOAA's Coral Reef Ecosystem Integrated Observing System (CREIOS) provides a diverse suite of long-term ecological and environmental observations and information products over a broad range of spatial and temporal scales. The CREIOS goal is to understand the condition and health of, and processes influencing, coral reef ecosystems, to assist stakeholders in making improved and timely ecosystem-based management decisions to conserve coral reefs

crenulate - a shape in which the edge is slightly scalloped

crepuscular - most active at low light levels during dusk and dawn



The large eyes of a squirrelfish hint about its crepuscular behavior, allowing it to be active and feed during periods of diminished light. (Photo: Copyright Corel Corporation)

CREWS (Coral Reef Early Warning System) - *in situ* NOAA meteorological and oceanographic monitoring sites that collect data continuously which are transmitted hourly via satellite to a data archival site. An automated system (hardware and software) that monitors select oceanographic and meteorological parameters and produces specialized alerts when conditions may result in environmental stresses conducive of coral bleaching. NOAA plans to expand the CREWS from the Florida Keys/Bahamian sites to many remote coral reef sites throughout the world



A CREWS station on site.

Crinoidea - a small class of ancient echinoderms (sea lillies and feather stars) which number about 600 species. All are suspension-feeders, occupying deep parts of the oceans to just below the shoreline. Some are common on coral reefs. Crinoids have long, slender arms arranged radially around a rigid, calcareous, cuplike structure, the calyx. Two basic adult body types are recognized: the sea lillies, with a long, anchored stem vertically supporting the calyx and arms above the sea bottom; and the stemless featherstars, or comatulids, with a whorl of flexible appendages on the calyx



A sea lilly (Crinoidea) is a stalked, usually sessile, echinoderm. This sea lilly was observed off Grand Bahama Island at a depth of about 1200 feet. (Photo: T. K. Baumiller and C. G. Messing/Harbor Branch Oceanographic Institution)

crinose - hairy

CRISP (Coral Reef Initiative for the South Pacific) - a French coral reef conservation and sustainable management initiative designed as a vector of regional integration between the developed and developing countries of the Pacific. CRISP pursues the following objectives: gaining a better understanding of coral ecosystems in terms of their biodiversity, current status and functioning; conducting operations to protect and manage coral ecosystems on a broad scale; promoting economic potential based on the biodiversity and use values of coral ecosystems; and sharing information and knowledge, building capacities; and managing local, national and international networks throughout the Pacific

criterion - a standard rule or test on which a judgment or decision can be based.

critical depth - the depth in seawater below which carbon loss through respiration by phytoplankton exceeds carbon gain through photosynthesis; no net phytoplankton production occurs

critical habitat - the ecosystem upon which endangered and threatened species depend; habitat crucial to the survival of the species; The Endangered Species Act (ESA) defines "critical habitat" as specific areas within the geographical area occupied by the species at the time of listing, that contain the physical or biological features essential to the species' conservation and which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species if the agency determines that the area is essential for conservation

critical value - in statistics, the value of a test statistic at or beyond which the null hypothesis is rejected

crocodile - in addition to freshwater environments, crocodiles also inhabit brackish waters and coral reef habitats. The American crocodile can be found on offshore cayes and atolls, and in mainland coastal habitats. Two endangered species of crocodile, the American crocodile (*Crocodylus acutus*) and Morelet's crocodile (*Crocodylus moreletii*), occur in Belize. The largest American crocodile population (less than 300) in Belize is found in the Turneffe Atoll, which is one of the largest remaining nesting areas in the Caribbean. Morelet's crocodile can be found in brackish water around coastal areas. The saltwater crocodile (*Crocodylus porosus*), the world's largest reptile, can be found in coastal, coral reef-rich waters from eastern India and Bangladesh through Southeast Asia to Papua New Guinea and Australia. They occur as far east as the Solomon Islands and Vanuatu



Morelet's crocodiles (*Crocodylus moreletii*) live primarily in freshwater areas such as swamps and marshes and can also be found in forested riparian habitats. (Photo: Jerry Gingerich)

crocodilefish - any of about 60 species of bony fishes in the family Platycephalidae. Crocodilefishes have distinct pits immediately behind the eyes and a concave head margin. Their eyes have iris lappets which help break up the black pupil and improve its camouflage. Crocodilefishes are usually found on sandy or rubble bottoms near mangroves, seagrasses or corals



Crocodilefish (*Papilluliceps longiceps*) in Hurghada, Red Sea. (Photo: Thomas Jundt)

cross - in genetics, the mating of two individuals or populations

crossing over - in genetics, the breaking during meiosis of one maternal and one paternal chromosome, the exchange of corresponding sections of DNA, and the rejoining of the chromosomes. This process can result in an exchange of alleles between chromosomes

cruciate - cross-shaped

crust (geology) - the outermost layer of the Earth, consisting of relatively low-density rocks

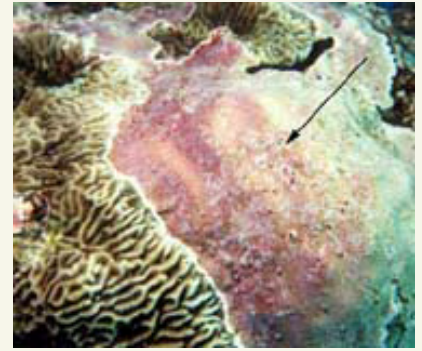
Crustacea - a subphylum of Arthropoda that includes shrimp, mantis shrimp, lobsters, crabs, water fleas, copepods, crayfish and wood lice. There are almost 40,000 described species of crustaceans. The Crustacea are mainly aquatic, but include some semi-terrestrial and terrestrial groups



A marine shrimp (Crustacea).

crustose - grows flat along the substrate; crust-like

crustose coralline algae - crustose coralline algae are red algae of the division Rhodophyta. They are very important members of a reef community in which they cement and bind the reef together. They are particularly common in high wave energy areas but can also be found throughout all reef zones. Crustose corallines resemble pink or purple pavement. Morphology can range from smooth and flat, to rough and knobby, or even leafy



Crustose coralline algae are very common on reefs. (Photo: <http://www.botany.hawaii.edu>)

CRW (Coral Reef Watch) program - formed in 2000, NOAA's CRW maximizes NESDIS's coral reef resources by joining and building on existing NESDIS coral reef strengths under a more coordinated program. It seeks to develop a long-term coral reef monitoring system with the ability to predict coral bleaching episodes in all major U.S. coral reef areas

cryptis - protective camouflage coloration where the individual resembles its background

cryptic - pertaining to concealment, usually in reference to color pattern or behavior (e.g., hiding in reef crevices)



The viper moray is a cryptic fish, concealing itself in crevices and holes in the coral reef. (Photo: Dr. Anthony Picciolo)

cryptobiosis - a suspension of life processes when conditions become unfavorable. In these resistant states some animals, such as nematodes, rotifers and tardigrades, can survive extreme drying, heat, or cold, and then return to "life" when favorable conditions return

cryptogenic - of obscure or unknown origin

cryptogenic species - species whose endemic or alien status is unclear. For many species, data are lacking on their original geographic distribution, and it cannot be determined whether they are native or introduced into a particular location

ctene - the locomotor structure of ctenophores (comb jellies) made up of cilia arranged into flattened plates. The ctenes are arranged into eight longitudinal bands, from the aboral to the oral surface

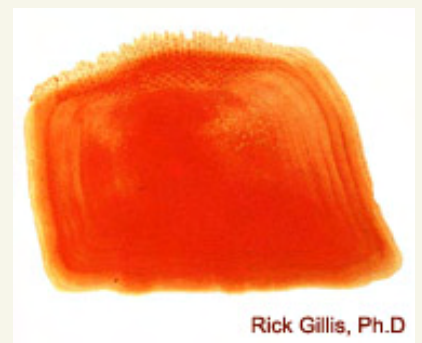


Light refracts off the ctenes of the comb-jelly *Mertensia ovum* producing stripes of rainbow color. (Photo: Kevin Raskoff, MBARI.)

ctenidium - a comb-like structure; the respiratory organ of a mollusk (ctenidial gill)

cteniform - comb-shaped

ctenoid - comb-shaped; with a comb-like margin



Rick Gillis, Ph.D

A ctenoid scale of a bony fish. It is thought that the combed edge helps to reduce hydrodynamic drag during swimming. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

ctenophore - a member of the animal phylum Ctenophora. A small phylum (about 50 species) whose members, known as comb jellies and sea walnuts, superficially resemble jelly fishes. These planktonic organisms are thought to have evolved from a medusoid cnidarian

cucumiform - cucumber-like form



The sea cucumber (Echinodermata) has a cucumiform shape. (Photo: NOAA)

cue - in animal behavior, a signal from one animal which acts as a stimulus to elicit a behavioral response in another. The cue may be visual, acoustic, or chemical

cuirass - a protective covering, such as a cuticle, plates, scales or shells



The cuirass is body armor, particularly aimed at protecting the chest and back. (Photo: Institut et Musée des Suisses dans le Monde)

culling - the selective removal of animals from a population for conservation purposes

culture - a population of plant or animal cells or microorganisms that is grown under controlled conditions

culture medium - a substance which contains nutrients and a favorable environment for the *in vitro* growth of microorganisms and cells

cuneiform - wedge-shaped

current - generally, a horizontal movement of water; a body of air, water, etc. that moves in a definite direction; the flow of electricity expressed in amperes

curvilinear regression - the relation between variables when the regression equation is nonlinear. With nonlinear relations, an intrinsically linear model may be assumed and then data are fitted to the model using polynomial regression i.e., some models are employed that use regression to fit curves instead of straight lines

curvilinear relationship - a situation that is best represented by something other than a straight line

cusp - a point or projection on a tooth

cutaneous - pertaining to the skin

cuticle - an extracellular, protective external body covering, secreted by the epidermis, of some invertebrate animals, usually composed of fibrous material, such as chitin or collagen; the waxy layer of epidermal cells of plant parts, such as leaves, stems, and fruit

cuticular pore - a minute pore opening at the surface of the cuticle

cuttle bone - the internal calcified shell remnant of cuttlefish

Cuvierian tubules - clusters of sticky tubules, located at the base of the respiratory tree, which may be discharged by some sea cucumbers (holothurians) when mechanically stimulate, as for example, when being threatened by a predator. Their great adhesivity, combined with their high tensile strength, allows the Cuvierian tubules to entangle and immobilize potential predators with which they come into contact. After expulsion, the lost tubules are readily regenerated, making them a formidable defense mechanism



Respiratory tree and the Cuvierian tubules in a sea cucumber (Illustration: BIODIDAC)

cyanide fishing - a destructive fishing technique in which sodium cyanide or some other cyanide compound is used to stun and capture coral reef fishes for the aquarium and live food trade

cyano- - a prefix denoting blue or dark blue

cyanobacteria - photosynthetic aquatic bacteria, often called blue-green algae, but have no relationship to algae. Cyanobacteria get their name from the bluish pigment phycocyanin, which they use to capture light for photosynthesis. They also contain chlorophyll a, the same photosynthetic pigment found in the chloroplasts of plants. Not all "blue-green" bacteria are blue; some common forms are red or pink, resulting from the pigment phycoerythrin



A bloom caused by cyanobacteria (-blue-green algae+).

cyanocyte - a hemocyte that breaks down and releases hemocyanin into the hemolymph

cyberspace - the whole range of information resources available through computer networks

cycloid - having a smooth-edged margin

cyclomorphosis - cyclical changes in form such as seasonal changes in morphology, as seen in some planktonic crustaceans

cyclone - an area of low pressure. Circulation is counterclockwise around a low pressure system in the Northern Hemisphere and clockwise in the Southern Hemisphere

cyclonic - refers to a region of low atmospheric sea level pressure; or, the wind system around such a low pressure center that has a clockwise rotation in the Northern Hemisphere and a counterclockwise rotation in the Southern Hemisphere

cyclosystem - a system of very small tubules that links the polyps of calcareous colonial hydrozoans

cyclotheonarnide A - a bioactive compound, isolated from a marine sponge *Theonella* sp., is a potential drug for the treatment of thrombosis, a blood disease in which a blood clot forms in the circulatory system

cydippid larva - a larva of ctenophores

cymbiform - boat-shaped

cyst - a small, capsule-like sac that encloses an organism in its dormant or larval stage; a fluid-filled sac or vesicle in the body of an animal; a thick-walled resting spore, as in certain algae or fungi

cystid - the exoskeleton and body wall of the stationary trunk of bryozoans

cytochrome - a class of protein, found in mitochondrial membranes, whose main function is oxidative phosphorylation of ADP to form ATP; an iron-containing molecule that transfers electrons in metabolic pathways

cytochrome oxidase - an oxidizing enzyme found in mitochondria of cells. It contains iron and a porphyrin and is important in cellular respiration as an agent of electron transfer from certain cytochrome molecules to oxygen molecules. Cytochrome c is a highly conserved protein found in plants, animals, and many unicellular organisms. This, along with its small size, makes it useful in studies of evolutionary divergence

cytogenetics - the science that links the study of inheritance (genetics) with that of cells (cytology) and is concerned mainly with the study of the structure, and function of chromosomes

cytokinesis - the division of the cytoplasm of a cell during cell division

cytology - the study of the structure and function of cells

cytometer - an instrument for counting cells

cytoplasm - the protoplasm of a cell exclusive of that of the nucleus. It consists of a continuous aqueous solution (cytosol) and the organelles and inclusions suspended in it. The cytoplasm is the site of most of the chemical activities of the cell

cytoplasmic genes - DNA-containing bodies in the cell but external to the nucleus

cytoplasmic inheritance - inheritance via genes found in cytoplasmic organelles, e.g., mitochondria, rather than the nuclear genes; inheritance via the maternal lineage; extrachromosomal inheritance

cytosine - one of the four nitrogenous bases in DNA that make up the letters ATGC. Cytosine is the "C". The others are adenine, guanine, and thymine. Cytosine always pairs with guanine

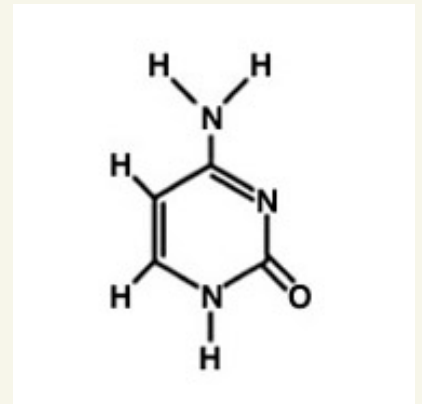


Diagram of the chemical structure of cytosine, one of the four nitrogenous bases in DNA.

cytoskeleton - the network of microtubules, microfilaments, and larger filaments that provides a eukaryotic cell with its structural support, shape, and its capacity to move and arrange its organelles within the cell

cytosol - the fluid, less structured part of the cytoplasm of a cell, excluding organelles and membranous structures; the portion of the cytoplasm which remains after removal of particulate components

cytotoxic - able to cause cell death

CZCS (Coastal Zone Color Scanner) - a scanning radiometer with six spectral channels centered at 0.443, 0.520, 0.550, 0.670, 0.750 and 11.5 micrometers and selected to allow measurement of ocean color and temperature, suspended sediment and chlorophyll concentrations, and ocean pollutants

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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: D

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

dacriform - tear-drop shaped

dactyloid - finger-like

dactylozoid - a colonial hydrozoan polyp that possesses a large, nematocyst-bearing fishing tentacle, and functions in defense and in food capture

Dalton's Law - the total pressure exerted by a mixture of gases is the sum of the pressures that would be exerted by each of the gases if it alone were present and occupied the total volume

damselfish - a large family (Pomacentridae) of bony fishes which are abundant and common inhabitants of coral reefs. They possess robust, deep, and laterally compressed bodies. The majority of damselfishes do not have particularly brilliant markings or coloration. Exceptions are the brilliantly colored anemone fishes, the banded sergeant major, and the bright orange garibaldi. Many species of damselfishes are highly territorial



One of the prettier damselfishes, the blue chromis (*Chromis cyanea*), swimming on a hawaiian coral reef (Photo: Keoki and Yuko stender)

dark-field microscope - a microscope that has a special condenser and objective with a diaphragm that scatters light from the observed object. The object appears bright on a dark background

dark-spots disease - a coral disease characterized by darkly pigmented areas of tissue on stony corals. -At present, there is no known pathogen. The coral tissue remains intact, although at times lesions and coral tissue death are observed in the centers of the pigmented areas. Tissue loss is minimal, if present. This disease is widespread throughout the Caribbean. -For additional information and illustrations, see: http://www.coral.noaa.gov/coral_disease/dark_spots.shtml



Dark spots disease infecting *Stephanocoenia intersepta*. (Photo: NOAA; image copyrighted)

dart - a structure of an invertebrate animal that pierces or wounds; a small, narrow-pointed missile that is thrown or shot

darwin - a logarithmic unit measuring the rate of evolution in characteristics of organisms

Darwin medal - the most prestigious award given by the International Society for Reef Studies (ISRS), presented every four years at the International Coral Reef Symposium. It is awarded to a senior ISRS member who is recognized worldwide for major contributions throughout their career

Darwin Mounds - two areas of hundreds of sand and cold-water coral mounds at depths of about 1,000 m, in the northeast corner of the Rockall Trough, approximately 185 km northwest of the northwest tip of Scotland. The Darwin Mounds cover an area of approximately 100 sq. km. The tops of the mounds are covered with *Lophelia pertusa* corals and coral rubble

Darwin point - the latitude at which reef growth just equals reef destruction by various physical forces

Darwinian evolution - evolution of life forms by the process of natural selection acting on random genetic variations

data - multiple facts (usually but not necessarily empirical) used as a basis for inference, testing, models, etc.; the word is plural (sing. datum) and takes a plural verb

data management - the act, process, or means by which data are managed. This includes the planning, collection, compilation, archival, safe-guarding, listing, organization, extraction, retrieval, manipulation, and dissemination of data

data management and observing system interoperability - the ability of two or more systems to exchange and mutually use data, metadata, information, or system parameters using established protocols or standards

data management services - a subset of data management and includes adherence to agreed-upon standards; ingesting data, developing collections, and creating products; maintaining data bases; ensuring permanent, secure archival; providing both user-friendly and machine-interoperable access; assisting users; migrating services to emerging technologies; and responding to user feedback

data mining - an information extraction activity whose goal is to discover hidden facts contained in databases. Using a combination of machine learning, pattern recognition, statistical analysis, modeling techniques and database technology, data mining finds patterns and subtle relationships in data and infers rules that allow the prediction of future results

data stewardship - a subset of data management and consists of the application of rigorous analyses and oversight to ensure that data sets meet the needs of users. This includes documenting measurement practices and processing practices (metadata); providing feedback on observing system performance; inter-comparison of data sets for validation; reprocessing (incorporate new data, apply new algorithms, perform bias corrections, integrate/blend data sets from different sources or observing systems); and recommending corrective action for errant or non-optimal operations

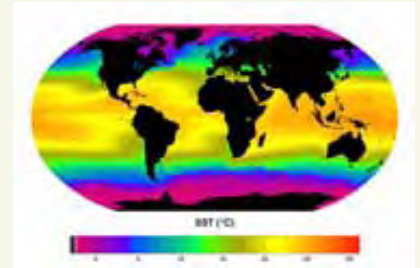
data warehouse - a database, frequently very large, that can access vast arrays of heterogeneous data, stored within a single logical data repository, that are accessible to different querying and manipulation methods. While the warehouse can be distributed over several computers and may contain several databases and information from numerous sources in a variety of formats, it should be accessible through a server. Thus, access to the warehouse is transparent to the user, who can use simple commands to retrieve and analyze all the information. The data warehouse also contains data about how the warehouse is organized, where the information can be found, and any connections between data. Frequently used for decision support within an organization, the data warehouse also allows the organization to organize its data, coordinate updates, and see relationships between information gathered from different parts of the organization

database - a structured file of information or a set of logically related data stored and retrieved using computer-based means

database management system (DBMS) - a set of computer programs for organizing the information in a database. A DBMS supports the structuring of the database in a standard format and provides tools for data input, verification, storage, retrieval, query, and manipulation

daughter cell - one of the two cells formed by the division of a parent cell

Day/Night SST - observations of sea surface temperature obtained during both daytime and nighttime orbits from the Advanced Very High Resolution Radiometer (AVHRR) on NOAA's polar satellite



1985-2000 average sea surface temperature from AVHRR Pathfinder.

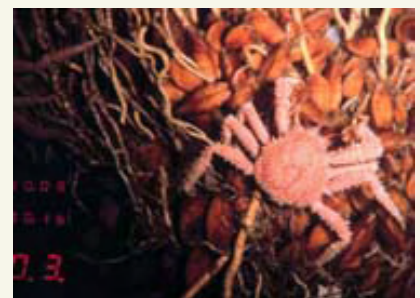
de facto - in fact; in reality; existing but not officially recognized or legally established

dead ahead - a position directly in front of a vessel

decadal - refers to a climatic process that re-occurs every decade or once every few decades

decalcification - the loss of calcium salts from living tissues

decapod crustacean - a members of the Order Decapoda, Class Malacostraca, Superclass Crustacea, Phylum Arthropoda; has five pairs of thoracic legs. Examples are shrimps, lobsters, crabs, and hermit crabs



A spider crab is a decapod crustacean.

decibel - a logarithmic scale used to denote the intensity (loudness), of a sound relative to the threshold of human hearing. A step of 10 dB is a 10-fold increase in intensity or sound energy

decibel - unit for measuring sound intensity

deciduous - periodically shed

decomposer - a heterotrophic organism that breaks down dead biological matter and uses some of the products and releases others for use by consumer organisms

decomposition - the breakdown of organic matter by bacteria and fungi

decompression - a change from one ambient pressure to a lower ambient pressure as the scuba diver ascends. Decompression also occurs in a decompression chamber. Decompression results in a reduction of gas pressures within the body

decompression chamber - a hyperbaric steel enclosure used to treat victims of decompression sickness (the "bends") in which the air pressure is first gradually increased and then gradually decreased. This shrinks the nitrogen bubbles and allows the nitrogen to safely diffuse out of the victim's tissues



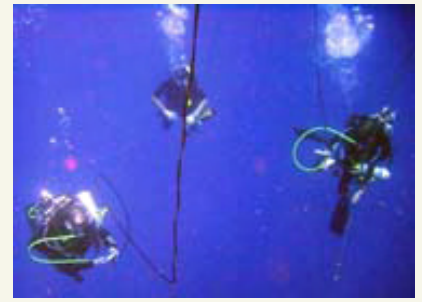
A NOAA decompression chamber.

decompression dive - any dive where the scuba diver is exposed to a higher pressure than when the dive began. Decompression occurs as the diver ascends

decompression diving - scuba diving that requires in-water stops during ascent to the surface to allow off-gassing of nitrogen

decompression sickness (the bends) - a dangerous and potentially lethal condition of divers precipitated by rapid changes in ambient atmospheric pressure, mostly in rapid ascent from underwater, but can also result from flying in an aircraft too soon after a dive. It occurs because at high pressures (such as SCUBA divers experience while underwater) the blood can contain more dissolved nitrogen than at lower pressures. When the diver ascends too rapidly, the blood can no longer contain this dissolved nitrogen and tiny gas bubbles begin to form in the blood. Symptoms include: body pain (mainly in the joints), headache, confusion, itchy skin rash, visual disturbances, weakness or paralysis, dizziness, or vertigo. Treatment involves the administration of oxygen and placing the patient into a decompression chamber until the nitrogen bubbles shrink and safely diffuse from the tissues

decompression stop - a specified time spent at a specific depth as a scuba diver ascends from a dive for purposes of releasing nitrogen gas from the tissues (nitrogen off-gassing)



These NOAA divers are making a decompression stop to allow nitrogen to escape from their tissues. (Photo: NOAA/National Marine Fisheries Service)

deductive reasoning - an inference in which the conclusion about particulars follows necessarily from general theory. In science, deductive reasoning would involve stating an hypothesis first, and then trying to find facts that reject the hypothesis

deep fore reef - the deepest seaward part of a coral reef; a vertical cliff beginning at a depth of about 60 m

deep scattering layer - a thin sound-reflecting layer of zooplankton and nekton that ascends toward the surface at night and descends each day (diurnal vertical migration) in response to changing levels of light

deep water - the water beneath the permanent thermocline that usually has a low and uniform temperature

deep-sea corals - stony, soft, gorgonian, black, and horny corals that inhabit the colder deep waters of continental shelves and offshore canyons, ranging from 50 - 1000m+ depths. They lack zooxanthellae and may build reef-like structures or occur solitarily



Lophelia pertusa, a deep-sea stony coral.

definitive host - in a parasite's life cycle, it is the host organism in which the parasite reproduces sexually

deforestation - the removal of trees from a habitat dominated by forest

degeneracy - in relation to the genetic code, more than one codon can code for the same amino acid

degenerate character - a character, trait or structure that has evolved to a less developed state from its ancestral form or function

degenerate code - the genetic code in which more than one triplet of nucleotides codes for the same amino acid

degeneration - a process by which tissue deteriorates, loses functional activity, and may become converted into or replaced by other kinds of tissue; deterioration which causes some degree of loss of original function; the process of declining from a higher to a lower form

degradation - the breaking down of a substance into smaller or simpler parts

Degree Heating Week (DHW) - the NOAA satellite-derived Degree Heating Week (DHW) is an experimental product designed to indicate the accumulated thermal stress that coral reefs experience. A DHW is equivalent to one week of sea surface temperature 1 deg C above the expected summertime maximum. For example, 2 DHWs indicate one week of 2 deg C above the expected summertime maximum

Degree Heating Week accumulation - accumulated thermal stress that coral reefs experience over a typical 12-week period

degrees of freedom - in statistics, the number of independent comparisons that can be made between the members of a sample; in a contingency table it is one less than the number of row categories multiplied by one less than the number of column categories. The number of degrees of freedom is defined as the number of observations that can be chosen freely, i.e., an estimate of the number of independent categories in a particular statistical test or experiment

deimatic behavior - defensive postures or other visual displays, including color changes, that function to intimidate or frighten another animal

delayed fertilization - when fertilization of an egg does not occur immediately following introduction of spermatozoa into the female reproductive tract, but may be delayed for weeks or months

delta - the fan-shaped area at the mouth or lower end of a river formed by eroded material that has been carried downstream and dropped in quantities larger than can be carried off by tides or currents



Nile River delta, as seen from Earth orbit. (Photo: NASA)

delta notation - the absolute abundance of an isotope is difficult to measure with accuracy. Therefore, we compare isotopic ratios in a sample with those in a standard resulting in the delta-notation: $d(x) = \left[\frac{R_x - R_{st}}{R_{st}} \right] \times 10^3$, where $d(x)$ is the delta-value of a sample, R_x and R_{st} are the isotopic ratios in sample (R_x) & standard (R_{st}). The d -value is the relative difference in the isotopic ratio of the sample and the standard. It is expressed in part per mille (‰); that is why the right-hand side of the equation is multiplied by 10³ (1000). Carbon and oxygen data from carbonates are usually referred to the PDB standard (a belemnite, *Belemnitella americana*, from the Late Cretaceous PeeDee Formation in South Carolina)

delta plain - a nearly horizontal portion of a delta which during low tide is largely exposed to the atmosphere

deme - a local interbreeding population of a species

demersal - pertains to an organism that is essentially bottom living but may feed and swim in the water column

demography - the rate of growth and the age structure of populations, and the processes that determine these properties

Demospongiae - a class of asymmetrical sponges (phylum Porifera) which range in size from a few millimeters to over two meters in largest dimension. They are composed of spongin fibers alone or together with siliceous spicules that are differentiated into megascleres (larger size) or microscleres (smaller size) of diverse shapes. The class includes approximately 5000 species in 10 orders. They are the most diverse group of sponges and only

exhibit the leuconoid grade of construction. Their geographic distribution in the oceans is from the intertidal to the abyssal zone. Some species inhabit freshwater. Their shapes include thin encrustations, lumps, finger-like growths, or urns. Pigment granules in amoebocytes often make members of this class brightly colored, including bright yellow, orange, red, purple, or green. The most economically important group are the bath sponges



A yellow barrel sponge in the class Demospongiae (Photo: Rick Gillis)

denaturation - the inducing of structural alterations that disrupt the biological activity of a molecule. It often refers to breaking hydrogen bonds between base pairs (by heat) in double-stranded nucleic acid molecules to produce single-stranded polynucleotides, or altering the secondary and tertiary structure of a protein, destroying its activity

denatured alcohol - ethyl alcohol (ethanol) to which a poisonous substance, such as acetone or methanol, has been added to make it unfit for consumption

denaturing gradient gel electrophoresis (DGGE) - a method for separating DNA fragments according to their mobilities under increasingly denaturing conditions

dendriform - having a structure that resembles a tree or shrub

dendrite - a sensory branch of a neuron that carries a nervous impulse to the cell body

dendritic - branched like a tree



Black coral is dendritic in shape. (Photo: Waikiki Aquarium)

dendrogram - a branching tree-like diagram used to represent phylogenetic paths of evolution

denitrification - the formation of gaseous nitrogen and/or nitrogen oxides from nitrate or nitrite by denitrifying bacteria during anaerobic respiration

denitrify - to remove nitrogen from any substance or chemical compound

denitrifying bacteria - anaerobic bacteria in soil or water that use the nitrate ion as a substitute for molecular oxygen during their metabolism. The nitrate is reduced to nitrogen gas (N₂), which is lost to the environment during the process

dentate - having teeth or tooth-like points; serrate

denticle - a little tooth

denticulate - having an edge with small projecting teeth

deoxyribonucleic triphosphates - unreactive nucleotides that closely resemble the nucleotides that make up DNA. They are 'dummy' nucleotides that act as placeholders when DNA is sequenced

depauperate - an area poor in species richness and/or biodiversity; an impoverished habitat

dependent species - a species dependent on another for survival, e.g., a predator on a prey, a commensal or other kind of symbiont

dependent variable - the variable being measured

deposit - material left in a new position by a natural transporting agent, such as water, wind, ice, or gravity, or by human activity

deposit feeder - an animal that feeds on nutrients in the sediments

depressed - a body shape which is flattened dorso-ventrally, e.g., a ray, skate, monkfish

depth contour - a line on a nautical chart connecting points of equal depth

derived character - in evolution, an advanced trait which only appears in some members of a taxonomic group. For example, a derived character for some mammals would be the loss of the tail, which occurs in the great apes and man. Another derived character is the presence of feathers in birds. Scales are the ancestral feature. Derived characters are also called apomorphies

dermal - pertaining to or affecting the skin

dermal flap - a small skin flap

dermis - the layer of the skin beneath the epidermis. The dermis is largely fibrous and contains collagen and elastin which are the proteins responsible for the support and elasticity of the skin. Depending upon the species, the dermis also contains tiny sensory nerve endings, blood and lymph vessels, and sweat and sebaceous glands

dermochelyid sea turtle - a leathery-shelled turtle in the family Dermochelyidae. The leatherback turtle (*Dermochelys coriacea*) is the only dermochelyid sea turtle. All other species of sea turtle belong to the family Cheloniidae. *Dermochelys coriacea* is a federally endangered species protected under the Endangered Species Act

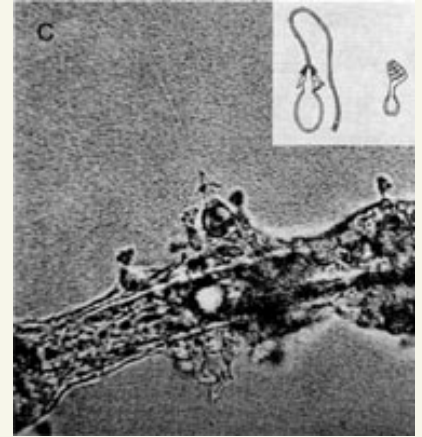
Dermochelyidae - a family of marine turtle that contains only a single species, the leatherback turtle (*Dermochelys coriacea*), the largest of all extant turtles. They are carnivorous, feeding almost exclusively on jellyfish

desalinization - the removal of salts from saline water to provide freshwater

designated Use - classification specified in water quality standards for each waterbody or segment describing the level of protection from perturbation afforded by the regulatory programs. The designated aquatic life uses established by the state or authorized tribes set forth the goals for restoration and/or baseline conditions for maintenance and prevention from future degradation of the aquatic life in specific waterbodies

desmocyte - a connective tissue cell which differentiates into cells which form the fibrous and supporting tissues of an animal's body; also called a "fibroblast"; in corals, an anchoring cell of the calicoblastic epithelium or axis epithelium of gorgonians

desmoneme - in hydrozoans, a small nematocyst with a short, unarmed, spirally coiled tubule, which functions in entangling and wrapping around appendages or bristles of prey animals



The desmoneme of the hydrozoan *Hydra vulgaris*. (Photo: Alfred H. Gitter)

destruction resuspension - the process in which sediment particles on the substrate are brought back into water column suspension by waves, tides, or wind

determinate cleavage - cleavage resulting in blastomeres each capable of developing only into a particular embryonic structure, not into a complete organism

detritus - the particulate decomposition or disintegration products of plankton, including dead cells, cell fragments, fecal pellets, shells, and skeletons, and sometimes mineral particles in coastal waters



Low tide along South Carolina shoreline with bits of sea shells and other detritus (Photo: Richard B. Mieremet, NOAA)

detritus food chain - a trophic relationship among a variety of species that is sustained at its base by organisms that gather bits of nonliving organic material

detrivore - an animal that eats detritus

deuterostome - one of two distinct evolutionary lines of coelomates, consisting of the echinoderms and chordates and characterized by radial cleavage of the early embryo. The cleaving cells are indeterminate (if early embryonic cells are separated, each one develops into a complete organism). The anus develops from the blastopore

developed country - describes nations or countries with social, cultural, industrial and technological advancement

developing country - describes regions and countries that are still in the process of acquiring modern technology and becoming economically productive. These regions are sometimes called the "Third World"

development - the chronological series of changes, from a lower to a higher state of organization, which multicellular organisms undergo from the fertilized egg (zygote) to maturity

developmental response - morphological and physiological characteristics an organism developed in response to prolonged exposure to environmental conditions

deviation - in statistics, the difference between an actual observation and the mean of all observations

dewlap - a fold of loose skin



Filefishes possess prominent dewlaps on their throat-breast region (Photo: NOAA)

dextral - right, as opposed to sinistral, or left

diadromous species - a species which undertakes a spawning migration from ocean to river or vice versa

diagenesis - all of the changes that occur to a deposited sediment during its conversion to rock; includes changes that result from chemical, physical as well as biological processes

diagnosis - identifying the nature or cause of some phenomenon; in pathology, (1) the act or process or deciding the nature of a disease by examination and observation, (2) a careful investigation of the facts to determine the nature of a thing, and (3) the decision resulting from either of these

diagnosis, clinical - a diagnosis based upon signs and laboratory analyses while the organism is alive

diagnosis, definitive - the name of a disease or pathological condition, as in "white plague"

diagnosis, differential - in taxonomy, a statement of the characters that distinguish a given taxon from other, specifically mentioned equivalent taxon; the process of identifying a pathological condition by differentiating all pathologic processes that may produce similar lesions

diagnosis, etiological - a diagnosis reflecting identification of the cause or causative agent of a disease

diagnosis, morphological - a diagnosis based upon a description of the alteration of form or structure of the tissues or organs, usually at the gross, histological, cellular or subcellular level

diagnosis, physical - a diagnosis based on information obtained by inspection or palpation (feeling with the hand)

diagnosis, presumptive - an unconfirmed diagnosis based on interpretation of initial and incomplete information

diagnostic characters - in taxonomy, the characters, or most important characters, which distinguish a taxon from other similar or closely related taxa

diapause - a state of arrested development or growth, accompanied by greatly decreased metabolism

diaphanous - thin and translucent; semi-transparent

diastema - a space; a gap

diatom - a unicellular alga that consists of two interlocking valves composed of silica



A living diatom
(*Pleurosigma angulatum*)
from Arctic seas.

diatomaceous - pertaining to diatoms or their fossil remains

dichopatric - pertains to allopatric populations with non-contiguous ranges

dichopatric speciation - a type of speciation in which a formerly contiguous population is split by the rise of some geographical barrier, e. g., a mountain range

dichotomous key - a tool to help identify taxa. It is made up of pairs of choices. Each choice is between statements describing specific traits of the taxa under consideration. Only one statement will be true for each choice. Each choice points to another set of choices until finally only one choice remains

diel - a 24-hour period that usually includes a day and its adjoining night; pertaining to the day-night cycle

differential diagnosis - see "diagnosis, differential"

diffusion - the movement of particles from a region of higher concentration to a region of lower concentration

digestion - the breakdown, by hydrolysis, of complex ingested nutrient compounds (carbohydrates, fats, proteins) into their building blocks, i.e., the conversion of food, in the alimentary canal, into soluble and diffusible products, capable of being absorbed into the circulating fluid and the cells

Digital Versatile Disc (DVD) - an advanced type of CD-ROM that holds a minimum of 4.7 gigabytes (unit of storage) to a maximum of 17 gigabytes of information. They are compressed using the MPEG codec, which stores only the changes from one frame to another instead of the entire frame

digitiform - finger-shaped

dimorphism - having two different distinct forms of individuals within the same species or two different distinct forms of parts within the same organism. It could refer to different colors or color patterns, sizes, anatomical parts, etc. Sexual dimorphism is a common case, where the two sexes have different shapes, sizes, etc.

dinghy - a small open boat

dinoflagellate - a unicellular, generally motile, chiefly marine protist with two whip-like flagella. Some autotrophic species, called zooxanthellae, are endosymbionts of corals and other invertebrates. Dinoflagellates are probably best known as a principal cause of marine bioluminescence, "red tides" and paralytic shellfish poisoning

dioecious - having separate sexes. Individuals within the species contain only one or the other of male and female reproductive systems

dioptr - a metric unit used in optics to measure the refractive power of a lens

dioxin - a chlorinated organic chemical byproduct (dibenzo-p-dioxins), released into the environment from incineration and during industrial processes that use chlorine. Dioxins are highly toxic and can have immediate and long-term health effects, including skin disease, cancer, and reproductive failure

dip net - a small mesh bag, sometimes attached to a handle, shaped and framed in various ways. It is operated by hand or partially by mechanical power to capture specimens

diphycercal - a caudal fin shape which is primitively symmetrical and pointed, and with the vertebral column or notochord extending to the tip, as found in primitive fishes, such as lampreys and chimaeras

diploid - the condition in which a cell contains a nucleus with two complete sets of chromosomes, one set inherited from each parent. The diploid condition is often abbreviated as 2n. Most plants and animals are diploid. The term also represents the number of chromosomes in most cells except the gametes, which are haploid in chromosome number

direct sun - refers to a measurement based only on direct radiation from the sun's disk and excluding indirect radiation from the remainder of the sky

directed fishing - fishing that is targeted at a certain species or group of species. This applies to both commercial and sport fishing

directional asymmetry - a pattern of deviation with a side bias. A side difference occurs for a given trait, with the larger side generally the same among individuals; the right minus the left value of a trait

directional selection - a type of natural selection that removes individuals from one end of a phenotypic distribution and thus causes a shift in the distribution. The frequency of an allele is changed in a constant direction, either toward or away from fixation for that allele. Directional selection occurs when individuals at one phenotypic extreme have an advantage over individuals with more common phenotypes

disaccharide - a sugar (carbohydrate) formed by the covalent bonding of two monosaccharides. Table sugar, sucrose, is a disaccharide

disciform - round or oval-shaped

discodermolide - a marine pharmaceutical isolated from deep-water sponges of the genus Discodermia. Discodermolide possesses immunosuppressive and anticancer properties which inhibit cell division by interfering with the cell's microtubule network

discoidal - disc-shaped; flat and round shape

discrimination - differential response to different stimuli

disease - any impairment of an organism's vital functions or systems, including interruption, cessation, proliferation, or other malfunction



Coral with yellow band disease, which results in serious losses of coral tissue.

disease vector - an organism which transmits infective organisms from one host to another

disjunct - distinctly separate; disjunct populations are populations separated from other potentially interbreeding populations by a distance large enough to prevent exchange of genetic materials

disjunct distribution - the discontinuous or separated geographical distribution of a species or other taxonomic unit

dispersal - the spread of a species to a new location. In many organisms, this happens at a particular stage in the life cycle, and is often critical for the species' survival. Organisms may disperse as spores, seeds, eggs, larvae, juveniles, or adults

disphotic zone - the part of the water column that is barely illuminated by sunlight from above; the "twilight zone" between the photic and aphotic zones

displacement behavior - a behavioral response that is appropriate for one situation appears in another situation, for which it is inappropriate

display - in animal behavior, visual messages or body language, used by animals primarily to communicate anger, fear, and other basic emotions. Displays are strong indications of an animal's emotional state



An agonistic display by the male Siamese fighting fish, *Betta splendens*. (Photo: Jennifer Beavin)

Disputed Island - formerly or currently considered U.S. possession by the U.S. The U.S., through negotiation, has disclaimed ownership of most islands in favor of another country. Two islands remain contested

disruptive coloration - a color pattern that breaks up the outline of an organism



The color pattern of the juvenile spotted drum, *Equetus punctatus*, is an example of disruptive coloration. (Photo: Dr. Tom Doepfner, Brown

disruptive selection - natural selection that favors individuals that deviate from the population average. For example, positive selection which favors individuals that are larger or smaller than average

dissepiment - a horizontal partition within or outside of a corallite

dissociation - the temporary or reversible chemical process in which a molecule or ion is broken down into smaller molecules or ions

dissolved oxygen - the concentration of oxygen dissolved in water, expressed in mg/l or as percent saturation, where saturation is the maximum amount of oxygen that can theoretically be dissolved in water at a given temperature and pressure

distal - the direction away from the midline of the body; the opposite of proximal

distant linked habitats - connected environments that are intended to conserve "all" biodiversity in an area- typically large and usually include both aquatic and terrestrial targets

distinct - clearly defined and easily recognized

distinct population segment - "population," or "distinct population segment," are terms with specific meaning when used for listing, delisting, and reclassification purposes to describe a discrete vertebrate stock that may be added or deleted from the list of endangered and threatened

distribution - the area where a species is known to occur

disturbance - any relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment; an event or change in the environment that alters the composition and successional status of a biological community

disulfide bond - a chemical bond between the sulfur atoms of two different amino acids in a protein

diurnal - active during the day light hours

dive computer - a small electronic sensor and calculator, carried by the scuba diver, that calculates and displays the basic information needed during a dive, i.e., depth, time, decompression status and tank pressure. By constantly monitoring depth and bottom time, dive computers automatically recalculate the diver's no-decompression status, giving longer dive times while still keeping the diver within a safe envelope of no-decompression time. Computers also monitor ascent rates, logs dives, and measures time intervals between dives

dive computer algorithm - a suite of equations that compute nitrogen uptake and elimination in tissues from changes in the diver's depth and elapsed time underwater

dive table - dive tables present dive times for specific depths, adherence to which, the scuba diver can avoid contracting decompression sickness (the bends). The theory behind dive tables is based on our understanding of how nitrogen is taken up on compression (descent) and given off on decompression (ascent). The first dive tables were devised by John S. Haldane in the period 1906-1908

The image shows a PADI Recreational Dive Planner (RDP) chart. It is a complex grid with multiple columns and rows. The columns represent depth (from 10 to 190 feet) and time (from 0 to 180 minutes). The rows represent different stages of a dive: maximum depth, surface interval, and next dive limits. The chart is color-coded with blue and white cells, and includes a PADI logo in the bottom left corner.

The PADI (Professional Association of Diving Instructors) recreational dive planner (dive table) has three tables. Table 1 gives the maximum amount of time the diver can stay at a certain depth on the first dive, and it also indicates how much nitrogen the diver has in in the tissues after a dive. Table 2 is concerned with the diver's surface interval time (how long a diver must remain at the surface before the next dive), and Table 3 allows the diver to determine safe diving limits on the next dive. (Photo: PADI)

divergent evolution - the evolution from one species of organism into a number of different species. As the original population increases in size, it spreads out from its center of origin to exploit other habitats and ecological niches. In time, this results in a number of populations, each adapted to its particular habitat. Eventually these populations, genetically may differ from each other sufficiently to become new species. Divergent evolution has also been termed "adaptive radiation"

diversity index - a mathematical index of species diversity within a community

diverticulum - a blind sac branching off a cavity or canal

diving bell - a hollow, usually inverted vessel, such as one used for diving deep in a body of water. It is open on the bottom and supplied with air under pressure. During the *Monitor* 2001 Expedition, navy divers utilized a 12-person, two-chamber saturation system with a two-person closed diving bell. The system can operate as deep as 1,500 ft considerably deeper than the *Monitor*, which rests on the sea floor at a depth of 235 ft. Saturation systems are often used in deep-water situations (below 200 ft) in order to reduce the time lost to decompression during the slow ascent to the surface required for preventing decompression sickness



The SAT system diving bell is raised to the surface after an eight hour dive on the wreck of the USS *Monitor*. The bell is the divers' "taxi" between their topside saturation living quarters and their work site, some 240 ft below the surface. (Photo: official U.S. Navy photo by Photographer's Mate Chief Petty Officer (DV/SW) Andrew McKaskle)

division - in botanical nomenclature, "division" is used instead of "phylum", and is equal in taxonomic status to the phylum

DNA (deoxyribosenucleic acid) - also termed deoxyribonucleic acid. The molecule that encodes genetic information in the cells. It resembles a double helix held together by weak bonds of four nucleotides (adenine, guanine, cytosine, and thymine) that are repeated ad infinitum in various sequences. These sequences combine into genes that govern the production of proteins. The DNA located within the nuclear membrane of eukaryotic cells is sometimes referred to as nDNA



Graphic of DNA shows the spiral double helix structure of the molecule.

DNA annealing - the reformation of double stranded DNA from thermally denatured DNA. The rate of reassociation depends upon the degree of repetition and is slowest for unique sequences

DNA barcode - DNA barcoding is a taxonomic method which uses a short genetic marker in an organism's mitochondrial DNA (mtDNA) to quickly and easily identify it as belonging to a particular species. This approach to species identification has its supporters and detractors

DNA chip - a small piece of glass or silicon that has small pieces of DNA arrayed on its surface

DNA fingerprinting - a method employed to determine differences in amino acid sequences between related proteins. It is used especially for identification by extracting and identifying the base-pair pattern of an organism's DNA

DNA hybridization - the process of joining two complementary strands of DNA, or one each of DNA and RNA, to form a double-stranded molecule; a technique in which single stranded nucleic acids are allowed to interact so that complexes or hybrids are formed by molecules with sufficiently similar, complementary sequences. By this means the degree of sequence identity can be assessed and specific sequences detected

DNA library - a collection of cloned DNA fragments that collectively represent the genome of an organism

DNA ligase - an enzyme that rejoins cut pieces of DNA

DNA marker - segments of chromosomal DNA known to be linked with heritable traits or diseases. Although the markers themselves do not produce the conditions, they exist in concert with the genes responsible and are passed on with them

DNA polymerase - an enzyme that replicates DNA. DNA polymerase is the basis of PCR (polymerase chain reaction)

DNA probe - in genomics, the DNA affixed to a microarray; a small piece of nucleic acid that has been labeled with a radioactive isotope, dye, or enzyme that is used to locate a particular nucleotide sequence or gene on a DNA molecule

DNA replication - DNA replication or DNA synthesis is the process of copying the double-stranded DNA prior to cell division. The two resulting double strands are identical (occasionally errors (mutation) in replication can result in a less than perfect copy) and each of them consists of one original and one newly synthesized strand

DNA sequence - the order of nucleotide bases in the DNA molecule

DO (dissolved oxygen) - the concentration of free oxygen dissolved in water and readily available to aerobic organisms. DO is usually expressed in milligrams per liter, parts per million, or percent of saturation

Dobson Unit (DU) - the unit of measure for total ozone or other gases

DOC (dissolved organic carbon) - a measure of the organic compounds that are dissolved in water

DODS (Distributed Oceanographic Data System) - see "OPeNDAP"

Dolastatin 10 - a marine pharmaceutical extracted from the marine sea hare (a snail) *Dolabella auricularia*. It is an anti-cancer drug which interferes with cell division processes

dolioform - barrel-shaped

doliolaria larva - the larval stage of sea cucumbers immediately following the auricularia stage. It is cylindrical in shape and possesses five transverse bands of cilia

dolomite - a sedimentary rock, similar to limestone, composed largely of calcium magnesium carbonate ($\text{CaMg}(\text{CO}_3)_2$)

dome shaped - a form that resembles half of a sphere

dominant species - a species which make up a large proportion of a community in terms of its biomass or numbers of individuals

domoic acid - an acidic cyanotoxin found associated with certain diatom blooms. Domoic acid can bioaccumulate in marine organisms that feed on the phytoplankton, such as shellfish and some fishes. In mammals, including humans, domoic acid is a neurotoxin responsible for Amnesic Shellfish Poisoning (ASP) , causing short term memory loss, brain damage, and in severe cases, death

doppler radar - radar that can measure radial velocity, the instantaneous component of motion parallel to the radar beam (i.e., toward or away from the radar antenna)

doppler shift - the change in the tone of a sound caused by the sound source moving away or towards the listener

dorid nudibranch - a type of nudibranch (order Nudibranchia) possessing a feather-like external gill on the back and a rhinophoral sheath. The mantle is thick and extends over the foot. The surface of the mantle may bear tubercles which vary in size, shape and number, and are often a taxonomic diagnostic character



This dorid nudibranch (*Chromodoris kunei*) feeds on sponges and stores their toxic chemicals in its body for protection. Its striking coloration advertise that it is not good to eat. (Photo: Ocean Futures Society/ Richard C. Murphy)

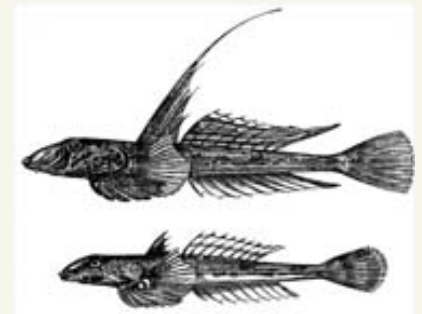
dormancy - a period of suspended growth and metabolic activity. Many plants, seeds, spores, cysts, and some invertebrates become dormant during unfavorable conditions

dorsal - refers to the upper or back surface of an animal



The upper or back surface of this queen angelfish is the dorsal surface, as opposed to the opposite belly surface, which is the ventral surface. (Photo: Chris Huss, Florida Keys National Marine Sanctuary)

dorsal fin - in fishes, one or more fins situated on the midline of the back, having spines or rays, sometimes both; excludes the adipose fin found in some fishes, such as catfishes and salmon



Dragonets, such as *Callionymus lyra*, exhibit strong sexual dimorphism in the dorsal fin (male [top] and female [bottom]). (Image: NOAA)

dorsoventral - an axis extending from the dorsal to ventral surface of an animal body

dot grid - a technique used to analyze a photograph of a quadrat (photo-quadrat), in which a grid of random dots is placed over an image of the photo-quadrat. It assumes that the proportion of dots that lies on a substrate is equal to the proportional area of the substrate

double helix - the normal structural configuration of DNA consisting of two helices winding about the same axis. The structure of DNA was first proposed by Watson and Crick (1953) with two interlocking helices joined by hydrogen bonds between paired bases

doubling time - the length of time required for a population to double in size

download - transferring data (usually a file) from one computer to another. The opposite of "upload"

downstream - in the direction of the water movement

downwelling - a downward current of surface water in the ocean, usually caused by differences in the density of seawater

drag - the frictional impedance (retarding force) acting on an object moving through a fluid parallel and opposite to the direction of motion

dredge - a metal collar with an attached collecting bag that is dragged along the bottom to obtain samples of rock, sediment, or benthic organisms

dredging - a method for deepening streams, swamps or coastal waters by scraping and removing solids from the bottom. The resulting mud is usually deposited in marshes in a process called filling. Dredging and filling can disturb natural ecological cycles. For example, dredging can destroy coral reefs and other aquatic life; filling can destroy the feeding and breeding grounds for many fish and invertebrate species

drift net - a fishing net, often miles in extent, arranged to drift with the tide or current and buoyed-up by floats or attached to a boat



A marine turtle is caught in a drift net. (Photo: NOAA)

drop net - a small, usually circular net with weights around the perimeter and a float in the center

drop root - an adventitious root in mangroves that originates from the branches, and roots in the surface-sediments

drowned river - a former river inundated by a rise in sea level in past times

Drupella - a genus of Indopacific muricid gastropod that preys almost exclusively on living coral tissues. Some, if not all of these corallivorous species, release a proteolytic enzyme in their saliva that partially digests its prey. *Drupella* species may cause considerable damage to reefs

dry weight - the moisture-free weight of a biological sample obtained by drying at high (oven-drying) or low (freeze-drying) temperatures for an time sufficient to remove all water

dsRNA (double stranded RNA) - long double-stranded RNAs (dsRNAs; typically >200 nt) can be used to silence the expression of target genes in a variety of organisms and cell types

duct - any tubular structure

duplex DNA - double-stranded DNA

DVD-ram - a high-capacity, high-performance optical disk that allows data to be read, written, and erased. It is comparable to a rewritable CD, and can hold up to 2.6 gigabytes of information per side

dychotomic growth - growth of a coral colony in which the corals divide symmetrically. Since all polyps grow simultaneously, neighboring polyps are the same age

dynamic optical demarcation - in animal behavior, a special signalling device used by an animal in a stereotypical movement, as for example, the waving of a fiddler crab's claw to attract the attention of other members of its species

dyne - unit of force to accelerate 1 gram to 1 cm per second per second

dysidotronic acid - an antiinflammatory drug derived from marine sponges in the genus Dysidea

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: E

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

EANx (Enriched Air Nitrox) - a breathing gas mixture for scuba divers which has a percentage of oxygen greater than 21 percent as is found in normal air. This mixture allows longer bottom times at limited depths

early life history - the stages from egg to juvenile in fish development

Eastern Tropical Pacific Seascape (ETPS) - a coastal and marine region of 2.1 million square kilometers (roughly 810,815 square miles) that includes the Exclusive Economic Zones (EEZs) of Costa Rica, Panama, Colombia, and Ecuador. The ETPS also encompasses interspersed international waters, including the islands of Galapagos, Malpelo, Gorgona, Cocos, and Coiba

ebb current (ebb) - the movement of a tidal current away from shore or down a tidal river or estuary

ebb strength - phase of the ebb tidal current at the time of maximum speed; also, the speed at this time

ebb tide - that period of tide between a high water and the succeeding low water; falling tide

ecad - a non-inheritable plant or animal form produced in response to particular habitat environmental factors; an environmentally induced form

ecdysone - a molting hormone of arthropods. It stimulates growth and ecdysis (molting)

Ecdysozoa - the ecdyzoans comprise one of the major and largest protostome groups within the animal kingdom. It includes both the arthropods and the nematodes, as well as lesser groups such as rotifers, cephalorhynchs (which include priapulids, kinorhynchs, and loriciferans), and onychophorans. Ecdysozoans build a cuticle, an outer layer of organic material that functions as a lightweight flexible exoskeleton. The name Ecdysozoa refers to the fact that many members of this group regularly shed their cuticle, a process called ecdysis

Echinodermata - an animal phylum that contains starfishes, sea cucumbers, sand dollars, brittlestars, basket stars, sea lilies, feather stars, and sea urchins. Adults exhibit pentamerous radial symmetry, secondarily derived from a bilateral ancestor. They are not at all related to the other radiate phyla, such as the Cnidaria



A pencil urchin of the phylum Echinodermata.

echinopluteus larva - a larval form of some echinoderms



Free-swimming echinopluteus sea urchin (*Echinocardium cordatum*) larva feeds on microplankton captured with its ciliated arms. (Photo: Jan Parmentier)

Echiura - an animal phylum that contains the echiurans or spoonworms. Some species inhabit coral crevices. Echiurans are deposit feeders

echo sounder - an instrument for determining the depth of water by measuring the time of travel of a sound-pulse from the surface of a body of water to the bottom and back

echolocation - the sonar-like ability used by bats, dolphins, some whales, and two groups of cave-dwelling birds to detect objects in their environment. Using echolocation, the animal emits high-frequency sounds that reflect off of an object and return to the ears or other sensory receptors

ecocline - a gradual and continuous change in environmental conditions of an ecosystem or community; gradual transition between ecotypes; a continuous change in form as a response to a continuous change in an environment

ecodeme - an intrabreeding population occupying any specified ecological habitat

ecological efficiency - the percentage of energy in biomass produced by one trophic level that is incorporated into biomass by the next highest trophic level

ecological equivalent - a different species that occupies a similar ecological niche in a similar ecosystem in a different part of the world

ecological genetics - the study of genetics in the context of the interactions among organisms and between the organisms and their environment. It studies phenotypic evolution in natural populations. The traits studied are related to those which affect an organism's survival and reproduction (fitness)

ecological isolation - a form of reproductive isolation in which two closely-related species are separated by what is often a slight difference in the niches they occupy

ecological resilience - a measure of resistance to ecological disturbance and the speed of return to the equilibrium state of an ecosystem; also called "ecosystem resilience"

ecological species - a concept of species, in which a species is a set of organisms adapted to a particular ecological niche

ecology - the study of the interrelationships between organisms and their environment, including the biotic and abiotic components

ecomorph - a local population or group whose appearance is determined by ecological factors

ecophenotype - a phenotype showing non-genetic adaptations associated with the habitat or environment

ecoreach - a subunit of an ecoregion, characterized by distinctive physical, chemical, and biological conditions within the ecoregion

ecoregion - a geographic area of relative homogeneity in ecological systems or in relationships between organisms and their environment; a relatively large area of land or water that contains a geographically distinct assemblage of natural communities

ecosophy - ecological philosophy; a set of ethics related to ecological and environmental matters; It refers to philosophies which have a predominant ecocentric or biocentric perspective

ecospecies - an assemblage of ecotypes which are separated by incomplete sterility barriers

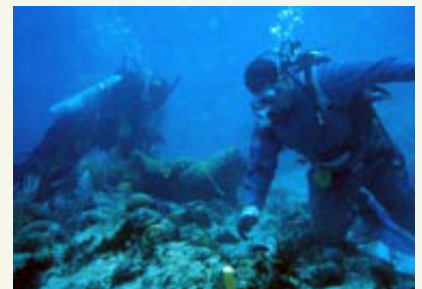
ecosystem - an ecological community considered together with the non-living factors of its environment as a unit

ecosystem approach - a strategy or plan to manage ecosystems to provide for all associated organisms, as opposed to a strategy or plan for managing individuals

ecosystem based management (EBM) - EBM integrates knowledge of ecological interrelationships to manage impacts within an ecosystem. Effective implementation of EBM should: (1) consider ecological processes that operate both inside and outside ecosystem boundaries, (2) recognize the importance of species and habitat diversity, and (3) accommodate human uses and associated benefits within the context of conservation requirements

ecosystem integrity - the ability to support and maintain a balanced, integrated, adaptive biological community having a species composition, diversity and functional organization comparable to that of a natural habitat in the region

ecosystem restoration - actions taken to modify an ecosystem for the purpose of re-establishing and maintaining desired ecological structures and processes



Two divers work to reattach a large fragment of elkhorn coral, *Acropora palmata*, at Mona Island, Puerto Rico. The coral in

the background has been attached to the reef framework using stainless steel wires. The wire binds the coral fragment to the living coral where it is expected to reattach to the live coral. (Photo: Erik Zobrist, NOAA Restoration Center)

ecotone - a transitional area between two adjacent ecological communities

ecotope - the abiotic or non-living part of an ecosystem

ecotourism - travel undertaken to experience sites or regions of unique natural or ecological quality, or the provision of services to facilitate such travel

ecotype - a genetically differentiated subpopulation that is restricted to a specific habitat

ecotype - a population in a given ecosystem that is adapted to a particular set of environmental conditions

ecozone - an area at the earth's surface representative of large and very generalized ecological units characterized by various abiotic and biotic factors

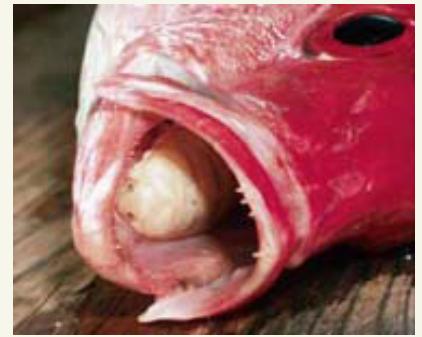
ecteinasclidin - a marine pharmaceutical derived from the sessile tunicate *Ecteina scidia turbinata* which acts by disrupting the structure of DNA in the cells of solid tumors

ecto- - a prefix meaning 'outside'

ectoderm - the outer germ layer of cells in an embryo that gives rise to the outer layer of skin (epidermis) and neural tissue

ectodermis - the outer cellular covering of a polyp

ectoparasite - a parasite which lives on the surface of its host



A marine ectoparasite lodged in a fish's mouth. (Photo: NOAA Ocean Explorer)

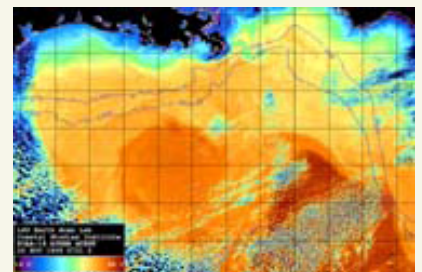
ectoplasm - the clear, nongranular portion of the cell cytoplasm just inside the cell membrane

Ectoprocta - an animal phylum synonymous with the phylum Bryozoa, the "moss animals"

ectotherm - a cold-blooded animal, one which cannot internally regulate its body temperature, such as a reptile, fish, or amphibian, whose body temperature is mostly determined by the surrounding environment and behavior; poikilotherm; cold-blooded organisms maintain their body temperatures in ways different from warm-blooded animals, such as mammals and birds

ectothermic - having an internal body temperature that is dependent on the surrounding temperature. Most aquatic animals are ectotherms; also called poikilothermal or "cold blooded"

eddy - a circular movement of water formed on the side of a main current



AVHRR image of eddy in the Gulf of Mexico. (Image: NOAA-14 Polar Orbiting Satellite/LSU Earth Scan Lab, Coastal Studies Institute)

edentate - toothless

edge effect - habitat conditions created at or near the more-or-less well-defined boundary between ecosystems (ecotone). Typically there is an increased richness of organisms resulting from the mixing of two communities where they join

eelgrass - a common seagrass (*Zostera marina*) distributed from Greenland to Florida that serves as an important habitat for fishes and shellfish. Unfortunately, approximately 90 percent of all eelgrass throughout its range along the Atlantic coast has been destroyed



Eel grass meadows.
(Photo: NOAA)

effector - a muscle or gland that receives a stimulus from a neuron

efferent - moving or carrying outward or away from a central part. Refers to blood vessels, nerves, etc. For example, blood vessels carrying blood away from the heart or nerve fibers conducting impulses from the brain or nerve cord

effluent - a discharge of pollutants into the environment, partially or completely treated or in its natural state. Generally used in regard to discharges into waters; in contrast to an emission, which is generally used in regard to discharges of pollutants into the air

efflux - an outward flow; flux of water, elements or gases out of an ecosystem or ecosystem component

effort - the amount of time and fishing power used to harvest fish. Fishing power includes gear size, boat size, and horsepower

egestion - the elimination of undigested food materials from an organism

egg - a female sex cell or gamete with the haploid number of chromosomes. It may be fertilized by a sperm cell to produce a zygote with the diploid number of chromosomes for that particular species. The eggs of some species may develop into multicellular individuals without being fertilized by a sperm cell. This is the process of parthenogenesis

egg case - the leathery case which contains the developing embryo in hagfishes, sharks, rays, skates and chimaeras; also called a "mermaid's purse"

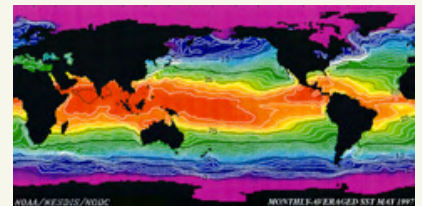


A skate egg case (Mermaid's purse) revealing the skate embryo contained within (Photo: David Siebenaller)

egg chamber - a cavity or chamber in the sand, excavated by a nesting seaturtle, into which eggs are deposited for incubation

Ekman layer - the thin horizontal layer of water riding on top of the ocean that is affected by wind

El Niño - an irregular variation of ocean current that from January to March flows off the west coast of South America, carrying warm, low-salinity, nutrient-poor water to the south. It is associated with the Southern Oscillation. These two effects are known as the El Niño Southern Oscillation (ENSO). El Niño usually occurs during the Christmas season when the equatorial counter current strengthens and flows eastward to overlie the cold, nutrient-rich waters of the Peru current. It does not usually extend farther than a few degrees south of the equator, but occasionally it does penetrate beyond 12 deg S, displacing the relatively cold Peru Current. The effects of this phenomenon are generally short-lived, and fishing is only slightly disrupted. Occasionally, the effects are major and prolonged



Graphic of sea surface temperatures show El Niño, May 1997.

elasmobranch - a member of the Subclass Elasmobranchii of cartilaginous fishes. These include sharks, rays, and skates



The manta ray is a large, graceful, mostly plankton-feeding elasmobranch. They also feed on small fishes. (Photo: Jackie Reid/ Flower Garden Banks National Marine Sanctuary)

elastic - capable of returning to an initial form or shape after deformation; resilient

electric field - the region extending outward in all directions from an electrically charged material that affects other electrically charged objects; the area around an electrified object where other charges are affected

electrocyte - a cell that generates electricity. The electric currents produced by some species of fishes, such as torpedo rays and electric eels, are generated in stacks or columns of electrocytes. The electrocytes of most 'electric fishes' are modified muscle cells. They are usually arranged in columns within electric organs. When an electrocyte is stimulated, a movement of ions (electrically charged atoms) across the cell membrane results in an electric discharge

electrogenic - capable of generating electric currents and a painful electric shock, as in electric rays

electromagnetic radiation - energy that travels through space in the form of waves. The highest frequencies in the spectrum of electromagnetic radiation are gamma-rays; the lowest frequencies are radio waves. All electromagnetic radiation travels at the speed of light. Shorter wavelength radiation (eg, ultraviolet) carries more energy and is likely to be more harmful to living tissue

electromagnetic receptor - a neurological receptor that responds to light, electricity, and magnetism. Photoreceptors respond to light and electroreceptors detect electrical energy

electron microscope - a microscope which beams electrons, instead of light beams, at and through the object of interest. This type of microscope provides the greatest resolution of extremely small details in the nanometer size range. Magnification may be up to x300,000

electron spin resonance - a chronometric dating technique that estimates dates from observation of radioactive atoms trapped in calcite crystals present in a number of materials, such as limestone, coral, shells, teeth, and bones; also called "Electron Paramagnetic Resonance (EPR)"

electrophoresis - a technique for separating different types of molecules based on their patterns of movement in an electrical field

electroporation - the creation of reversible small holes in a cell wall or membrane through which foreign DNA can pass. This DNA can then integrate into the cell's genome

electroreceptor - a receptor organ that senses changes in an electrical current in the surrounding water, for example, the ampullae of Lorenzini in sharks

electrotaxis - the movement of organisms in response to an electric field

eleutherobin - a marine pharmaceutical initially isolated from the soft coral *Eleutherobia* sp. from Western Australia, and more recently from *Erythropodium caribaeorum*, an encrusting coral found in South Florida and the Caribbean. Eleutherobin is a potent cancer cell inhibitor

elevation - the height of a geographic location above a fixed reference point, often the mean sea level

ELISA (enzyme-linked immunosorbent assay) - a rapid test where an antibody or antigen is linked to an enzyme as a means of detecting a match between the antibody and antigen; a technique for detecting specific proteins by using antibodies linked to enzymes

emarginate - a notched margin, but not so deeply as to be forked. As an example, a trout possesses an emarginate caudal fin



The caudal fin of this trout has an emarginate shape. (Image: U.S. Fish and Wildlife Service)

embayment - an indentation in the shoreline that forms a bay

embryo - the stage of early growth and differentiation of tissues and the formation of primitive organs and organ systems of a multicellular organism, from fertilization until birth or hatching. In seed plants, it is the young sporophyte that resulted from the union of the egg and one of the two tube nuclei

emergent vegetation - plants growing in water but emerging from it, usually at the water's edge

emersed - rising above the water surface

emigration - the movement of individuals out of a population or from one area to another

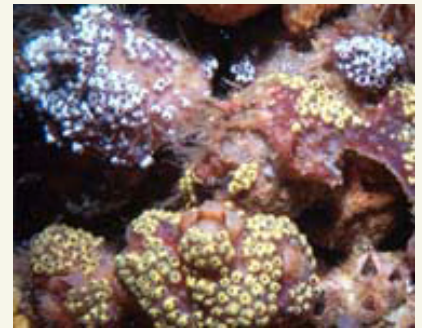
emission - any substance that is discharged into the soil, air or water

empirical - based on experience or observations, as opposed to theory or conjecture

emulsion - a suspension of small globules of one liquid in a second liquid with which the first will not mix

encrustation - a crustlike deposit or growth over a substratum

encrusting colony - a thin colony which adheres closely and is attached to the substrate



Encrusting tunicates at Gray's Reef off Sapelo Island, Georgia (Photo: Karen Angle).

encryption - a process that transforms plain text or data and makes it unreadable to an outside party. The transformation is made using a mathematical formula and a "key," which is a special data item, usually kept secret, used as input into the formula along with the data. To read the data from the encrypted version the key and the formula must be known

endangered species - under the Endangered Species Act (ESA), an endangered species is one that is in danger of extinction throughout all or a significant portion of its range

Endangered Species Act (ESA) - an Act of Congress passed in 1966 that establishes a federal program to protect species whose survival is threatened by habitat destruction, overutilization, disease, etc.

endangered taxa - taxa in danger of extinction and whose survival is unlikely if causal factors continue operating. Included are taxa whose numbers have been drastically reduced to a critical level or whose habitats have been so drastically impaired that they are deemed to be in immediate danger of extinction. Also included are those that possibly are already extinct, in so far as they have not been seen in the wild in the past 50 years

endemic species - a species whose distribution is restricted to a particular area

endergonic reaction - a chemical reaction that requires energy in order to proceed, so that the products have a higher free energy than the reactants

endo- - a prefix meaning 'inside'

endobenthic - refers to meiofaunal-sized organisms that move within the sediments

endocoel - the space of the cnidarian gastrovascular cavity between two mesenteries belonging to one and the same pair

endocrine gland - a gland that manufactures hormones and secretes them directly into the circulatory system to act at distant sites in the body

endocrine system - the system of ductless glands in animals that secrete hormones

endocytosis - uptake of material into a cell by the formation of a membrane-bound vesicle

endoderm - the inner germ layer of diploblastic and triploblastic embryos that gives rise to internal tissues such as the gut and gut derivatives, e.g., air bladder, lungs, and the lining of the digestive tract

endogenous - having its origin, or produced within the organism or one of its parts

endogenous rhythm - a metabolic or behavioral rhythm that originates within the organism and persists regardless of external conditions

endolithic - growing within a rock or any other hard inorganic substratum

endolithic algae - algae which burrow into calcareous rocks or corals

endonuclease - a nuclease that cleaves nucleic acids at specific internal sites

endoparasite - a parasite which lives in the internal organs of its host

endophytic - living within the tissues of a host plant or alga

endopinacocyte - in sponges, a pinacocyte lining the incurrent and excurrent canals

endopinacoderm - in sponges, a surface lined with endopinacocytes

endoplasm - the granular portion of the cell cytoplasm between the ectoplasm and nuclear membrane

endopodite - in crustaceans, the inner branch, or ramus, of a biramous appendage; the main shaft of that appendage; also called "endopod"

endoskeleton - skeleton, or support structure, which is on the inside of the organism's body. All vertebrates possess an endoskeleton that is made of either bone and/or cartilage



Endoskeleton of a 35-ton, 13-m gray whale on the floor of the Santa Cruz Basin.

endosymbiont - an organism which lives within the body of another organism as part of a symbiotic relationship. The relationship may be mutualistic or commensalistic; also called an 'endobiont'

endosymbiotic - being symbiotic and living within the body of an individual of the associated species

endothecal dissepiment - one of many horizontal partitions across the corallite within the corallite wall

endothermic - an animal that is able to maintain a body temperature that varies only within narrow limits by means of internal mechanisms. Most birds and mammals are considered endothermic; also called homeothermal or "warm blooded"



Whale fat (blubber) aids these humpback whales in maintaining a relatively constant body temperature. (Photo: Dave Matilla, NOAA/NOS National Marine Sanctuaries)

endothermic reaction - a reaction which absorbs heat

endozoochory - the dispersal of plant seeds or spores within the body of an animal, as passing through the animal's digestive system; also called "endochory"

endozoic - living inside an animal

energy - the capacity for doing work. Forms of energy include light, thermal, mechanical, electrical, and chemical. Energy may be transformed from one form into another

energy flow - the movement of energy through a community via feeding webs

enrichment - the addition of nitrogen, phosphorus and carbon compounds or other nutrients into a lake or other waterway that greatly increases the growth potential for algae and other aquatic plants. Most frequently, enrichment results from the inflow of sewage effluent or from agricultural runoff

ENSO (El Niño Southern Oscillation) - see El Niño and Southern Oscillation

enterocoelous - the mesoderm and coelom initially develop as pouches off of the primitive digestive tract (archenteron) of an embryo. Enterocoelous development of the coelom occurs in deuterostomes

enteron - the alimentary canal or the gut of an embryo. Some structures of the enteron may not be completely developed or differentiated in early embryonic growth

entrainment - the synchronisation of one biological rhythm to another or to a zeitgeber cycle, e.g. circadian rhythms are often entrained to the light-dark cycle; also, the process of small organisms being captured in the cooling water of a power plant

entropy - the measure of the disorder or randomness of energy and matter in a system

environment - everything external to the organism

environmental impact - a positive or negative effect of any action upon a give area or resource

environmental impact assessment - detailed studies which predict the effects of a development project on the environment. They also provide plans for the mitigation of adverse impacts

environmental impact statement (EIS) - a key component of an environmental impact assessment. An EIS provides a summary of the impact assessment study, including the main project characteristics, environment aspects most likely to be affected, possible alternatives, and suggested measures and systems to monitor or reduce any harmful effects

environmental resistance - the limits set by the environment which prevent organisms from reproducing indefinitely at an exponential rate

environmental sensitivity index (ESI) map - ESI maps serve as quick references for oil and chemical spill responders and coastal zone managers. They contain three kinds of information: (1) Shorelines (color-coded to indicate their sensitivity to oiling); (2) Sensitive biological resources (such as seabird colonies and marine mammal hauling grounds. They are depicted by special symbols on the maps); and (3) Sensitive human-use resources (such as water intakes, marinas, and swimming beaches). Project scientists have created collections of ESI maps, called ESI atlases, for most coastal areas in the US, including Alaska, Hawaii, the Great Lakes, and the Trust Territories. Each atlas includes maps and additional data and information. Starting in 1995 with the outer coast of California, ESI project members began using a Geographic Information System (GIS) to produce updated ESI maps that are higher in quality and can be more readily reproduced



A section of an Environmental Sensitivity Index map, showing part of the Point Reyes National Seashore. Shorelines are color-coded to show their sensitivity to oiling. (Photo: NOAA)

environmental sex determination (ESD) - the phenomenon in which the sex of the offspring is determined by environmental factors

environmental stress - severe environmental effects on the natural ecosystem



A catastrophic environmental stress-the 1989 grounding of the *Exxon Valdez*, which spilled an estimated 11 million gallons of crude oil over 1,300 miles of coastline.

environmentalism - advocacy for, or work toward, protecting the natural environment from destruction by human activities

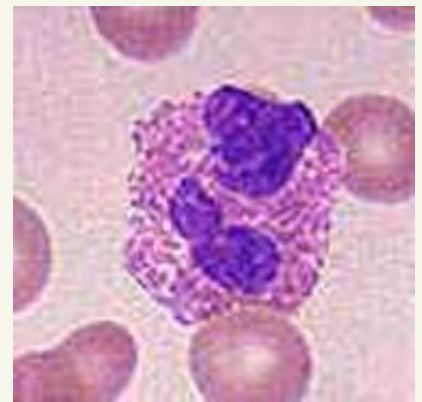
enzootic - an infectious disease constantly present in an animal population but having low incidence

enzyme - an organic catalyst

enzyme unit (EU) - a unit to measure enzymatic activity in cells. One enzyme unit is the quantity of enzyme needed to cause a reaction to process 1 micromole of substance per minute under specified conditions

eon - a unit of time equal to 1 billion years

eosinophile - a type of white blood cell (leukocyte) that engulfs and digests bacteria. Eosinophils, along with other types of white blood cells, are important in an organism's internal defense system



A human eosinophile. The smaller round cells are red blood cells.

ephemeral - short-lived, transitory

ephyra larva - a jellyfish (Scyphozoa) larval stage that develops into the adult medusa or jellyfish



Rick Gillis, Ph.D.

Ephyra larva of the jellyfish Aurelia. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

epibenthic (epifaunal or epifloral) - refers to organisms living on the surface of the substrate

epibiont - an organism that lives on the outside of another organism

epicenter - the point on the earth's surface directly above the hypocenter, where the energy of an earthquake is first released

epidemic - the widespread outbreak of a disease, or a large number of cases of a disease in a single community or relatively small area

epidemic spawning - the simultaneous shedding of gametes by a large number of individuals



Star coral shedding gametes in an epidemic spawning event.

epidermis - the outer epithelial layer of the body

epifauna - animals that live upon or are associated with substratum features

epilithic - growing on rock or stone. Epilithic organisms live attached to rocks

epimeletic behavior - behavioral activities associated with care-giving or help to other individuals

epipelagic zone - the surface layer of the ocean (also called the sunlight zone) which extends from the surface to 200 meters. Most of the visible light exists in this zone. Wide variations in temperature occur in this zone, both latitudinally and seasonally

epipellic - living on or in fine sediments, such as mud or sand

epiphyte - microalgal organism living on a surface (e.g., on a seaweed frond); a plant living on the surface of another plant

epipsammic - attached to, or moving through, sand particles

epistasis - the prevention or masking of the expression of an allele at one locus by an allele at another locus

epistome - the flap over the mouth of some lophophorates

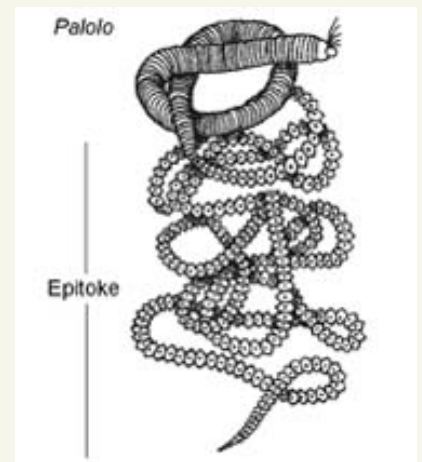
epitheca - a layer of calcium carbonate that grows outside corallite walls

epitheliomuscular cell - a columnar epithelial cell that contains contractile fibrils in cnidarians. Epitheliomuscular cells facilitate polyp movement and contraction

epithelium - a tissue layer of cells which lines body cavities and tubules, or covers surfaces. The cells may be ciliated or non-ciliated, and may be squamous (flat, scale-shaped), cuboidal (cube-shaped), or columnar (column-shaped) in shape. The cells may occur in a single layer, or may be multi-layered (stratified)

epithet - the second name of the binomial given to a species; the species name or second part of a Latin binomial. In the name "Homo sapiens," sapiens is the specific epithet

epitoky - a mode of reproduction unique to polychaete worms in which the worm undergoes a partial or entire transition into a pelagic, sexually reproductive form, known as an epitoke. In many cases, epitoky involves loss or degeneration of digestive structures and enhancement of swimming, sensory, and reproductive structures. The epitoke is considered a delicacy in some islands of the South Pacific.



Palolo (Eunice viridis) are polychaete worms that are about 12 inches long and live in burrows dug into the coral pavement on the outer reef flat. The worm is composed of two distinct sections. The front section is the basic segmented polychaete with eyes, mouth, etc., followed by a string of segments, called the "epitoke," that contain reproductive gametes. (Image: www.nps.gov)

epizoite - an animal that lives on the surface of another organism

epizootic - a temporal pattern of disease occurrence in an animal population in which the disease occurs with a frequency clearly in excess of the expected frequency in that population during a given time interval; an outbreak (epidemic) of disease in an animal population

epizootiology - the study of the factors which determine frequencies and distributions of infectious diseases among non-human animals

epoch - a division of geologic time next shorter than a period. Example: the Pleistocene epoch is in the Quaternary period

equatorial current - an ocean current which flows westerly near the equator. There are two such currents in both the Atlantic and Pacific Oceans. The one to the north of the equator is called the North Equatorial Current and the one to the south is called the South Equatorial Current. The easterly flowing Equatorial Countercurrent lies between the Equatorial Currents

equilibrium - the state in which the action of multiple forces produces a steady balance, resulting in no change over time

equinox - either of the two times during a year when the sun crosses the celestial equator and the length of day and night are equal

era - a division of geologic time next smaller than the eon and larger than a period. Example: The Paleozoic era is in the Phanerozoic eon and includes, among others, the Devonian period

erectile - capable of being raised or erected, often referring to spines of bony fishes

erg - unit of work measuring force of one dyne applied over one centimeter

ergo - therefore; hence

erosion - the wearing away of the land surface naturally by wind or water, but is often intensified by human's land-clearing practices. The runoff is harmful to coral reefs

errant - motile or free swimming



The polychaete *Nereis sp.* is an errant species of worm. (Photo: U.S. Geological Survey)

ERSST (Extended Reconstruction of SST) data set - a globally complete reconstruction of of sea surface temperatures (SST) based on *in situ* measurements and satellite data produced at a monthly, 2 degree resolution

erythrophore - a chromatophore which contains reddish pigments found in carotenoids and pteridines

esca - in some fishes, e.g. frogfishes, the first dorsal fin ray is modified to function as a fishing pole and lure. The part close to the body is the illicium or fishing pole. The esca is the lure on the end of the illicium

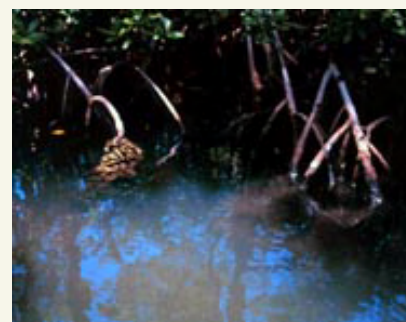
escape reaction - in animal behavior, a response to a predator or other dangerous situation, in which the threatened animal may flee, hide, or stay motionless in order to avoid contact

escarpment - a steep slope or long cliff that results from erosion or faulting and separates two relatively level areas of differing elevations

ESRI (Environmental Systems Research Institute, Inc.) - a world leader in GIS (geographic information system) software and technology

essential amino acid - an amino acid that cannot be synthesized by animals and therefore has to be ingested with food

essential fish habitat - under the Magnuson-Stevens Fishery Conservation and Management Act, those waters and substrates that fishes require to spawn, breed, feed, or grow to maturity



This tangle of red mangrove roots in the Jobos Bay, Puerto Rico National Estuarine Research Reserve is an essential fish habitat, serving as a both a nursery area and protection for many marine animals. (Photo: NOAA)

EST (expressed sequence tag) - a small part of the active part of a gene, made from cDNA which can be used to fish the rest of the gene out of the chromosome by matching base pairs with part of the gene. The EST can be radioactively labeled in order to locate it in a larger segment of DNA

establishment - the subsequent growth and/or reproduction of a colonized species in a new territory

ester - a chemical compound formed by the reaction of an organic or inorganic acid with an alcohol, with the elimination of water

esthetasc - a sensory seta covered by cuticle projecting from most antennules and antennae in crustaceans

esthete - a light sensitive organ in a minute vertical canal in the upper layer of the shell plate of a chiton

estimate - the best guess arrived at after considering all the information given in a problem

estimator - in statistics, an estimator is a function of the known data that is used to estimate an unknown parameter

et-epimeletic behavior - behavioral activities which solicit attention, care, or help from other individual; care-soliciting behavior

ethogram - an inventory or catalog of all of the behavioral patterns of an organism or a species

etiology - the science that is concerned with origins and causes of disease

euchromatic - containing euchromatin, the extended regions of chromosomes. These extensions become most dense and thus most visible microscopically during the metaphase of the cell cycle; in a histological preparation, denotes any cell or tissue that stains the color of the stain used

euchromatin - chromosome regions that are loosely packaged and more accessible to RNA polymerases than heterochromatin. These regions also stain differentially in chromosome banding preparations

eudistomins - a family of marine pharmaceuticals, produced by the tunicate *Eudistoma* sp, which holds promise as potent antibiotic and anti-tumor drugs

eukaryotic - descriptive of organisms with cells having a distinct nucleus with nDNA, and intracellular membranes. This includes all protists, fungi, plants and animals. The organisms are termed eucaryotes

eumetazoa - all multicellular animals excluding the sponges

euphotic depth - the depth to which significant phytoplankton photosynthesis can take place. It is typically taken to be the depth at which PAR falls to 1 percent of its value just below the surface

euphotic zone - the layer of the ocean that receives sufficient sunlight for photosynthesis. The depth to which 1% of incident light penetrates (1% is the minimum amount of light required for photosynthesis)

euryhaline - pertaining to an aquatic organism that can withstand a broad salinity range

euryokous - adapted to numerous ecological niches

euryphagous - describes an organism which gains its nourishment from a large variety of foods

eurytele - a type of nematocyst

eurythermal - pertaining to an aquatic organism that can withstand a broad temperature range

eustatic - pertains to world-wide change in sea level, such as that caused by tectonic movements or expansion or contraction of glaciers

eutrophic - a situation in which the increased availability of nutrients such as nitrate and phosphate stimulates the growth of plants such that the oxygen content is depleted and carbon sequestered



Eutrophic conditions can result in large fish kills, as many fish die from reduced levels of oxygen in the water.

evagination - protrusion of some part or organ from its normal position; the act of turning inside out; an outgrowth or protruded part

evanescent - short-lived; temporary; soon disappearing

event - in probability, an event is an occurrence or the possibility of an occurrence that is being investigated

everted - turned inside out

evo-devo (evolutionary developmental biology) - a relatively new approach in biology that seeks to explain the causes biodiversity. It attempts to integrate every area of biology from molecular genetics through embryology, molecular and population genetics, comparative morphology, paleontology, molecular evolution, ecology and functional morphology. It offers both an account of developmental processes and also new integrative frameworks for analyzing interactions between development and evolution. A major challenge lies in integrating these approaches to understand the evolution of biodiversity at a mechanistic level. The "evo-devo" community needs access to genomic information on a wide range of organisms

evolutionarily significant unit (ESU) - a population or group of populations that is considered distinct (and hence a "species") for purposes of conservation under the Endangered Species Act. To qualify as an ESU, a population must 1) be reproductively isolated from other conspecific populations, and 2) represent an important component in the evolutionary legacy of the biological species

evolutionary significant unit (ESU) - a group of organisms that has undergone significant genetic divergence from other groups of the same species. Identification of ESUs is based on natural history information, range and distribution data, and results from analyses of morphometrics, cytogene

evolutionary tree - a lineage designed to show the evolutionary history of relationships among groups of organisms

ex situ conservation - the preservation of components of biological diversity outside their natural habitats, e.g., in zoos, aquaria, botanic gardens and gene banks

exaptation - in evolution, a biological adaptation where the biological function currently performed by the adaptation was not the function performed while the adaptation evolved under earlier pressures of natural selection

excitotoxin - a toxic molecule that stimulates nerve cells so much that they are damaged or killed. For example, domoic acid, a toxin produced by certain species of algae. Domoic acid binds to a receptor that helps nerve cells control the flow of ions across their cell membranes. The receptor no longer works correctly, and the uncontrolled flux of ions damages and eventually kills the nerve cell

Exclusive Economic Zone (EEZ) - the sovereign waters of a nation, recognized internationally under the United Nations Convention on the Law of the SEA as extending out 200 nautical miles from shore. Within the U.S. the EEZ typically is between three and 200 miles from shore

excretion - a physiological process, originating in cells, that removes waste materials produced by the body

excurrent canal - in sponges, an excurrent canal discharges water received from the apopyle, into the spongocoel (atrium). The water then passes through the osculum or oscula to the outside

Executive Order - one of a number of official documents, numbered consecutively, through which the President of the United States manages the operations of the Federal Government

Executive Order 13089 - on June 11, 1998, President Clinton issued Executive Order 13089 directing all agencies to increase their efforts to protect our nation's coral reef resources. The executive order calls for the establishment of a U.S. Coral Reef Task Force, cochaired by the Secretaries of the Interior and of Commerce. The Task Force will develop and implement a comprehensive program of inventory, monitoring, and research to map and identify the major causes and consequences of degradation of coral reef ecosystems

Executive Order 13158 - on May 26, 2000, President Clinton signed Executive Order 13158 on Marine Protected Areas (MPAs) to strengthen the protection of U.S. ocean and coastal resources. This significant milestone in ocean conservation directs the Departments of Commerce and the Interior, and other federal agencies, to strengthen and expand a national system of MPAs by working closely with state, territorial, local, tribal, and other stakeholders

exergonic reaction - a chemical reaction that releases energy

exhalant system - in sponges, part of the aquiferous system between the apopyle and the and osculum

EXIF format - EXIF stands for Exchangeable Image File Format, and is a standard for storing interchange information in image files, especially those using JPEG compression. Most digital cameras now use the EXIF format

exocoel - the spaces of the gastrovascular cavity of cnidarians located between two mesenteries belonging to different pairs

exocrine gland - a gland that secretes its product through a duct

exogenous - having its origin external to the organism or ecosystem

exogenous deoxyribonucleic acid (DNA) - refers to any deoxyribonucleic acid (DNA) which originates outside of the organism of concern or study; also referred to as foreign DNA or heterologous DNA

exon - a nucleotide sequence (of DNA or RNA) in a gene that codes for part or all of the gene product or for some control function. In eukaryotes, exons are separated by non-coding sequences called introns; that part of the gene (a section of DNA) that is transcribed into messenger RNA and encodes a protein

exopinacoderm - the unicellular external surface of a sponge (ectosome composed of pinacocytes)

exopodite - in crustaceans, the outer branch, or ramus, of a biramous appendage; also called "exopod"

exoskeleton - an external skeleton or supportive covering of an animal formed from the ectoderm, as for example, the shell coverings of a crustacean, the calcium carbonate secretions of stony corals, or the bony plates of an armadillo

exothecal dissepiment - a horizontal partition outside of the corallite wall

exothermic reaction - a reaction that gives off heat

exotic species - a non-native species that is introduced into an area; also referred to as alien or invasive species

exozoochory - the dispersal of plant seeds or spores accidentally attached to the outside of an animal's body; also called "epizoochory"

expected value - in statistics, the mean value calculated for a statistic over an infinite number of samples

explanate coral colony - a colony that spreads horizontally as the branches fuse into a solid or near solid plate

exploitation - the removal of individuals or biomass from a population by predators or parasites

exponent - an expression of the number of times that a base is used as a factor

exponential growth - growth in the size of a population in which the rate of growth increases as the size of the population increases; change in a population growth rate that is proportional to the size of the population

exposure - contact with infectious agents such as bacteria or viruses in a manner that promotes transmission and increases the likelihood of disease

exposure suit - a full or partial garment that is worn by scuba divers for protection against heat loss. Water conducts heat away from the body about 20 times faster than air. In addition to providing warmth, exposure suits also serve to protect from minor scrapes, stings and abrasions. There are three kinds of exposure suits: *wet suits*, which allows water to seep in between the insulated rubber covering and the skin. They come in a variety of thicknesses suitable for insulation in water as cold as 50 degrees F; *body suits*, made from Lycra or nylon. They provide full length abrasion protection, but only minimal insulation; and *dry suits* which are water-tight garments that keeps the divers body warm by providing insulation with a layer of gas, such as air. It is used for diving in waters that are too cold for comfortable wet suit protection, usually below 65 degrees F



Arctic diver with rebreather and heated dry suit prepares to descend into the ice. (Photo: NOAA/OAR/National Undersea Research Program)

extant - of a taxon: having living representatives; of a specimen: still in existence

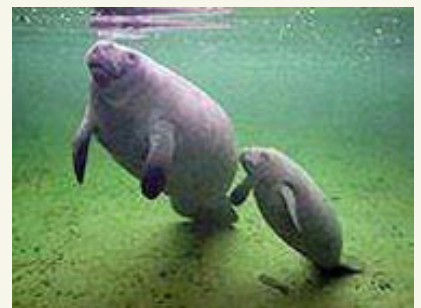
extant species - species which are now living

exteroreceptor - a neurological receptor that receives information from the environment external to the organism

extinct - of a taxon: having no living representatives.

extinct species - species for which there are no living representatives

extinction - the evolutionary termination of a species caused by the failure to reproduce and the death of all remaining members of the species; the natural failure to adapt to environmental change



Manatees are threatened with extinction from both habitat destruction and direct effects from human encroachment, such as serious wounds from boat propellers.

extinction coefficient - a coefficient measuring the rate of extinction, or diminution, with distance of transmitted light in sea water

extirpated species - a species that has been destroyed or removed completely from a particular area, region, or habitat. The species, however, may exist elsewhere, e.g., in a zoo or aquarium

extra- - outside, beyond

extra-embryonic membrane - membranes possessed by amniote (reptiles, birds, and mammals) embryos that allow these classes of vertebrates to be free of aquatic habitats for reproduction, and in their evolution, occupy terrestrial habitats. The membranes are the amnion, yolk sac, allantois and chorion

extracellular digestion - a form of digestion that takes place within the lumen of the digestive system. The resulting nutrient molecules are transferred into the blood or body fluids through the process of absorption

extratentacular budding - an asexual form of reproduction where daughter corallites grow from the outside wall of the parent corallites

extreme environment - an environment characterized by extremes in growth conditions, including temperature, salinity, pH, among others



Crowded life in an extreme environment *Riftia* tubeworms, mussels, and scavenging crabs found at a hydrothermal vent site in the Pacific Ocean. Most hydrothermal vents are found at an average depth of about 2,100 meters (7,000 ft) in areas of seafloor spreading along the Mid-Ocean Ridge system. (Photo courtesy of C. Van Dover.)

extremophile - a microorganism that lives at extreme levels of pH, temperature, pressure or salinity

extrinsic - not forming an essential part of a thing; arising or originating from the outside

extrinsic factor - a biotic or abiotic factor acting on an organism or population from outside the organism or population. These are the physical and chemical features of the environment, as well as other organisms

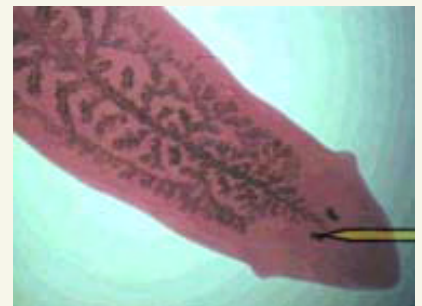
exumbrella - the upper surface of the bell of a medusa or jellyfish



The rounded upper surface of this jellyfish is the exumbrella.

Eye-in-the-Sea - a video camera capable of operating in deep water (up to 3,000 ft) for days at a time. It is mounted within a steel structure and anchored to the seafloor by its own weight

eyespot - any light-sensing structure in some primitive organisms that consists of a pigmented area and light sensitive cells; also called an ocellus



Eyespots of a free-living flatworm, *Planaria dugesia*.

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: F

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

facies - a geographical variant of a community, or a variant which includes a conspicuous or abundant species not present in the main community; all of the characteristics of a particular rock unit. The characteristics of the rock unit come from the depositional environment, which puts its own distinctive imprint on the sediment, making a particular facies. Thus, a facies is a distinct kind of rock for that area or environment

facultative - able to exist under more than one set of environmental conditions. For example, a facultative parasite may exist either as a parasite or as a saprotroph (gaining nutrients from dead organic matter)

facultative mutualism - mutualism in which one or both species in the association may survive and maintain populations in the absence of the other species

Fagatele Bay National Marine

Sanctuary - Fagatele Bay, located on Tutuila, the largest island of American Samoa, was designated as a National Marine Sanctuary in 1986. It is the smallest and most remote of all the national marine sanctuaries encompassing only 163 acres (.25 sq. mi.). Fagatele is the only true tropical coral reef in the National Marine Sanctuaries Program



Fagatele Bay, a National Marine sanctuary in American Samoa. (Photo: NOAA)

faginism - cannibalism by adults on their young

Fahrenheit temperature scale - a thermometric scale on which the freezing point of water is at 32 degrees F (Fahrenheit) above the 0 degree (F) mark on the scale, and the boiling point of water is at 212 degrees F

falcate - scythe-shaped



Falcate-shaped dorsal fin of an *Orca Whale*. (Photo: Robyn Angliss, NOAA/NMML)

falciform - curved like a long, narrow scythe

falcluate - a shape that is curved and sharp-pointed, like a claw

family - a taxonomic group containing one or more genera

fan palm - the only species of tree (*Pritchardia remota*) on the island of Nihoa in the Northwestern Hawaiian Islands



The fan palm is the only species of tree on the island of Nihoa, in the Northwestern Hawaiian Islands. (Photo: Sheila Conant)

FAQ (Frequently Asked Questions) - documents that list and answer the most common questions on a particular subject

farctate - a filled or solid structure, as opposed to one that is tubular or hollow

faro - a rhomboid-shaped, steep-sided, continental shelf atoll

fat - a triglyceride (lipid) that is usually solid at room temperature

fathom - is a unit of length often used to measure depth of water and is equivalent to 6 feet or 1.8 meters

fathometer - an instrument for measuring underwater depth using sound

fatty acid - any of a class of saturated aliphatic monocarboxylic acids that form part of a lipid molecule; a product of fat hydrolysis

fault - a crack or fracture in the Earth's crust accompanied by a displacement of one side of the fracture. Movement along the fault can cause earthquakes or, in the process of mountain-building, can release underlying magma and permit it to rise to the surface



An aerial view of the San Andreas fault in the Carrizo Plain, Central California. (Photo: US Geological survey)

fault zone - an area in which there are several closely spaced faults

fauna - the entire group of animals found in an area

feather star - feather stars are echinoderms in the class Crinoidea. The juveniles attach to the substrate by a stalk with rootlike branches. The mouth side faces upward. In the adult stage they break away from the stalk and move about freely. They possess appendages, known as cirri, attached to the underside of the body with which they cling to sponges or corals. Some can swim by undulating movements of the arms. Some have five arms, others up to 200



Feather stars are very mobile, but usually they cling by their cirri to sponges or corals. They are very abundant in areas exposed to strong currents, because they feed on plankton. (Photo: Teresa (Zubi) Zuberbühler (www.starfish.ch))

feces - egested undigested food wastes

fecundity - the productiveness or potential productiveness of an organism, measured in the number of viable offspring it may produce; the number of eggs an animal produces each reproductive cycle; the potential reproductive capacity of an organism or population

Federal Geographic Data Committee (FGDC) - coordinates the development of the National Spatial Data Infrastructure (NSDI). The NSDI encompasses policies, standards, and procedures for organizations to cooperatively produce and share geographic data. The 17 federal agencies that make up the FGDC are developing the NSDI in cooperation with organizations from state, local and tribal governments, the academic community, and the private sector

Federal Information Processing Standards (FIPS) codes - a standardized set of numeric or alphabetic codes issued by the National Institute of Standards and Technology (NIST) to ensure uniform identification of geographic entities through all federal government agencies. The entities covered include: states and statistically equivalent entities, counties and statistically equivalent entities, named populated and related location entities (such as, places and county subdivisions), and American Indian and Alaska Native areas

Federal waters - generally waters from 3 - 200 miles offshore

feeding guild - a group of unrelated fishes that feed on similar foods, e. g., benthivore, detritivore, herbivore, insectivore, omnivore, planktivore, piscivore, etc

feral - existing in a wild or untamed state. The term is often used to describe an animal which has reverted to such a state from domestication. An example of the latter is a once farmed fish, or the progeny of a farmed fish, which is living (but not necessarily breeding) in a wild state

fermentation - the anaerobic breakdown by microorganisms of complex organic substances, especially carbohydrates, to CO₂ and alcohol; fermentation is also used to describe the process by which various chemical or pharmaceutical compounds can be made in large tanks, called fermenters, that contain microorganisms or plant or animal cells, and the nutrients they require to live and grow

fermi - unit of length equal to one quadrillionth of a meter

ferruginous - rust color

fertilization - the process where a spermatozoan (sperm cell) penetrates the cell membrane of an egg cell and the nuclei of the sperm and egg cells join together and their chromosomes combine to form a diploid zygote

fetch - the uninterrupted distance over which the wind blows (measured in the direction of the wind) without a significant change of direction

fibrillose - covered with or containing fibrils

fibropapillomatosis - a fibroepithelial tumor, probably caused by a herpes-type virus, found in juvenile, subadult, and adult sea turtles, causing them to be emaciated, weak, depressed, and anemic. Affected turtles may have flotation problems resulting from fibrous tumors in the lungs. Fibrous tumors are also found in visceral sites, such as liver, lung, kidney and gastrointestinal tract.

fide - on the authority of, according to, with reference to a publication or to a cited published statement

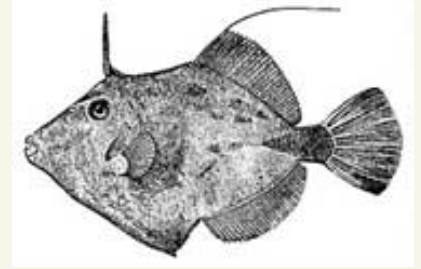
field guide - a pocket-size book or a CD containing taxonomic keys for identification, illustrations and/or photographs of organisms, distribution maps, and some natural history notes

field research - the study of organisms in their natural habitat

fila - a thread-like structure, a filament

filamentous - slender and/or threadlike

filefish - any species of bony fishes in the family Monacanthidae. The body of filefishes is laterally compressed and roughly diamond-shaped in profile. The filefish gets its name from its very rough skin. The first dorsal fin is essentially a single sharp spine which



The plainhead filefish, *Monacanthus hispidus*, a common inhabitant of coral reefs and seagrass beds in the tropical Atlantic. Strays are often found as far north as New England. (Photo: NOAA)

filial - an offspring generation

filiform - thread-shaped

filiform tentacle - a long, thin tentacle of a hydrozoan polyp, usually concentrated toward the base

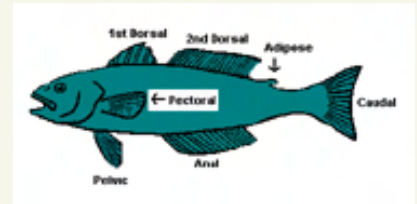
filter feeder - an organism that feeds by capturing particles suspended in the water column. A synonym of suspension feeder.

fimbriate - a structure that is fringed at the margin



The papillae of this scorpion fish possess a fimbriate appearance.

fin - organ of locomotion and balance in fishes and some other aquatic animals; in fishes, fins are of two types: paired (pectoral and pelvic fins) and unpaired or median (dorsal, adipose, anal, and caudal fins and finlets). Fins of bony fishes contain hard spines and/or soft rays, which may be jointed and branched. The spines and rays are covered by integument. Counts of spines and rays are used as diagnostic characters in fish taxonomy; a membranous, finlike, swimming organ, as in pteropod (having the anterior lobes of the foot modified so as to form a pair of winglike swimming organs), and heteropod (where the foot developed into a median fin) mollusks



Drawing of a bony fish that shows the locations of the median and paired fins. (Graphic: Cristi A. Cave, Stream Biology and Ecology)

fin (scuba) - a rubber or plastic shoe-like device attached to the feet to increase surface area for greater thrust while swimming; they may be open heeled or full-footed. Scuba divers prefer the open heel style, usually worn with booties



Open heel SCUBA fins with mask and snorkel. This type of adjustable-strap fin is worn over neoprene booties.

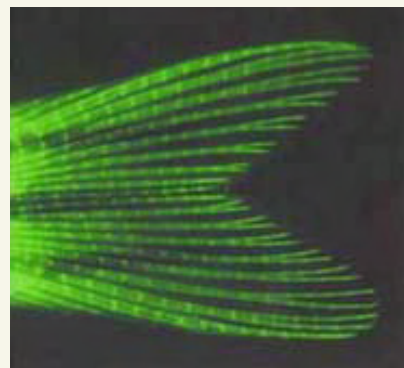
fin membrane - the thin membrane between and connecting fin rays and spines of fishes



Note the thin fin membrane stretched between the hard spines and soft rays of the

sergeant major, *Abudefduf septemfasciatus* (Photo: John E. Randall, Ph.D.)

fin ray - a slender, rod-shaped structure that supports the membranes of the fins of fishes. There are two types of rays, soft rays and spines. Soft rays are jointed, often branched, and flexible near their tips. Spines are unjointed, unbranched, and usually sharp at the tip and stiff along the shaft



Caudal fin of a fish. The fin is stained with the vital dye calcein which colors calcium/calcified bone matrix. Note the soft segmented fin rays. (Photo: Dr. M. Kathy Lovine, Washington University, St. Louis, MO)

fine sediment - a sediment composed of fine-grained materials, such as clay or mud particles

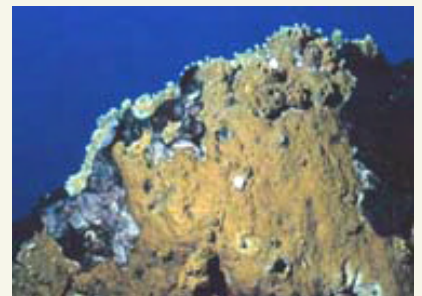
fingerling - a young or small fish

finlet - one of several small non-retractable fins located dorsally and ventrally between the second dorsal and anal fins and the caudal fin of scombroids (mackerals, tuna) and some other fishes, e. g., sauries and snake mackerals. Finlets appear to have a hydrodynamic function in fishes that have been studied for this character



A series of small finlets between the dorsal and anal fins and the tail of a bluefin tuna. (Photo: NOAA)

fire coral - a species of hydroid (*Millepora* sp.) that frequently is brownish to orange-yellow in color and forms encrusting colonies that can assume the shape of its support structure. Their nematocysts release a virulent toxin which causes painful welts on human skin. Fire corals are not true corals (see Hydrozoa)



Fire coral in the Flower Garden Banks National Marine Sanctuary (Photo: Jackie Reid)

fire wall - a combination of hardware and software that separates a network into two or more parts for security purposes

first revisor - in zoological nomenclature, the person who first selects one of two or more simultaneously published names that he or she believes represent the same taxon, or who selects which one of two or more taxa the name will apply to for which identical names have been simultaneously published; also applies to first selection of multiple original spellings

First Revisor (Principal of) - the principle that the relative precedence of two or more names or nomenclatural acts published on the same date, or of different original spellings of the same name, is determined by the first reviser

first stage regulator - attached to the scuba tank, the first stage regulator reduces the high tank pressure to an intermediate pressure of 100 to 150 psi above the surrounding water pressure



The first stage regulator is attached to the scuba tank. (Photo: NOAA/ National Undersea Research Program)

firth - a partly land-locked arm of the sea

FISH (fluorescence *in situ* hybridization) - hybridization of cloned DNA to intact chromosomes, where the cloned DNA has been labelled with a fluorescent dye. This is the major method of physical mapping of cloned DNA fragments on chromosomes

Fish Barcode of Life (Fish-BOL) Initiative - a global effort to coordinate an assembly of a standardized reference sequence library for all fish species, one that is derived from voucher specimens with authoritative taxonomic identifications. The benefits of barcoding fishes include facilitating species identification for all potential users, including taxonomists; highlighting specimens that represent a range expansion of known species; flagging previously unrecognized species; and perhaps most importantly, enabling identifications where traditional methods are not applicable. This effort is creating a valuable public resource in the form of an electronic database containing DNA barcodes, images, and geospatial coordinates of examined specimens. The database contains linkages to voucher specimens, information on species distributions, nomenclature, authoritative taxonomic information, collateral natural history information and literature citations

fish census - the collection of data over time concerning the species of fishes in an area, their relative abundances, and population densities

fish kill - the sudden death of fishes due to the introduction of pollutants, toxic blooms, or the reduction of the dissolved oxygen concentration

fish louse - a parasitic crustacean on marine and freshwater fishes

FishBase - a repository of available information on the taxonomy, biology, ecology, occurrence and utilization of fishes. It holds published information on almost all of the estimated 25,000 existing fish species. The information is arranged in 55 subject tables. It can be accessed through the Internet (<http://www.fishbase.org>) or installed on a PC from a CD-ROM. At the heart of FishBase is the authoritative taxonomic fish classification established by W.N. Eschmeyer (California Academy of Science). It ensures that all information is assigned to current scientific names, even if a publication uses an outdated name

fisher - anyone involved in the harvesting, processing, or marketing of fishes or shellfish

fisherman - a person, male or female, who harvests fishes or shellfish

fishery - all the activities involved in catching a species of fish (or other aquatic organisms) or a group of species; the sum of all fishing activities on a given resource, e.g. a shrimp fishery, or activity of catching fish from one or more stocks, e.g. the North Sea cod fishery, or it may also refer to a single type or style of fishing, e.g., trawl fishery

fishery closure area - a fishery which is closed or restricted by a government entity. Such closure prohibits fishing for commercial, recreational, or subsistence purposes

Fishery Conservation and Management Act - the federal law that created the regional councils and is the federal government's basis for fisheries management in the EEZ. Also known as the Magnuson Act after a chief sponsor, Senator Warren Magnuson of Washington State

fishery management council - a regional, quasi-governmental group with authority to manage fisheries in federal waters, generally from three to 200 miles offshore

fisheye lens - an ultra-wide angle lens giving 180o angle of view. The widest fisheye lenses produce a circular and very distorted image

fishing mortality - deaths in a fish stock caused by fishing

fissure - a deep and narrow depression cutting across the reef front with origins relating to jointing planes in the reef limestone or non-limestone bedrock

fistula - an abnormal passage between two organs or between an organ and the outside of the body. Fistulae are caused by ulceration, congenital malformation, or when damaged tissues come into contact with each other and join together while healing

fistule - in sponges, a tubular structure on the upper surface, upon which the osculum is situated. A fistule is frequently found on species that burrow into mud or excavate coral

fitness - the potential evolutionary success of an allele or genotype, which is defined as the reproductive success or the proportion of genes that an individual leaves in the gene pool of a population (expected contribution to future generations). The individuals with the greatest fitness leave the largest numbers of offspring. The fitness of genes and organisms is always relative to the other genes and organisms that are present in the same population

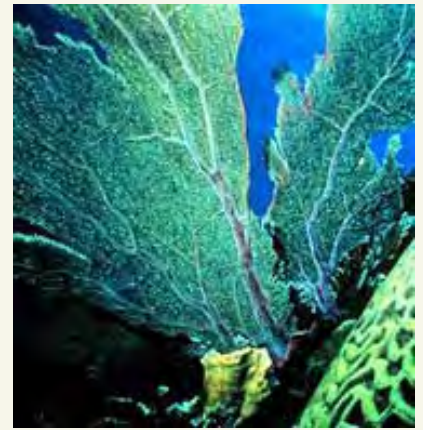
fitness landscape - in evolutionary biology, fitness landscapes are used to visualize the relationship between genotypes (or phenotypes) and reproductive success. It is assumed that every genotype has a well defined replication rate (often referred to as "fitness") This fitness is the "height" of the landscape. Genotypes which are very similar are said to be "close" to each other, while those that are very different are "far" from each other. The two concepts of height and distance are sufficient to form the concept of a "landscape". The set of all possible genotypes, their degree of similarity, and their related fitness values is then called a fitness landscape; also called "adaptive landscape"

five prime and three prime ends (5' and 3' ends) - a double stranded DNA (the double helix) always has an orientation or directionality. Because of this directionality, the nucleotides along one strand are heading in one direction (e.g. the 'ascending strand') and the others are heading the other (e.g. the 'descending strand'). For reasons of chemical nomenclature, the asymmetric termini of each strand are called the 5' and 3' ends (pronounced "five prime" and "three prime"). Nucleotide sequences are read by enzymes in the "5' to 3' direction". In a vertically oriented double helix, the 3' strand is said to be ascending while the 5' strand is said to be descending

fixed action pattern - in ethology or animal behavior, a complex behavioral response which once released by a key stimulus, runs to completion. It is performed in a very similar way by its individual members; also called "modal action pattern" because of individual variations in behavior

fjord - a deep-water inlet, carved out by glacial action and usually surrounded by mountains or steep slopes

flabellate - fan-shaped



A flabelliform Gorgonia
(Photo: NOAA)

flabelliform - fan-shaped

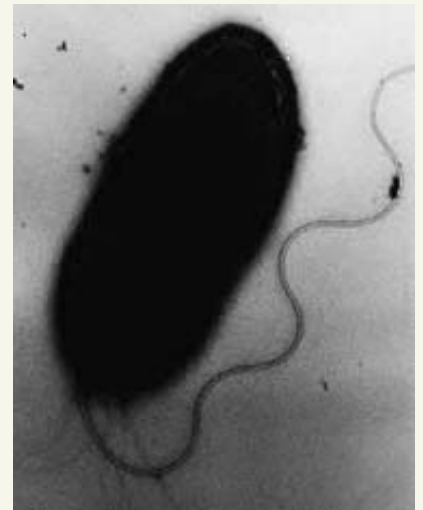
flaccid - limp, flabby, lacking in firmness

flagellate - a unicellular protist with one or more flagella, a whip-like organelle often used for propulsion; having or resembling a lash or whip (as does a flagellum)

flagellated chamber - in sponges, an internal cavity that is lined with choanocytes

flagelliform - whip-shaped

flagellum - a whip-like appendage used for locomotion in sperm cells and some bacteria, fungi, and protists



A bacterium with a whip-like flagellum. (Photo: U.S. National Institutes of Health)

flagship species - popular, charismatic, socially appealing species that serve as symbols and rallying points to evoke public sympathy and stimulate conservation awareness and action. Whales, seals, sea lions, and marine turtles are flagship species

flange - a projecting rim

flaring corallite - a corallite with expanding, trumpet-like curves to the outer corallite wall

flat - very shallow and still water, usually with a sand or mud bottom

flatfish - any fish species in the order Pleuronectiformes, which includes flounders, flukes, dabs, halibuts, plaice, soles, and turbot. All flatfishes have an unusually compressed body form adapted to life on the bottom. As the bilaterally symmetrical immature forms develop, one eye migrates to either the left or right side, depending upon the species. The body compresses laterally with changes in the skeletal and internal organ systems, and the animal rests on either its left or right side. The side on the bottom is pale, while the other side is strongly pigmented. Some species are able to change their pigmentation to match the appearance of the bottom

flavescent - yellowish color

flipper - the phenomenon in which the sex of the offspring is determined by environmental factors

flock - a socially coordinated group of birds

flood tide - the phase of the tide between low water and the subsequent high tide; a rising tide

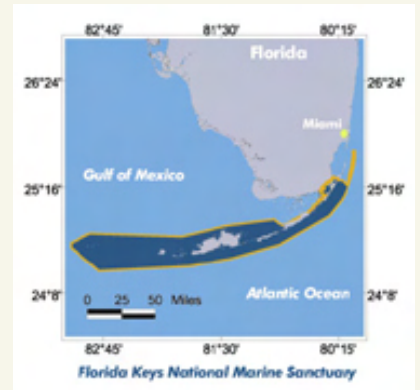
floodplain - a lowland along a riverbank, lake, and coastline which is subjected to periodic inundation

flora - the entire group of plants found in an area

Florida Current - the segment of current between the Gulf of Mexico Loop Current and the Gulf Stream, from the Dry Tortugas to the southeastern tip of Florida, and confined by the 250 meter and 500 meter isobaths

Florida Keys National Marine Sanctuary

- the Florida Keys National Marine Sanctuary was designated as a national marine sanctuary in November of 1990. The Florida reef tract is the most extensive living coral reef system in North American waters and the third largest barrier reef system in the world. The sanctuary extends 220 miles in a northeast to southwest arc between the southern tip of Key Biscayne, south of Miami, to beyond, but not including the Dry Tortugas Islands



The Florida Keys National Marine Sanctuary.
(Graphic: NOAA)

Florida Reef Tract - the third largest barrier reef in the world, running from the Miami area southwest to the Dry Tortugas

floridean starch - a carbohydrate which is the chief food reserve in red algae (Rhodophycota). It is a branched polymer of glucose similar to amylopectin of green plants. It occurs as granules in the cytoplasm

floriform - flower-shaped

flotsam - wreckage or discarded material, e.g. garbage, found floating on the surface of the ocean or washed up on the beach



Seahorses caught in flotsam off the Colombian/Panamanian coast. (Photo: NOAA)

flow cytometry - a technique used to sort cells or other biological materials by means of flow through apertures of defined size or by laser sorting

Flower Garden Banks National Marine Sanctuary - the Flower Garden Banks National Marine Sanctuary was designated as a national marine sanctuary on January 17, 1992. The sanctuary is located about 110 miles off the coasts of Texas and Louisiana, and harbors the northernmost coral reefs in the United States and serves as a regional reservoir of shallow water Caribbean reef fishes and invertebrates.

The coral reefs rise to within 66 feet of the surface. The area containing both the East and West Banks is 41.7 square nautical miles in size and contains 350 acres of reef crest. In October 1996, Congress expanded the sanctuary by adding a small third bank, Stetson Bank, located about 70 nautical miles south of Galveston, Texas.

Environmental conditions at Stetson Bank do not support the establishment and growth of coral reefs



Graphic depicting location of the Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico.

fluctuating asymmetry (FA) - a pattern of small, random deviations between sides in the size of a given trait - the random component of bilateral asymmetry, i.e., subtle random deviations from perfect bilateral symmetry. It arises when genetic or environmental stressors disrupt developmental processes that normally promote symmetrical growth. Fluctuating asymmetry is of particular interest because of its potential as a biomonitor of environmental quality. It is a relatively new tool for assessing the impact of environmental and genetic stresses on populations. One of the main advantages of FA is its increased sensitivity relative to other bioindicators. If effective, this tool could allow biologists to monitor populations and make recommendations before a severe problem arises, often without the high cost of other solutions

fluorescence - the emission of light from a substance caused by exposure to radiation from an external source

fluorescent pigment - a pigment that absorbs light at one wavelength and emits it at a different wavelength. The emitted light usually has a lower energy than the light absorbed by the pigment

fluorometer - an instrument for measuring fluorescence

flushing - the exchange of water between an estuary or coastal waterway and the ocean

flushing time - the time required for a waterbody, e.g., an inlet, estuary, marina, etc. to exchange its water with water from the parent waterbody

fluting - grooves in the shaft of a column

flux - the rate of flow of energy or particles across a given surface

flyway - a broad-front band or pathway used in bird migration

focal species - the species that is identified as being most sensitive to a threat in a changing environment. Species are being lost from areas in which their habitats are being destroyed, fragmented or simplified. Focal species can be used to identify the appropriate spatial and functional parameters that must be present in an environment if it is to retain the biota that occurs there

foliaceous - leaf-like; also foliose



Foliaceous coral. (Photo: NOAA)

foliform - leaf-shaped

foliose coral - a coral whose skeletal form approximates that of a broad, flattened plate

food chain / food web - all the interactions of predator and prey, included along with the exchange of nutrients into and out of the ecosystem. These interactions connect the various members of an ecosystem, and describe how energy is converted and passes from one organism to another

food pyramid - pyramid-shaped diagram which shows feeding relationships within a food chain, e.g. that herbivores are smaller, more numerous and faster breeding than the predators that feed on them

foot - in mollusks, the structure found on the animal's ventral side, that consists primarily of muscle, and is modified for locomotion, food gathering, and digging

forage - to search for food

forage fishes - small fishes which occur in large numbers and serve as food for predatory fishes

foramen - an opening in a structure

Foraminifera - planktonic and benthic protozoan protists that have a test (shell) composed of calcium carbonate



These foraminiferans have a test composed of calcium carbonate. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

fore reef - the portion of a reef seaward of reef crest. A synonym of reef slope

fore reef escarpment - a slope or cliff seaward of the fore reef terrace, at a depth of about 25-30m

fore reef slope - a sand covered, gradual or sharply descending slope; the next-to-deepest part of the fore reef

fore reef terrace - the uppermost portion of the fore reef; a flat plain beginning at the base of the buttress or mixed zone, at a depth of about 60 m

foreign DNA - refers to any deoxyribonucleic acid (DNA) which originates outside of the organism of concern or study; also referred to as exogenous DNA or heterologous DNA

foreign fishing - fishing by a foreign (non-U.S.) fishing vessel (Magnuson-Stevens Fishery Conservation and Management Act)

formal metadata - metadata that follows an FGDC approved standard

formalin - formaldehyde gas dissolved in water. Formalin is used as a fixative and preservative in some collections of biological specimens

formenkreis - a group of related allopatric species or subspecies

fossa - a hole or cavity in the coral skeleton

fossorial - adapted for a digging or burrowing life style or behavior

founder effect - in evolution, the effect of establishing a new population by a small number of individuals, carrying only a small fraction of the original population's genetic variation. As a result, the new population may be distinctively different, genotypically and phenotypically, from the parent population from which it is derived. In extreme cases, the founder effect is thought to lead to the speciation and subsequent evolution of new species

foveolate corallite - a corallite of some species which is located at the base of a funnel-shaped depression

FRA (Fish Replenishment Area) - a designated area, within a Fisheries Management Area (FMA), where certain specified fish harvesting activities are prohibited

fractal - the smallest part of a mathematical set of numbers which when repeated or scaled will maintain the primary permutation; an object which is self-similar at all scales. Regardless of scale the same level of detail and appearance is present

fractal geometry - a method to study shapes that are self-similar over many scales

fragile - easily broken

fragmentation - a type of asexual reproduction common in branching corals. Branches break off from the parental colony to establish other colonies nearby

framework - a rigid, wave resistant calcareous structure constructed by sessile organisms such as sponges, corals, and bryozoans, in a high energy environment

free - unconstrained or not chemically bound in a molecule or not fixed and capable of relatively unrestricted motion

free dive - diving without the assistance of any breathing apparatus, such as scuba

free energy - the usable energy in the bonds of a molecule; energy that is available to do useful work. A decrease in free energy accompanies any spontaneous process

free radical - an atom or group of atoms possessing an unpaired electron; free radicals are highly reactive and bind with other molecules, thus disrupting normal cellular processes and causing cellular damage (oxidative stress)

free-living coral - a coral which is not attached to a substrate

freely associated state - an "associated state" is used to describe a free relationship between a territory and a larger nation. The details of an association are specific to the countries involved. This is also known as "free association." The Federated States of Micronesia, the Republic of Palau, and the Republic of the Marshall Islands are associated with the United States under what is known as the Compact of Free Association. Under this relationship the states possess international sovereignty and ultimate control over their territory. However, the governments of those areas have agreed to allow the United States to provide defense, funding grants, and access to US social services for citizens of these areas

French Frigate Shoals - an open atoll in the Northwest Hawaiian Islands (NWHI) that consists of a large, crescent-shaped reef surrounding numerous small, sandy islets. While the land area is only one-fourth square kilometer (67 acres), the total coral reef area of the shoals is over 938 square kilometers (232,000 acres). The reef system associated with French Frigate Shoals supports the greatest variety of coral species in the NWHI, with 41 species of stony corals documented. It also supports more than 600 species of invertebrates, many of which are endemic to the area, over 150 species of algae, and many species of fishes. Hundreds of green sea turtles travel to the shoals for safe nesting. The many small islets of French Frigate Shoals also provide refuge to the largest sub-population of endangered Hawaiian monk seals



Sponges in French Frigate Shoals reef. (Photo: NOAA)

frequency - the number of items occurring in a given category

frequency - the number of cycles of a wave per second. Frequency is expressed as units of Hertz (Hz)

frequency distribution - a graphical, tabular, or mathematical representation of the manner in which the frequencies of a continuous or discrete random variable are distributed over the range of its possible value

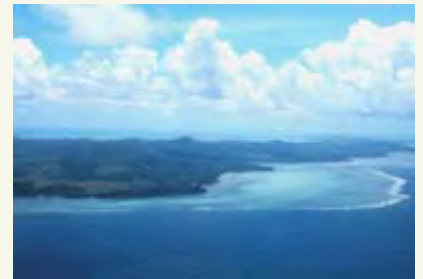
frequency of recombination - the number of crossover events observed between two linked loci expressed as a proportion of the total number of meioses sampled

freshwater lens - an underground pool of freshwater that takes the shape of a lens. Lenses are critical sources of fresh water on many islands. The freshwater lens is suspended by seawater. For example, when rain falls on a limestone island, it quickly sinks into the porous calcareous rock, picking up a mineral content from the organic material, soil and rock that it passes through. This water accumulates within the rock, continuing it's downward path. Eventually, it meets the layer of salt water that permeates limestone platforms at sea level. Because fresh water is less dense than salt water, the lens of fresh water will float on top of the saline groundwater. In many areas, this lens is very thin. If the sea level increases and/or if the lens becomes depleted because of excess withdrawals, seawater can intrude and make the water unsuitable for many uses. The size of the lens is directly related to the size of the island. Larger islands have lenses that are less vulnerable to tidal mixing and excessive withdrawals

friction - the mechanical resistive force offered by one medium or body to the relative motion of another medium or body in contact with the first; also called "frictional force"

frictional drag - the molecular (viscous) retarding force on an object, such as air, as it moves across the earth's surface

fringing reef - a shelf reef that grows close to shore. Some develop around oceanic islands. A synonym of shore reef



A fringing reef off a South Pacific Island.

frogfish - any of over 40 species of bony fishes in the family Antennariidae. They are small globose fishes with loose prickly skin, limb-like pectoral fins with an elbow-like joint, small round gill openings, and a very large upward directed mouth. The first dorsal spine is modified into a moveable fishing rod (Illicium) tipped with a lure (esca)



Closeup of a pink frogfish perched on a purple sponge (Photo: Jeff Dawson)

frond - a leaf-like thallus, such as the body of a kelp

front - a boundary or transition zone between two air or water masses of different properties

frontal threat display - agonistic display behavior in which a fish faces another fish and flares its gill covers (opercula) and opens its mouth wide. This behavior may indicate aggression, territoriality or self defense (by making it appear too large to attack or eat)

frugivore - an animal which primarily eats fruit

frustule - a nonciliated, planula-like cnidarian larva. It constricts off from a polyp, creeps along the substrate, settles, and develops into a polyp; the siliceous shell of a diatom

fry - newly hatched, active feeding post larval fishes; may include all fish stages from hatching to fingerling

fucoid - seaweed-shaped

fucosyltransferase inhibito - a suspected antiinflammation and antitumor compound isolated from marine sponges in the genus *Sarcotragus*

full thickness - in histopathology, a lesion, wound or process that involves all layers of tissues in a structure. For example in the body wall of a polyp, the epidermis, mesoglea, and gastrodermis ; also called "transmural"

fulvous - dark yellow, orange-yellow

fulvous - dull yellow color

fundamental niche - the full range of physical, chemical, and biological factors a species could use if there were no competition from other species

Fungi - the Kingdom of usually multicellular, heterotrophic eukaryotes that have multinucleated cells enclosed within cell walls. Nutrition is obtained by decomposing dead and dying organisms and absorbing the decomposition products



Fungi growing in an Oregon woodland. (Photo:

fungicide - a chemical compound used to retard or prevent the growth of fungi

funnel organ - a structure, common in several phyla, that leads from the coelom to the outside and may be used for waste elimination and/or reproduction (Annelida, Brachiopoda, and other small phyla); the modified tubular opening of the mantle cavity in cephalopods used in generating a stream of water for use in locomotion

furcate - to divide into branches; to fork

fusiform - a shape that is tapered at both ends; spindle-shaped; torpedo-shaped, like a mackerel

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: G

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

G1 - phase in the cell cycle between the completion of cell division and the initiation of DNA synthesis

G2 - phase in the cell cycle between the completion of DNA synthesis and the next cell division

Ga - symbol for one billion (10⁹) years. The a stands for the Latin annus, year

Gaia theory - a model in which the organisms on the Earth have radically altered its composition. A stronger position is that the Earth's biosphere effectively acts as if it is a self-organizing system, which works in such a way as to keep its systems in some kind of equilibrium that is conducive to life

gale - a storm with wind speeds between 34 to 40 knots

galeiform - helmet-shaped

gall - an abnormal outgrowth caused by infection or irritation by certain fungi or bacteria

game species - species of animals that are hunted or fished, for purposes of sport, recreation, and food capture

gamefish - a species of fish considered to possess sporting qualities on fishing tackle

gamete - a sex cell, e.g., a spermatozoan or egg cell, produced by sexually reproducing organisms

gamete bundle - in coral sexual reproduction, the polyps of many species release bundles of eggs and sperm cells, called gamete bundles, that float to the sea surface. The layers surrounding the egg and sperm bundles soon rupture, releasing the gametes at the surface, where fertilization occurs

gametocyte - a reproductive cell capable of dividing by meiosis to produce gametes, e.g., a spermatocyte or oocyte

gametogenesis - the development and maturation of gametes (sex cells) through meiosis. The process is termed 'spermatogenesis' in the development of sperm cells and 'oogenesis' in the development of egg cells

gametophyte - a life cycle stage in certain algae that produces male and female reproductive organs

gamma ray - an electromagnetic wave or photon emitted from the nucleus

gamodeme - a deme forming a more or less isolated local intrabreeding community

ganglion - a cluster of nerve tissue primarily composed of cell bodies of neurons, usually located outside of the central nervous system; a knotlike swelling of an invertebrate's nerve cord that contains a concentration of coordinating nerve cells

gap analysis - a Geographic Information System (GIS) methodology to identify the distribution of biodiversity over large spatial areas. It was developed in 1988 by the U.S. Geological Survey in an effort to ensure that regions rich in species diversity are conserved with the hope that this will eliminate the need to list species as threatened or endangered in the future. The gap analysis approach uses maps of vegetation and predicted animal distributions to locate centers of species richness outside areas currently managed for biodiversity protection. These are considered the "gaps" of gap analysis. Thus far, its use primarily has been in the terrestrial sphere

gap dynamics - the formation and replacement of patches or gaps in a seascape or landscape, as in the destruction of corals and growth of new corals in that opening

gap formation - the creation of a habitat patch of different characteristics within a larger patch; the generation of patches in a seascape or landscape, such as the generation of openings in a coral reef as a result of storm damage or coral death

gap junction - a junction between certain animal cell types that allows different molecules and ions (small intracellular signaling molecules) to pass freely between cells. The junction connects the cytoplasm of the cells. One gap junction is composed of two hemichannels which connect across the intercellular space, one from each cell. They are analogous to plasmodesmata that join plant cells; also called "nexus"

gap phases - the phases of the cell cycle known as G1 and G2, during which relatively less obvious cellular activity is visible

gape - the measurement of the widest opening of a mouth; to open the mouth wide; yawn; an opening

garden eel - a family of eels (Heterocongridae) that occur in colonies in the sandy bottoms adjacent to coral reefs, where they live individually in burrows from which they protrude to feed on plankton. From a distance these eels resemble a field of seagrass. They are very shy and disappear into their burrows at the approach of a potential predator



Red Sea garden eels (Gorgasia sillneri) in Hurghada, Red Sea. Garden eels live in colonies in sandy bottoms adjacent to coral reefs. They live individually in burrows from which they protrude to feed on plankton. (Photo: Thomas Jundt)

gas - a major state of matter consisting of freely moving atoms and molecules with no definite shape or volume, like air

gas chromatograph/mass spectrometer (GC/MS) - an instrument that identifies the molecular composition and concentrations of various chemicals in water and soil samples

gas chromatography - a method of separating chemical components of a mixture, which involves the passage of a gaseous sample through a column having a fixed adsorbent phase

gas hydrate - see "methane hydrate"

gas laws - laws that predict how gases will behave with changes in temperature, pressure, and volume

gastric - pertaining to the stomach

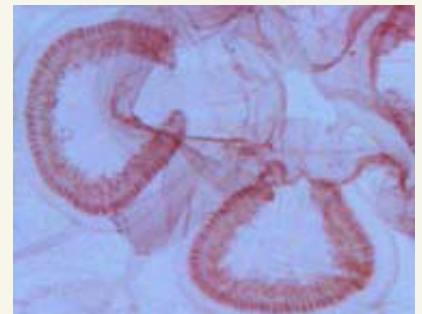
gastric filaments - in scyphozoan medusae, a fringe of short, threadlike filaments whose secretory cells secrete digestive enzymes. They are located on the floor of each gastric pouch

gastric mill - the grinding apparatus in the cardiac stomach of crustaceans. It is formed by three chitinous teeth that project into the stomach; the thick-walled muscular pouch below the crop in many birds and reptiles, used for grinding food



Gastric mill and teeth within the stomach of a grooved tanner crab (*Chionoecetes tanneri*). (Photo: NOAA)

gastric pouch - in scyphozoans (jellyfish), one of four sacs in which food is digested. Each pouch contains a conspicuous horseshoe-shaped gonad on its floor



Gastric pouch region of the jellyfish, *Aurelia*. The horseshoe-shaped structure is a gonad. (Photo: John Houseman, BIODIDAC)

gastrodermis - the epithelial lining of the gastrovascular (digestive) cavity of cnidarians and ctenophores (comb jellies)

gastrolith - A deposit of calcium salts made in the stomach of many crustaceans during the period between molts. It may be used to store calcium needed in the new exoskeleton

Gastropoda - a class of the phylum Mollusca that includes snails, sea slugs, nudibranchs, limpets, and cone shells. There are approximately 30,000 living species described. Many species are inhabitants of coral reefs and nearby seagrass beds



A sea slug of the Class Gastropoda, Phylum Mollusca.

gastropore - a pore in the hard skeleton of a hydrozoan colony which houses a gastrozoid (feeding polyp)

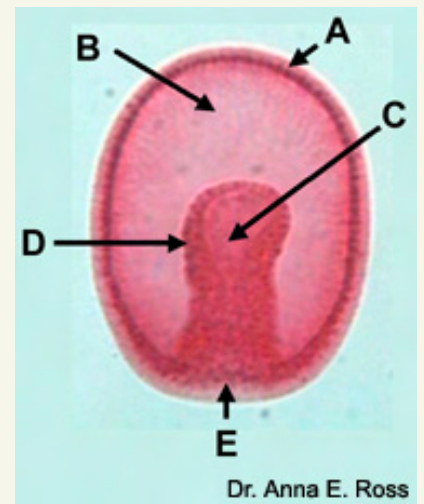
gastrostyle - a small central support column of the feeding polyps (gastrozooids) of a hydrocoral

gastrovascular canal - a canal system, lined with gastrodermis, that connects the gastrovascular cavities of colonial coral polyps

gastrovascular cavity - the internal digestive cavity of cnidarians and ctenophores that is lined with the gastrodermis

gastrozoid - a polyp in hydrozoans and other colonial cnidarians which is specialized for feeding

gastrula - the embryonic stage of an animal that has cells differentiated into germ layers. Sequentially, It follows the blastula stage



Dr. Anna E. Ross

An echinoderm gastrula. It was formed by the invagination of blastomeres at the vegetal pole area of the blastula to produce the archenteron, which will become the digestive system. The opening into the archenteron is the

blastopore, which will become the anus of the adult. The cavity of the archenteron is the gastrocoel. The roof of the archenteron, which forms the mesoderm, will expand and pinch off mesodermal vesicles with an internal cavity that will become the coelom (see: mesoderm).
A - ectoderm; B - blastocoel; C - archenteron; D - endoderm; E - blastopore.
(Photo: Dr. Anna E. Ross, Christian Brothers University, TN)

gastrulation - during embryonic development of most animals, a complex and coordinated series of cellular movements occurs at the end of cleavage. The details of these movements vary among species, but usually result in the formation of of an embryonic stage termed the gastrula. The gastrula has two primary germ layers, the ectoderm and endoderm in diploblastic animals, and three primary germ layers with the development of the mesoderm in triploblastic animals



An early gastrula. The cells at the vegetal hemisphere have begun to invaginate into the blastocoel, forming the archenteron. (Photo: Dr. Anna E. Ross, Christian Brothers University, TN)

Gause's principle - the principle that "no two species can coexist indefinitely on the same limiting resource." Also called Gause's Law, or the 'competitive exclusion principle'

gazetteer - a dictionary or index of geographical names with locations

gb (gigabase pairs) - one billion (10^9) pairs of nucleotide bases in DNA

GBIF (Global Biodiversity Information Facility) - an international non-profit organization that provides free and universal access to data regarding the world's biodiversity. A wide range of countries and organizations participate in GBIF and have made their data available through the GBIF web site (<http://www.gbif.org>)

GCRMN (Global Coral Reef Monitoring Network) - a global network whose aim is to improve management and sustainable conservation of coral reefs for people by assessing the status and trends in the reefs and how people use and value the resources. It does this by providing many people with the capacity to assess their own resources, within a global network, and to spread the word on reef status and trends

gel - a jelly-like substance formed by the coagulation of a colloidal liquid; a cytoplasmic phase

gel electrophoresis - a process for separating molecules by forcing them to migrate through a gel under the influence of an electric field

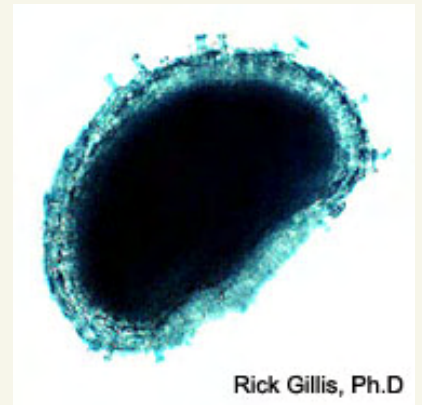
gelatinous - having the the consistence of jelly



the body of a jellyfish has a gelatinous consistency.
(Photo: Mary Hollinger/NOAA)

geminate species - a little differentiated species evolved from a close common ancestor; a "twin" species. For example, pairs on either side of the Isthmus of Panama who are each other's closest relative and were probably one species before the sea level dropped

gemmule - an asexual, spore-like reproductive unit in sponges, capable of overwintering and developing into an adult sponge the following summer



A sponge gemmule. Calcareous spicules projecting from the covering of the gemmule provide additional protection. (Photo credit: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

gen. et sp. nov. - in taxonomy, the abbreviation for genus et species nova, meaning new genus and species

gene - the functional and physical unit of heredity passed from parent to offspring. Genes are pieces of DNA, and most genes contain the information for making a specific protein

gene amplification - a selective increase in the number of copies of a gene which codes for a specific protein without a proportional increase in other genes

gene array - a regular pattern of DNA fragments, or oligonucleotides, spotted onto a solid support and used as a diagnostic tool to measure many individual gene expression levels simultaneously

gene duplication - gene duplication occurs when an error in DNA replication leads to the duplication of a region of DNA containing a functional gene. The duplicated gene is free to mutate and may take on new functions. The two genes that exist after a gene duplication event are termed paralogous genes, or paralogs. Gene duplication may have a major role in evolution

gene expression - the conversion of information from gene to protein via transcription and translation

gene flow - the movement of genes through or between populations as the result of out-crossing and natural selection

gene frequency - the relative occurrence of a gene in a given population, usually expressed as a percentage

gene index - a listing of the number, type, label and sequence of all the genes identified within the genome of a given organism

gene locus - the specific place on a chromosome where a gene is located

gene mapping - determination of the relative locations of genes on a chromosome

gene pool - the sum total of genes, with all their variations, possessed by a particular species at a particular time

gene product - the product, either RNA or protein, that results from expression of a gene. The amount of gene product reflects the activity of the gene

gene silencing - the interruption or suppression of the expression of a gene at the levels of transcription or translation

gene splicing - a cell process by which a gene is cut into different parts, exons and introns. The exons are the coding region and are put back together to make the gene that is transcribed and translated into a protein

gene therapy - an approach to preventing and/or treating disease by replacing, removing or introducing genes or otherwise manipulating genetic material. In some cases, the material can be injected with a genetic vaccination. In other cases the material is introduced through harmless bioengineered viruses that carry the therapeutic gene to the cell. Globules known as liposomes can also be used to carry therapeutic genes to specific cells

gene tree - a phylogeny of a gene, which may or may not accurately reflect the phylogeny of the organisms possessing that gene

gene-based medicine - instead of solely replacing defective genes, gene-based medicine is the application of nucleic acids (DNA, RNA) containing genetic information as therapeutic reagents in general. Nucleic acids are used to add a therapeutically beneficial function to cells, delete pathological functions from cells, or utilize cells for the production of therapeutic proteins. This can be either a transient or a permanent effect

genecology - the study of the genetic basis of ecological differentiation; the study of the genetic composition of populations in relation to their habitats

generalist - an organism which can survive under a wide variety of environmental conditions, and does not specialize to exist under any particular set of circumstances

generation - offspring from the same parental group going through their life cycle together

genetic assimilation - the disappearance of a species as its genes are diluted through crossbreeding with a closely related species

genetic code - the chemical code by which genetic information in DNA is translated into biological function. A set of three nucleotides (codons), the building blocks of DNA, signifies one amino acid. Amino acids are the building blocks of proteins

genetic disease - a disease that has its origin in changes to the genetic material. Genetic diseases usually refer to diseases that are inherited in a Mendelian fashion, although non-inherited forms may also result from genic (DNA) mutation

genetic distance - a measure of the genetic similarity between any pair of populations. Such distance may be based on phenotypic traits, allele frequencies or DNA sequences; any of several measures of the degree of genetic difference between populations, based on differences in allele frequencies. Genetic distances are used for understanding effects of genetic drift and gene flow

genetic distancing - a measure of the genetic similarity between any pair of populations. Such distance may be based on phenotypic traits, allele frequencies or DNA sequences. For example, genetic distance between two populations having the same allele frequencies at a particular locus, and based solely on that locus, is zero. The distance for one locus is maximum when the two populations are fixed for different alleles. When allele frequencies are estimated for many loci, the genetic distance is obtained by averaging over these loci

genetic diversity - the variety of different types of genes or alleles in a species or population

genetic drift - random changes in the frequency of alleles in a population. In small populations, it can lead to the elimination of a particular allele by chance alone. It is thought to be one cause of speciation when a group of organisms is separated from its parent population

genetic engineering - the technique of selectively removing, modifying, or adding genes to a DNA molecule by use of recombinant DNA or other specific molecular gene transfer or exchange techniques. These techniques produce endogenous proteins with properties different from those of the normal, or to produce entirely different proteins altogether. Organisms modified by genetic engineering are sometimes referred to as transgenic, bioengineered, or genetically modified

genetic erosion - a process whereby an already limited gene pool of an endangered, sexually reproducing species diminishes even more when individuals from the surviving population die off without getting a chance to breed with others in their endangered low population. Genetic erosion occurs because each individual organism has many unique alleles which get lost when it dies without getting a chance to reproduce; the loss of genetic diversity within the same species over time, due to human intervention or environmental changes

genetic expression - the process by which genetic information contained in DNA is converted into proteins within a cell. The gene is said to express or code for a particular protein

genetic map position - the location of a gene on a genetic map, deduced from recombination frequencies

genetic marker - a DNA sequence used to "mark" or track a particular location (locus) on a particular chromosome

genetic modification - human-designed changes in an organism, whether done through traditional breeding or genetic engineering. The terms "genetically modified" and "genetically engineered" are sometimes used interchangeably

genetic mutation - a permanent structural alteration in DNA. In most cases, DNA changes either have no effect or cause harm, but occasionally a mutation can improve an organism's chance of surviving and passing the beneficial change on to its descendants

genetic pollution - the uncontrolled and undesirable gene flow into the genomes of organisms in which such genes are not present in the wild state. The term is usually associated with the gene flow from a genetically engineered or genetically modified organism to a non-genetically engineered or modified organism. In some instances it has also been used to describe gene flow from an invasive or domesticated species to a wild population; the accidental transfer of genetic material from a genetically engineered organism to one that is not genetically engineered

genetic stability - a measure of the resistance to change, with time, of the sequence of genes within a DNA molecule or of the nucleotide sequence within a gene

genetically modified organism - an organism that has been modified by the application of recombinant DNA technology

genital bursa - an invagination at the base of an arm of a brittle star. Each bursa is a pouch lined with ciliated epidermis and is the primary respiratory surface for the organs of the perivisceral coelom. The epidermal cilia generate a ventilating current. The bursae have the gonads on the coelomic side of their wall

genome - all the DNA contained in an organism or a cell, which includes both the chromosomes within the nucleus and the DNA in mitochondria

genome size - the size of a genome (all the genetic material in the chromosomes of a particular organism) is generally given as its total number of base pairs

genomic library - a collection of clones made from a set of randomly generated overlapping DNA fragments that represent the entire genome of an organism

genomics - the comprehensive analysis of all the genes of an organism; molecular characterization of all the genes and gene products of a species, including the study of gene sequences, gene mapping, and gene function; genomics usually involves high speed sequencing of the DNA and computer searches for sequences that code for genes. Genomics allow researchers to identify specific genes responsible for specific proteins with specific functions in an organism

genotype - the genetic constitution of an individual or group. In taxonomy, the genotype is the type species of a genus

genus - a taxonomic group containing one or more species

geo-referenced data - refers to data with geographic location information included, such as latitude and longitude

geochemistry - the study of the chemical elements, their isotopes, and related processes with respect to the abundance and distribution of materials within the Earth's waters, crust, and atmosphere

geoecotype - a regional ecotype (a population adapted to a restricted habitat as a result of natural selection within a local environment)

geographical isolation - a form of reproductive isolation in which members of a population become separated from another population by geographical barriers that prevent the interchange of genes between the separated populations

geographical speciation - speciation occurring during a period of geographical isolation

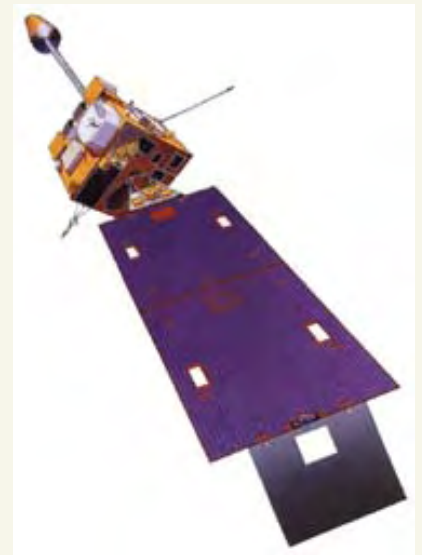
GeoHab - a joint SCOR-IOC Program of international cooperative research on harmful algal blooms (HABs) in marine and brackish waters

geoid - the hypothetical surface of the Earth that coincides everywhere with the mean sea level

geologic time scale - a relative time scale based upon fossil content. Geological time is divided into eons, eras, periods, and epochs

geomorphology - the study of landforms and the processes which shape them

geostationary satellite - satellite whose orbit around the equator equals that of the Earth's rotation, making it possible for them to view the same disc of Earth's surface below continuously



Artist's rendition of GOES I/M, geostationary satellites whose mission includes data collection and broadcasting, and environmental sensing. (Image: NASA/Goddard Space Flight Center)

geostrophic current - a flow that sustains a balance between Coriolis deflection and a pressure gradient

geotextile - a product used as a soil reinforcement agent and as a filter medium. It is made of synthetic fibers manufactured in a woven or loose nonwoven manner to form a blanket-like product, e.g., a silt curtain

geothermal vent - a submerged feature consisting of a vent of hot, mineral-rich waters on the ocean floor; geothermal vents are generally located on or near spreading oceanic ridges or on the continental margins of subduction trenches

Geotiff - a file format that embeds image registration information directly into a raster file; an industry-neutral raster file format widely used and recognized by all of the major GIS software vendors. ESRI began support for Geotiff at version 7.0 of ARC/INFO and version 3.0 of ArcView. Geotiff represents an effort by over 160 different remote sensing, GIS, cartographic, and surveying related companies and organizations to establish a TIFF-based interchange format for georeferenced raster imagery

geotropism - a turning or growth movement by a plant in response to gravity. Plant parts that grow downward, such as the roots, would be positive geotropism. A negative geotropism would be the stems growing upward

germ cell - a gamete; a haploid sperm or egg cell or their precursors

germ layers - distinct layers of cells, produced during the early embryonic developmental process of gastrulation, which gives rise to all cells, tissues, organs, and organ systems of the organism's body. The three types of germ layers are the ectoderm, endoderm, and mesoderm. Diploblastic organisms (e.g. cnidarians) have two layers, ectoderm and endoderm; triploblastic organisms (all higher animal groups) have mesoderm between these two layers

germinal epithelium - the tissues of the primary reproductive organs that produce eggs and sperm cells

gestation period - the period of development of the young in viviparous animals, from the time of zygote formation (fertilization) until birth

ghost crab - any of several light-colored burrowing crabs of the genus *Ocypoda* frequenting the tide line along sandy shores from the northeast United States to Brazil. Ghost Crabs have a relatively thin, light exoskeleton and two large black eyes that stand up like periscopes. They are called ghosts because of their ability to instantly disappear from sight, moving at speeds at speeds up to 10 miles per hour, while making sharp directional change and disappearing into their burrows



The ghost crab, *Ocypode pallidula*, gets its name comes from its ability to blend in with sand, then alternately "appear" and "disappear" while making rapid sharp directional changes (Photo: Keoki and Yuko Stender)

ghost net - a lost or abandoned fishing net that drifts through the oceans posing a danger to fishes and other marine life

gibbosity - swelling or protuberance; a convex hump; something that bulges out or is protuberant or projects from a form

giesma - in a histological preparation, a stain which contains both basic and acidic dyes

GIF (Graphics Interchange Format) - a bit-mapped digital image graphics file format suitable for efficiently importing image data into computer files or for transmitting or displaying the formatted image on a computer monitor or printing it out. GIF supports color and various resolutions. It also includes data compression, making it especially effective for scanned photos

gigabyte (gb) - a measurement of storage space equal to a thousand megabytes

gill - a highly vascularized respiratory organ with a large surface area in aquatic animals. Gills are in direct contact with the surrounding water for gas exchange



The gill cover (operculum) of this fish is lifted to expose the gills, which are the respiratory organs of fishes and many other aquatic animals.

gill arch - one of several curved bony or cartilaginous structures located on either side of the pharynx that support the gills of fishes and amphibians. Each gill arch is made up of an upper and a lower limb that are joined posteriorly. The gill filaments and gill rakers are attached to the gill arches

gill chamber - in fishes, the cavity containing the gills on each side of the rear of the head, enclosed by the operculum and the branchiostegal membrane

gill filament - a fingerlike projection from a gill arch through which respiratory gases enter and leave the blood

gill net - a net primarily designed to catch fish by entanglement in a mesh that consists of a single sheet of webbing which hangs between cork line and lead line, and which is fished from the surface of the water



A fisherman setting out a gill net. (Photo: NOAA)

gill pouch - an anatomical structure of bivalves used to protect developing embryos; located in the gills

gill raker - one of a series of knob- or comb-like projections on the front edge of the gill arch. Gill rakers aid in the fish's feeding. Their shape and number are a good indication of the diet of the fish. Fishes which eat large prey, such as other fishes, have short, widely spaced gill rakers that prevent the prey item from escaping between the gills. Fishes which eat smaller prey have longer, thinner and more numerous gill rakers. Species which feed on plankton have the longest, thinnest and most numerous gill rakers. Gill rakers also protect and clean the gill fillaments. Counts of gill rakers are used as taxonomic characters



Gill arch of an almaco jack (*Seriola rivoliana*) showing the gill rakers and gill filaments. (Photo: NOAA)

gill tuft - a fluffy cluster of gill filaments

GIS (Geographic Information System) - a system that allows automatic location of information suitable for mapping. Usually involves a software system that takes geographic position data and other data (e.g., type of bottom sediment) in order to create a map. Data on processes (e.g., current speed) can be incorporated to make a geographic model of flow

glabrous - refers to a smooth surface without hairs or setae

gladiate - sword-shaped

gland - a group of cells or a single cell in animals or plants that is specialized to secrete a specific substance

gland cell - an epithelial cell that secretes digestive enzymes into the gastrovascular cavity of a cnidarian; also called "granular gland cell" or "zymogen cell"

glass sponge - a hexactinellid sponge, found at deeper depths, with a skeleton made of four and/or six pointed siliceous spicules

global change - a transformation which occurs on a worldwide scale (for example, an increase in CO₂ in the atmosphere) or exhibits sufficient cumulative effects to have worldwide impact (for example, local species extinction resulting in global loss of biodiversity)

Global Environment Facility (GEF) - an independent financial organization that provides grants to developing countries for projects that benefit the global environment and promote sustainable livelihoods in local communities. GEF funds are contributed by donor countries. GEF grants support projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants

Global Taxonomy Initiative (GTI) - initiative established by the Conference of the Parties to the Convention on Biological Diversity (CBD) to address the lack of taxonomic information and expertise around the world

global temperature - an area-weighted mean of temperatures recorded at ground and sea surface -based observation sites around the globe, supplemented by satellite or model-based records in remote regions; usually referring to sea surface temperature

Global Temperature-Salinity Profile Program (GTSP) - a cooperative international program designed to develop and maintain a global ocean Temperature-Salinity resource with data that are as up-to-date and of the highest quality as possible. The primary goal of the GTSP is to make these data quickly and easily accessible to users. Both real-time data transmitted over the Global Telecommunications System (GTS), and delayed-mode data received by the U.S. National Oceanographic Data Center (NODC) are acquired and incorporated into a continuously managed database. Countries contributing to the project are Australia, Canada, France, Germany, Japan, Russia, and the United States. Canada's Marine Environmental Data Service (MEDS) leads the project, and has the operational responsibility to gather and process the real-time data

global warming - the gradual increase in global temperatures caused by the emission of gases that trap the sun's heat in the Earth's atmosphere (greenhouse effect). Gases that contribute to global warming include carbon dioxide, methane, nitrous oxides, chlorofluorocarbons (CFCs), and halocarbons (the replacements for CFCs). The carbon dioxide emissions are primarily caused by the use of fossil fuels for energy

globular - globe-shaped; having the form of a sphere, or nearly so



The porcupine fish, when threatened, swallows water and takes on a globular shape. (Photo: Copyright Corel Corporation)

glossary - an alphabetical list of technical terms, with brief definitions for those terms, in some specialized field of knowledge

glucose - a monosaccharide, $C_6H_{12}O_6$, that is the end product of carbohydrate metabolism and is the chief source of energy for living organisms

glutamate - an amino acid neurotransmitter that acts to excite neurons. Glutamate is thought to play an integral role in neural pathways associated with learning and memory

glutamate receptor - a protein molecule that helps gate the flow of ions across a neuron's cell membrane

glutinous - sticky

glycan - a polysaccharide consisting of monosaccharides joined by glycosidic linkages

glycobiology - a field of science that combines carbohydrate (sugar) biochemistry and molecular biology. Glycobiology includes the study of the structure, chemistry, biosynthesis, and biological functions of glycans and their derivatives; also called glycomics

glycomics - see glycobiology

glycosidic bond - a type of covalent bond that joins two monosaccharides (simple sugars) via an atom of oxygen

glycosidic linkage - a bond formed between a hemiacetal group of a sugar molecule (such as glucose) and an alcohol functional group to form an acetal

gnathic - pertaining to the jaw

Gnathostomata - the group of vertebrates that possess jaws; includes fishes, amphibians, reptiles, birds, and mammals

goatfish - any species of bony fishes in the family Mullidae. Goatfishes, also called surmullets, are elongate, moderately sized fishes which are characterized by a pair of long, tactile barbels under the chin. Some species are brilliantly colored and some are noted



The yellow goatfish, *Mulloidichthys martinicus*, uses barbels to dig in sand or coral rubble for food, usually small invertebrates. (Photo: NOAA)

goby - any species of bony spiny-rayed fishes in the family gobiidae. Gobies are small fishes with large heads and elongated tapering bodies. They comprise the largest family of marine fishes, with over 2000 species. Gobies range in size from the mudskipper (about 15-30 cm) to the tiny pygmy goby, *Eviota sigillata*, a 1-2 cm long coral reef-dwelling goby which has the shortest lifespan for any known vertebrate



The antitropical shrimpgoby, *Amblyeleotris ogasawarensis*. This species of goby grows to 11cm in length. It lives in a burrow with a snapping shrimp (Photo: John E. Randall, Ph.D.)

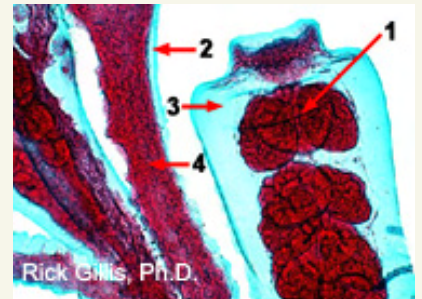
GOES (Geostationary Operational Environmental Satellite) - a class of satellite operated by NOAA, positioned in a nearly stationary orbit over the equator at an altitude of about 22,500 miles. GOES-8 is currently the operational "east" spacecraft at 75 degrees West longitude, while GOES-10 is the "west" spacecraft located at 135 degrees West. GOES-11 is in standby at 110 degrees West



Image developed by NASA from GOES data-Hurricane Floyd at the U.S. coast on September 15, 1999 (Hal Pierce, NASA Goddard Space Flight Center)

gonads - the primary sex organs of an animal. In males they are the testes, and in females, the ovaries

gonangium - a reproductive polyp of a colonial hydrozoan. It consists of a stalk containing medusa buds surrounded by a thin membrane, the gonotheca



A gonangium of the hydrozoan *Obelia*. 1= medusa bud; 2= perisarc; 3=gonotheca; 4= coenosarc. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

gonochoric - having separate sexes. Individuals within the species contain only one or the other of male and female reproductive systems

gonoduct - any duct that generally transfers eggs or sperm cells

gonophore - a sexual zooid produced as a medusa bud upon a hydroid, sometimes becoming a free hydromedusa and sometimes remaining attached

gonopodium - a term given to the anal fin (or the anterior portion of it) of a male fish when it is modified to function as a copulatory organ, e.g., in guppies

gonopore - an opening between the reproductive system and the outside environment; the genital pore of many invertebrates

gonosome - a collective term for all reproductive structures of a colonial hydrozoan

gonotheca - a thin membrane covering the body of a gonangium, the reproductive polyp of a colonial hydrozoan

gonozooid - a reproductive polyp of a colonial hydrozoan

gorgonian - an anthozoan of the subclass Octocorallia, commonly called sea fans and sea whips



A sea fan, *Gorgonia ventalina*, in the Florida Keys.

gorgonin - a fibrous protein in the mesoglea which provides skeletal support for sea fans and other members of the Order Gorgonacea

government document - a publication produced by a government agency

GPS (Global Positioning System) - a network of satellites and receiving devices used to compute accurate geographical positions on the Earth. A GPS is used in navigation, and its precision supports cadastral surveying



Portable GPS unit utilized in surveying.

gradient analysis - an intuitive method to portray variation along a single or multiple environmental gradients. The plots display species or community abundance in response to a known environmental gradient, i. e., the analysis of species composition along a gradient of environmental conditions

gradualism - a model of evolution that assumes slow, steady rates of change, as contrasted with punctuated equilibrium, an evolutionary model in which change occurs in relatively rapid bursts

gram atom (g-at) - the quantity of an element whose weight in grams is numerically equal to the atomic weight of the element; represents the mass in grams of Avogadro's number of atoms of the element

Gram's stain - a method for differential staining of bacteria; Gram-positive cells stain purple-black and Gram-negative cells stain pink; useful in bacterial taxonomy and identification

grassroots - people or society at a local level, rather than at the center of major political activity. A grassroots movement is one driven by the constituents of a community

gravid - pregnant; heavy with young; full of ripe eggs or distended by such fullness



Gravid green crab with egg mass on the abdomen. (Photo: Gary Weber)

Gray's Reef National Marine Sanctuary

- Gray's Reef comprises one of the largest nearshore sandstone reefs in the southeastern United States. It is located 32 kilometers (17.5 nautical miles) off Sapelo Island, Georgia. Designated in 1981, the Gray's Reef National Marine Sanctuary boundaries protect 17 square miles of open ocean. Sandstone outcroppings and ledges up to ten feet in height separate the sandy, flat-bottomed troughs in a reef that combines temperate and tropical flora and

fauna. The rocky platform, some 60 to 70 feet below the surface, is covered by a carpet of attached organisms and is known locally as a "live bottom habitat." Gray's reef is not a coral reef. It is a consolidation of marine and terrestrial sediments (sand, shell, and mud) which was laid down as loose aggregate between 6 and 2 million years ago



A reef scene showing biodiversity at Gray's Reef. (Photo: NOAA)

grazer - an animal which feeds on plants



Sea urchins are important grazers on coral reefs. Their diet, however, is not totally restricted to plants and algae.

Great Barrier Reef - the largest complex barrier coral reef in the world, approximately 2,000 km (1,250 mi) long, in the Coral Sea, forming a natural breakwater for the northeastern coast of Australia. It is separated from the mainland by a shallow lagoon from 16–161 km (10 to 100 mi) wide. It is composed of more than 2,800 individual reefs and in some places it is more than 122 m (400 ft) thick. The Great Barrier Reef Marine Park, more than 340,000 km² (130,000 mi²), encompasses most of the reefs and interreef areas as well as the neighboring lagoon and a large section of the continental shelf. It is the largest UNESCO World Heritage Area



Satellite photograph of the Great Barrier Reef situated off the northeastern coast of Australia.

green algae - green algae belong to the Division Chlorophycota. These algae contain photosynthetic pigments similar to those in higher plants (chlorophylls a and b, as well as secondary pigments: carotenes, lutein, and zeaxanthin) and have a green color. Green algae include unicellular forms, filamentous forms, and leaf-like thalluses.



The green alga *Caulerpa taxifolia* with feather-like branches. The leaf is 5-65 cm in length. (Photo: NOAA)

green fluorescent protein (GFP) - a protein produced by a jellyfish *Aequorea victoria* which fluoresces in the lower green portion of the visible spectrum when exposed to blue light. GFP has become an invaluable tool in contemporary cell and molecular biology research, because its intrinsic fluorescence can be visualized in living cells. GFP has become well established as a marker of gene expression and protein targeting in intact cells and organisms. Mutagenesis and engineering of GFP into chimeric proteins are opening new vistas in physiological indicators, biosensors, and photochemical memories

green gland - in some crustaceans (shrimp, crabs, lobsters), an excretory gland with ducts opening near the base of the large antennae; also called "antennal gland"

green turtle - one of seven extant species of marine turtles. The green turtle, *Chelonia mydas*, is herbivorous and feeds on algae and seagrasses. It is in the family Cheloniidae

greenhouse effect - the heating that occurs when gases such as carbon dioxide trap heat escaping from the Earth and radiate it back to the surface

greenhouse gases - atmospheric gases, primarily carbon dioxide, methane, and nitrous oxide restricting some heat-energy from escaping directly back into space

gregarious - living or moving in a group with others of its kind, as in a flock of birds or school of fish

grid - a network of uniformly spaced parallel lines intersecting at right angles. When superimposed on a map, it usually carries the name of the projection used for the map. For example: Lambert grid, transverse Mercator grid, and universal transverse Mercator grid

griseous - blue-grey color

Grocott-Gomori's methenamine silver stain (GMS) - in histology, a stain preparation for fungi

groin - a solid structure built at an angle from a shore prevent erosion from currents, tides and waves, or to trap sand



A groin is a relatively slender permeable or impermeable barrier structure aligned and constructed to trap littoral drift or retard erosion of the shore. This is a photograph of a timber pile groin

gross photosynthetic rate - the total rate of CO₂ fixation with no allowance for the CO₂ simultaneously lost during respiration

gross primary production - the total amount or weight of organic matter created by photosynthesis over a defined time period (total product of photosynthesis)

ground truthing - measurements conducted on the ground or at sea to calibrate, compare or verify observations made from satellites or aircraft

ground water - underground water that is generally found in the pore space of rocks or sediments and that can be collected with wells, tunnels, or drainage galleries, or that flows naturally to the earth's surface via seeps or springs. The term is not applied to water that is percolating or held in the top layers of the soil, but to that water in the zone of saturation below the water table

groundfish - fishes, usually of commercial value, that live on or near the bottom; also called "bottom fish"

grounding - a ship's striking a shoal or reef

groundwater seep - subsurface water flowing into a coastal body of water

grouper - any species of bony fishes in the subfamily Epinephelinae of the sea bass family, Serranidae. Groupers have a typical seabass appearance with robust bodies, large mouths and sharp teeth. Some get to be enormous in size, many feet long and reaching weights



The Hawaiian grouper, *Epinephelus quernus*, is endemic to Hawaii. It attains at least 3 feet and 50 pounds (Photo: Keoki and Yuko Stender)

growth band - a band formed yearly on coral by the secretion of CaCO_3 ; one yearly growth band contains two smaller bands representing winter growth and summer growth

growth factor - any of various chemicals, particularly polypeptides, that have a variety of important roles in the stimulation of new cell growth and cell maintenance. They bind to the cell surface on receptors. Specific growth factors can cause new cell proliferation

growth rate - the increase in mass per unit of time

growth - an increase in cell size or cell number, or both

grunt - any species of bony spiny-rayed fishes in the family Haemulidae. Grunts are medium-sized tropical fishes that are capable of making a grunting sounds by the grinding of pharyngeal teeth. They inhabit coral reef or hard bottom areas. Many forage at night over nearby sand and grass flats



Blue striped grunts (*Haemulon sciurus*) in the Florida Keys National Marine Sanctuary (Photo: NOAA)

guanine - one of the four nitrogenous bases in DNA and RNA that make up the letters ATGC, guanine is the "G". The others are adenine, cytosine, and thymine. Guanine always pairs with cytosine

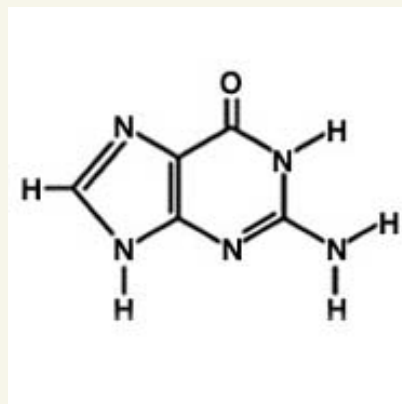
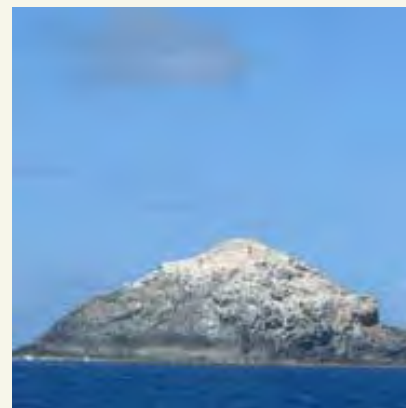


Diagram of the chemical structure of guanine, one of the four nitrogenous bases in DNA.

guano - the manure of birds and bats that is often used as fertilizer



Bird droppings form the guano deposits on Gardner pinnacles, Northwestern Hawaiian Islands. (Photo: NOAA)

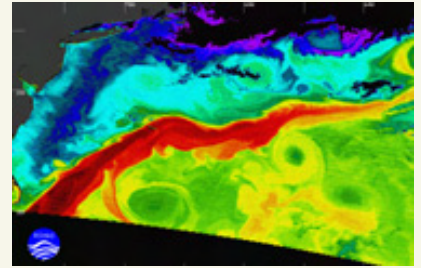
guild - a group of species that use the same resources in a similar way; an ecological association based on similar roles in a community rather than evolutionary descent, as for example, filter feeders or browsers

gular - of, relating to, or located on the throat

gulf - a portion of an ocean or sea that extends into the land; a partially land-locked sea, e.g., the Gulf of Oman

Gulf of Mannar Marine National Park - a marine national park on the south eastern tip of India which consists of 21 Islands approximately eight km off the coast of Tamil Nadu (a state at the southern tip of India). Spreading over an area of 10,500 km², the area described as the Pamban-to-Tuticorin barrier reef was converted into a Biosphere Reserve in 1989

Gulf Stream - the warm ocean current of the North Atlantic. It originates in the westward equatorial current and is deflected northward by the coast of South America into the Gulf of Mexico and then follows the coast of North America to Nantucket, where it is deflected eastward toward northern Europe



Sea surface temperature image of the Gulf Stream, derived from infrared measurements of the Moderate-resolution Imaging Spectroradiometer (MODIS), May 8, 2000. (Image produced from 11- and 12-micron bands by Bob Evans, Peter Minnett, and co-workers, University of Miami)

gunwale - the upper edge of the side of a ship

gustation - pertains to the sense of taste

gut - the digestive tube formed between the mouth and anus in which food is digested and nutrients absorbed; it consists of the mouth, pharynx, esophagus, stomach, intestine, and anus, though some animals do not have all these regions

guyot - a flat-topped submarine mountain

gynetype - a female type specimen

gynogenetic - containing genetic material derived from the female parent only

gyre - a large water-circulation system of geostrophic currents rotating clockwise in the Northern Hemisphere or counterclockwise in the Southern Hemisphere

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: H

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

habitat - the place or environment where a particular organism, population, or species lives

habitat affinity index - defines habitat affinity based on the relative concentration of a species in a particular habitat, compared with the availability of that habitat in a given study area

Habitat Area of Particular Concern (HAPC) - a habitat area designated by a Fishery Management Council under the Magnuson-Stevens Fishery Conservation and Management Act of 1976

habitat complexity - the areal extent and number and diversity of habitat types and distinct ecological zones within a specified area

habitat distribution - the structure and spatial characterization of all habitat types in a specified area

habitat diversity - the number of different types of habitats within a given area

habitat fragmentation - the breaking up of a habitat into unconnected patches interspersed with other habitats which may not be inhabitable by species occupying the habitat that was disrupted. The breaking up is usually by human action

habitat patch - an area distinguished from its surroundings by environmental discontinuities

habitat sharing - a situation in which species occupy the same habitat without competition, either through requiring different resources or being present at different times

habitat specialist species - species that can only survive in a specific environment, such as those that rely on certain specific resources

habituation - in animal behavior, the temporary waning or disappearance of an innate response when it is elicited many times in succession

hadalpelagic zone - the deepest zone of the ocean, extending from about 6000 meters to the very bottom (10,911 meters in the Mariana Trench off the coast of Japan). The temperature is constant at just above freezing (about 4 degrees C)

hair cell - a mechanoreceptor cell having hair-like processes (stereocilia and kinocilia). Vibrations or pressure deform these processes which relay the induced nervous impulses to the central nervous system. They are responsive to sound and other mechanical stimuli

half-life - the time required for a radioactive substance to lose half of its nuclei

halichlorine - a bioactive compound, isolated from the marine sponge *Halichondria okadai*. It has potential as a drug for the treatment of atherosclerosis

halichondrin B - a marine pharmaceutical, derived from a New Zealand deep water sponge *Lissodendoryx* sp., which inhibits cell division by interfering with the cell's microtubule network

Halimeda - an important genus of calcareous green algae in coral reef environments

halo - in animal coloration, a circle of color around a spot of another color

halocline - the boundary where there is a marked change in salinity between surface fresh water and underlying saltwater in a stratified coastal environment

halophile - an organism which lives in an environment of high salt concentration. Halophiles have special adaptations to permit them to survive under these conditions

halophyte - a plant that grows in soils that have a high content of various salts



A black mangrove is an example of a halophyte, a plant that thrives in a saline environment.

hamlet - any of about 10 species of small grouper in the genus *Hypoplectrus* (family Serranidae) that inhabit shallow reef areas in the western Atlantic. They feed mostly on small benthic crustaceans, and occasionally on small fishes. The black hamlet is a simultaneous hermaphrodite (both sexes occurring within the same individual). A mating pair takes turns acting out sex roles during courtship



A butter hamlet photographed at Curacao (Photo: Mark Rosenstein / Active Window Productions (markrosenstein.com))

hamular - hook-shaped

hamulus - a small hook-like projection

haplodiaplontic - having a life history that includes both haploid and diploid phases

haploid - a haploid cell contains a nucleus with a single complete set of chromosomes. The haploid condition is often abbreviated as *n*. Most fungi, protists, and algae are haploid, as are some insects, bryophytes, and the gametes of all organisms

haplotype - a set of closely linked genes that tends to be inherited together as a unit; a particular set of alleles at linked loci that are found together on a single homolog

hapteron - a single branch within a holdfast

hard bottom - a substrate formed by the deposition of calcium carbonate by reef building corals and other organisms or existing as bedrock or volcanic rock usually of minimal relief

hard coral - a coral in the anthozoan order Scleractinia. Also known as the stony corals, these organisms possess a hard external calcareous skeleton. A synonym of **stony coral**



Skeleton of a hard coral colony.

hard coral forms - may be conveniently summarized as: encrusting (lichen-like); branched (staghorn-like); massive (rock-like); sub-massive (pillar-like); tabulate (table-like); foliose (scroll-like); and solitary

Hardy-Weinberg Law - the frequency of a given genotype will reach equilibrium in a randomly mating population and will stay constant over many generations in the absence of selection pressures

harem - a social structure whereby several females associate and breed with a single male

harmful algal bloom (HAB) - an increased abundance of algae that may cause illness in people or marine animals. HAB's can cause mass mortalities of marine organisms, are a public health risk, and can cause economic damage through declines in tourism, shellfish bed closures, and reductions in the market value of seafood

harmonics - pertaining to sound, harmonics are multiples of the fundamental frequency (a single sine wave)

harvest - to capture, catch, collect or harvest organisms by any means

hastate - spear-shaped

hatch - the process of an embryo leaving the egg envelopes

hatch success - the proportion of eggs in a nest that produce live hatchlings

hatchling - A newly hatched bird, reptile, amphibian, or fish

haterumadienone - a bioactive derivative of puupehenone, isolated from a sponge *Dysidea* sp., which interferes with cell division processes

Hawaiian Archipelago - the Hawaiian Archipelago consists of eight large islands and 124 small islands, reefs, and shoals. It stretches for over 2,400 km from 19 degrees - 28 degrees N to 155 degrees -178 degrees E. It can be divided into two distinct regions: the Northwestern Hawaiian Islands (NWHI), primarily uninhabited atolls, islands, and banks accounting for the majority of U.S. reefs, and the Main Hawaiian Islands (MHI) largely made up of populated, high, volcanic islands with non-structural reef communities, fringing reefs, and two barrier reefs

hawser - a large rope for mooring or towing a ship

hazardous waste - a discarded material which contains substances known to be toxic, mutagenic, carcinogenic, or teratogenic to humans or other life; ignitable, corrosive, explosive, or highly reactive alone or with other materials

heading - the direction in which a vessel is pointed at any given moment

heat shock proteins (HSPs) - a group of proteins that are present in the cells of all living organisms. They are induced when a cell is exposed to various types of environmental stresses, e.g., heat, cold and oxygen deprivation. Heat shock proteins are also present in cells under normal conditions, assisting in other cellular protein functions and behavior. They also trigger immune responses through both intracellular and extracellular activities; also called stress proteins

heavy metal - a metal having a specific gravity of 5.0 or greater. Heavy metals are generally toxic to organisms in relatively low concentrations, and tend to accumulate in the food web. Examples include arsenic, cadmium, chromium, lead, and mercury

hectare (ha) - a metric unit of measure for area, equal to 2.47 acres

heiau - a traditional Hawaiian place of worship; a religious shrine

helicoid - spiral-shaped

heliophilous - having an attraction for sunny places

heliotropism - an orienting response to the sun

heliox - a breathing gas mixture for scuba divers that contains only oxygen and helium, used for deep diving to remove the narcotic effect of nitrogen

helix - a structure with a spiral shape

helophilous - having an affinity for marshes

heme - a complex red organic pigment containing iron and other atoms to which oxygen binds

hemichordate - any of various worm-like marine animals belonging to the phylum Hemichordata, having a primitive notochord and gill slits



An acorn worm in the phylum Hemichordata. (Photo: BIODIDAC)

hemipenis - a hemipenis (plural hemipenes) is one of a pair of copulatory organs of male snakes, lizards, and amphisbaenians. Only one is used during mating. Hemipenes are usually held inverted within the body and are everted for copulation

hemocoel - the extensive spaces of an arthropod's body through which the hemolymph (blood) circulates

hemocyanin - a bluish, copper-containing respiratory pigment with an oxygen-carrying function similar to that of hemoglobin that is present in the blood of certain mollusks and arthropods

hemocyte - a cellular component of the blood, especially in invertebrate organisms. There are different types of hemocytes performing a variety of functions, which include defense and nutrient transport

hemoglobin - the iron-containing protein (pigment) found in red blood cells of vertebrates. Hemoglobin transports oxygen from the respiratory surface (gills, lungs) to the body's tissues. It is red when oxidized

hemolymph - the circulating and tissue-bathing fluid of the arthropod open circulatory system. It is composed of cells and plasma and often loosely termed as blood

Henry's Law - the amount of gas that will dissolve in a liquid at a given temperature is almost directly proportional to the partial pressure of that gas

hepato- - pertaining to the liver

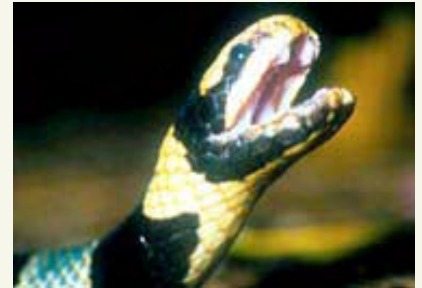
herbivore - an animal that feeds on plants

heredity - the transfer of genetic information from parent cells to progeny

hermaphrodite - an animal or plant which is equipped with both male and female reproductive organs

hermatypic coral - a reef-building coral with zooxanthellae in its tissues

herpetology - the scientific study of amphibians and reptiles



Herpetologists study the biology of amphibians and reptiles, such as this Indopacific sea snake, *Laticauda colubrina*. This species lays its eggs on land. Other species are livebearers and give birth to their young in the ocean. (Photo: Sohan Shetty)

hertz - unit of frequency equal to one cycle per second

heterauxesis - disproportionate growth of a structure in relation to the rest of the body

heterocercal - a caudal fin where the upper lobe is larger than the lower lobe. Most sharks have heterocercal caudal fins

heterochromatin - the portion of chromosome material that remains condensed and is transcriptionally inactive during interphase of the cell cycle

heterochrony - a change in the timing of ontogenetic events between two species. These can be the result of relatively small genetic changes between an ancestor and its descendant species

heterodont - a type of dentition where the teeth are not all similar. For example, a mixture for special functions, such as canines, incisors and molars for piercing and tearing, snipping and grinding

heterogeneous - consisting of dissimilar elements, parts or forms; having non-uniform structure or composition

heterologous - derived from organisms of a different but related species

heterosis - a situation where crossing two inbred lines yields offspring that are more healthy/vigorous than their parents; hybrid vigor

heterotrichous - pertaining to a nematocyst with spines that vary in size

heterotroph - an organism that cannot manufacture its own food, and therefore requires external sources of energy

heterotypic school - a well-defined group or school of several kinds of fishes

heterozoid - a specialized non-feeding bryozoan zoid. Heterozoids include forms specialized for producing and brooding eggs, or, more rarely, spermatozoa. Others are specialized to protect the colony, or have a cleaning function, or strengthen and support the colony

heterozygote - an individual having a heterozygous gene pair. A diploid or polyploid with different alleles at a particular locus

heterozygous gene pair - a gene pair having different alleles in the two chromosome sets of the diploid individual, for example, **Aa**

heuristic - problem analysis based on informal judgment or experience versus data manipulation; a guideline or rule of thumb that is normally effective in dealing with a given situation

Hexactinellida - a class of sponges (phylum Porifera) commonly called glass sponges, as they have distinct siliceous spicules which are united with each other and form a network. The body is usually cylindrical or funnel-shaped. Most Hexactinellida are syconoid or leuconoid in body organization. All species are marine and are rarely found at depths less than 50 meters



A glass sponge in the class, Hexactinellida. (Illustration: BIODIDAC)

hexamerous - having six parts, or parts in multiples of six arranged radially, as found in anthozoans in which the tentacles and mesenteries are in multiples of six

hexaxon - in sponges, a spicule with six rays

hiatus - a gap, e.g., unoccupied space between the distributions of two species or populations; a space between teeth

high tide - the tide at its fullest extent, when the water reaches its highest level



A small island at the mouth of the Amazon River at high tide. See **low tide** for contrast. (Photo: Alessandra and Michael)

high-resolution satellite SST climatology - 9 km monthly or yearly averages of satellite-derived (see AVHRR) sea surface temperatures obtained over periods of 10 years or longer

hinge - the elastic part of a bivalve (Mollusca) shell that unites the valves along the top of the shell

histogram - a bar graph in which the area over each class interval is proportional to the relative frequency of data within this interval

histology - the branch of biology that studies the microscopic structure of animal or plant tissues. The four basic types of animal tissues are: epithelial tissue, nervous tissue, muscular tissue and connective tissue (bone, cartilage, blood, fat, and areolar (fibrous)). The three basic plant tissues are: dermal tissue, ground tissue, and vascular tissue

histone - a type of protein present in the nucleus of eukaryotic cells that helps to compact DNA into tightly packed chromosomes

historical data - data sets from previous studies

histosol - soil with a high organic content

hoa - a channel or pass connecting the atoll lagoon with the open ocean

holdfast - a root-like structure for attachment that anchors attached seaweeds, other algae, and octocorals to the substratum

holism - the hypothesis that the properties of a system cannot be determined or explained simply by the sum of its components alone, i.e., the total of a system is greater than the sum of its parts; as opposed to reductionism

holobenthic - pertaining to fauna that are confined to a benthic existence throughout their entire life cycle

holobiont (coral) - a collective term referring to the totality of a coral animal, its endosymbiotic zooxanthellae, and the associated community of microorganisms

holoblastic cleavage - complete cleavage of the zygote. The cleavage furrows pass all the way through the zygote; typical of isolecithal and mesolecithal eggs

Holocene epoch - an epoch of the Quaternary period dating from the end of the Pleistocene approximately 8,000 years ago until the present

holoeuryhaline - pertains to organisms that inhabit fresh, brackish and marine waters

holoplankton - planktonic organisms that spend their entire life cycle in the floating state, as contrasted with organisms, such as fishes, which spend only a portion of their life cycle (eggs, larvae) as members of the planktonic community

holothurian - a sea cucumber in the echinoderm class Holothuroidea



A holothurian (sea cucumber), *Holothuria atra*.

holothurin - a toxic substance released by some holothuroids (sea cucumbers)

holotrichous - pertaining to a nematocyst with spines along the whole shaft or thread

holotype - in taxonomy, a single specimen designated or indicated the type specimen by the original author at the time of publication of the original description

home page - the first page that a browser opens when accessing a Web address (URL). The home page generally serves as a gateway to the rest of the Web site by providing links to the other pages

home range - the area over which an animal normally travels in its daily activities

homeobox - a region of DNA sequence found in genes involved in the regulation of the development (morphogenesis) of fungi, plants and animals. Genes that have a homeobox are called homeobox genes and form the homeobox gene family. They are also called "HOX genes." Homeobox genes regulates activities of other genes (turns genes 'on' and 'off')

homeostasis - the ability to maintain a relatively constant internal environment

homeotic gene - a gene that controls the activity of other genes involved in the development of a body plan

homeotic mutation - a mutation that causes a body part of an organism to develop in an inappropriate position

homing behavior - a type of behavior where the adult organism returns to its place of origin

homocercal - a caudal fin with upper and lower lobes that are approximately equal in size; characteristic of most bony fishes

homodont - type of dentition where the teeth are all similar, indicative of a uniform diet

homogeneous - of similar or uniform structure or composition throughout; refers to anything which displays a uniform or consistent composition

homolog - in genetics, one member of a chromosome pair. Homologous chromosomes have corresponding DNA sequences and come from separate parents, i.e., one homolog comes from the maternal parent and the other comes from the paternal parent; in evolution, a characteristic that is similar in different species because it evolved from a common ancestor

homologous behavior - a behavior in different species which is similar in its manifestation, but not necessarily in function

homologous chromosomes - the pair of chromosomes in a diploid individual that have the same overall genetic content. One member of each homologous pair of chromosomes is inherited from each parent

homology - the relationship of any two characters that have descended from a common ancestor. The term can apply to a morphological structure, a chromosome, an individual gene, or a DNA sequence

homonym - in taxonomy, each of two or more identical but independently proposed names for the same or different taxa. A junior homonym is the later published of two homonyms. A senior homonym is the earlier published of two homonyms

Homonymy, Law of (Principle of) - any name that is a junior homonym of an available name must be rejected and replaced; the principle that the name of each taxon must be unique

homotypic school - a well-defined school of fish composed of one species with individuals all of similar size

homozygote - an individual having a homozygous gene pair. A diploid or a polyploid with identical alleles at a locus

homozygous gene pair - a diploid gene pair having identical alleles in both copies, for example, **AA** or **aa**

hookah - "hookah" refers to diving where the diver is supplied with breathable air from the surface via an air compressor and an airline (hose). This type of diving is ideal for shallow water commercial applications

horizontal classification - in taxonomy, classification which stresses grouping together taxa in a similar stage of evolution, rather than location on the same phyletic line

horn - a bony projection, e.g. the "horns" on the heads of cowfishes



the longspine cowfish, *Lactoria cornuta*, has a pair of horns projecting from the top of its head (Photo: Keoki and Yuko Stender)

horny coral - coral species in the Order Scleractinia that embeds calcium carbonate in a semi-soft, flexible material called keratin. This allows for the flexibility sea fans and sea whips require to survive in strong currents; gorgonians

horotelic - pertaining to evolution proceeding at a standard rate

horse latitudes - two belts or regions of subtropical high-pressure areas, located between 30-35 degrees north and south, in which the wind is light and varied and weather is hot and dry

host - an organism which serves as the habitat for a parasite or symbiont. The host may provide nutrition to the parasite or symbiont, or simply a place in which to live

hotspot - an environmentally endangered region that is both rich in species and found nowhere else

HotSpot animation - animations from HotSpot imagery denoting coral reef bleaching events over time

HotSpot charts - charted regions that highlight sea surface temperature (SST) anomalies that are greater than 1 deg C above the maximum monthly climatological SST. See also coral bleaching and coral bleaching hotspot

Hox gene - a member of a family of regulatory genes which all contain a common base pair sequence, the homeobox. In morphogenesis, they are involved in spatial patterning along the longitudinal axis of an organism. The genes are activated to define the anterior end, the posterior end, the middle, etc. Their expression pattern is collinear, that is, the order of genes in the cluster reflects the temporal and spatial sequence of gene activation in the organism

hump - the raised area behind the head in certain fish species, usually mature adults or breeding males

hurricane - an intense tropical cyclone in which winds tend to spiral inward toward a core of low pressure, with maximum surface wind velocities that equal or exceed 33.5 m/sec (75 mph or 65 knots) for several minutes or longer at some point



Infrared image of Hurricane Hugo making landfall September 22, 1989. (Image: NOAA)

hurricane surge - a rise in the sea surface on an open coast, often resulting from a hurricane



Surge from 1969's Hurricane Carol swamps a yacht club. (Photo: Providence Journal Co., NOAA/NWS Historic Collection)

hyaline - translucent or transparent

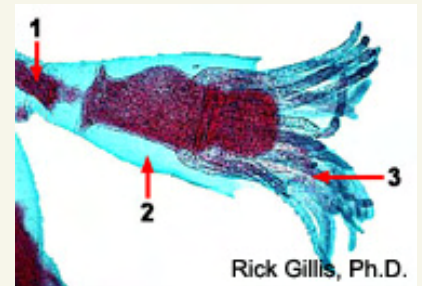
hyalinization - a form of tissue degeneration in which the tissues develop a homogeneous and glassy appearance

hybrid - an individual with parents of different species

hybrid name - in taxonomy, names of progeny of two individuals belonging to different taxa. Names given to hybrids are not normally available, as they are individuals, not populations, and hence not taxa

hybridization - the production of offspring (hybrids) from genetically dissimilar parents

hydranth - a feeding polyp of a colonial hydrozoan. It bears tentacles armed with nematocysts, a mouth and a thin outer covering, the hydrotheca



Hydranth of the hydrozoan, *Obelia*.
1=coenosarc;
2=hydrotheca;
3=tentacles. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

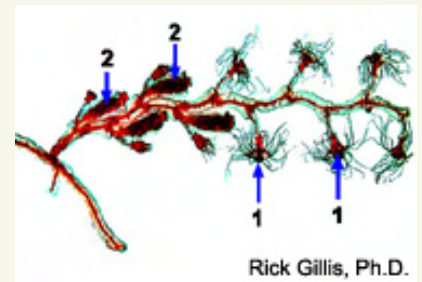
hydrate - a compound produced when certain substances chemically combine with water; as a verb, it means to supply water to something that absorbs it

hydraulic hypothesis - the hydraulic hypothesis (or "theory") attempts to explain the formation and existence of Lophelia coral reefs in deep, cool, Norwegian waters. It states that primary producers (mainly bacteria) are locally formed and concentrated at reef locations due to seepage of light hydrocarbons (mainly methane) on the continental shelf, and nutrient-rich groundwater in the fjords. The health and proliferation of these deep water reefs relies on the assumption that there is a stable, local input of nutrients through the seabed at or near the location where the reefs are found

hydrocarbon - an organic molecule, such as methane (CH₄), which consists only of carbon and hydrogen atoms

hydrocarbon seep - an area where hydrocarbons seep slowly from the sea floor

hydrocaulus - the main stem of a colonial hydrozoan which consists of a cylindrical tube of living tissue (coenosarc) covered by a thin outer membrane (perisarc)



Hydrocaulus of the hydrozoan, *Obelia*. (Photo credit: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

hydrochory - spread of plant seeds, spores or propagules by water

hydrocoral - a cnidarian, belonging to the class Hydrozoa, which contains an internal skeleton of calcium carbonate, unlike the related hydroids, whose skeleton is chitinous and external. Hydrocorals, which include fire coral and the precious red coral used for jewelry, form encrusting or branching skeletons similar to those of anthozoan corals

hydrogen bond - a relatively weak chemical bond consisting of a hydrogen atom between two electronegative atoms (e.g., oxygen or nitrogen), with one side being a covalent bond and the other being an ionic bond

hydrogen ion - an individual atom of hydrogen which is not attached to a molecule and therefore has a positive (+) charge

hydrogen sulfide (H₂S) - a toxic gas formed by the anaerobic decomposition of organic matter. Its chemical formula is H₂S. It is a common chemical found in the fluids of hydrothermal vents formed when seawater is exposed to the sulfate in volcanic rock below the ocean floor. Hydrogen sulfide is colorless with a strong odor of rotten eggs

hydrogenosome - an organelle found in ciliates, trichomonads, and fungi. Hydrogenosomes are enclosed by a membrane and produce molecular hydrogen and ATP. They are thought to have most likely evolved from mitochondria

hydroid - a body shape of cnidarian polyps. A hydroid has a fleshy central stalk topped by a ring of tentacles used for catching food. Anemones are one kind of hydroid; many jellyfishes are hydroids for part of their life cycle

hydrological cycle - the movement of water in all of its phases (gas, liquid, solid) from the Earth to the atmosphere and back to the Earth

hydrology - the science dealing with the properties, distribution and circulation of water and snow

hydrolysis - the breaking down of a compound into fragments by the addition of a molecule of water. The hydroxyl group is incorporated in one fragment and the hydrogen atom in the other

hydrophilic - having a strong affinity for water; tending to dissolve in, mix with, or be wetted by water -

hydrophobic - refers to molecules that do not interact with water and are not soluble in water. Hydrophobic compounds do not dissolve easily in water, and are usually non-polar. Oils and other long hydrocarbons are hydrophobic

hydrophone - an underwater microphone

hydroptic - having an excess of water or watery fluid

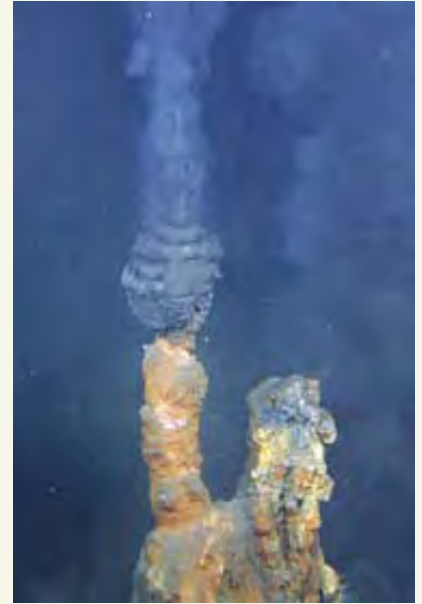
hydrorhiza - all structures by which hydrozoan polyps are attached to the substrate

hydrosere - an ecological succession beginning in a habitat with abundant water, typically on the submerged sediments of a standing water body (e.g. lake or lagoon), and ending on dry land

hydrostatic skeleton - a type of skeleton found in many soft-bodied invertebrates which consists of a turgid column of liquid within one of the body spaces that provides support or rigidity to the organism or to one of its parts. Hydrostatic skeletons are found in echinoderms (starfish, sea urchins), annelids (worms), nematodes (roundworms), and a number of other wormlike invertebrate phyla

hydrotheca - a thin outer covering of a hydranth, the feeding polyp, of a colonial hydrozoan

hydrothermal plume - a cloud of hot, mineral-rich water that flows out of a hydrothermal vent and disperses into the ocean, usually several hundred meters above the seafloor vent site. Rock particles and minerals in the plume water often make the plume look smoky

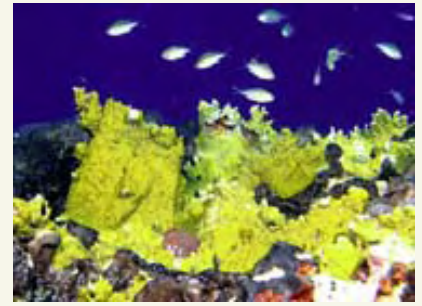


A "black smoker" chimney on the Brothers seamount on the Kermadec Ridge, emitting a hot hydrothermal plume of mineral rich fluid (Photo: Japan Agency for Marine-Earth Science and Technology (JAMSTEC))

hydrothermal vent - a sea floor fissure from which a spring of geothermally heated mineral and gas rich seawater issues. Hydrothermal vents are found on some oceanic ridges in zones of active seafloor spreading (plate tectonics)

hydroxyl group - an [-OH] or alcohol group on a larger molecule. The oxygen is single-bonded to the hydrogen and has one free bond to the rest of the molecule

Hydrozoa - a class within the phylum Cnidaria. The Hydrozoa contains five orders that include: small medusae with no polyp generation; colonial forms with alternating polyp and medusa stages and a chitinous exoskeleton; solitary polyps that lack a medusoid stage; colonial forms with massive aragonite skeletons (e.g., fire coral); and complex colonial forms, with individual polyps specialized for feeding, swimming, prey capture, and reproduction. Some, but not all, float by means of a large pneumatophore, or gas bag



White-tipped mustard-colored fire coral in the Flower Garden Banks.

hyoid - having a "U" shape

hyper- - above, exceeding, higher, more than, abnormally increased

hypereosinophilia - a disease characterised by a marked increase in the eosinophil (a type of white blood cell) count in the blood

hyperlink - text or images on a Web page that, when clicked with a mouse, causes the browser to load another page of HTML. Because a simple mouse click allows the user to easily go from one page of hypertext to another, these pages are said to be "hyperlinked." Text links are usually, but not always underlined in blue, while hyperlinks that are images often take the form of "buttons"

hyperplasia - abnormal increase in the size/volume of a tissue due to multiplication of cells

hypersaline - referring to water with a salinity higher than that of natural seawater

Hyperspectral AVIRIS (Airborne Visible/Infrared Imaging Spectrometer) - a hyperspectral image is a very high resolution image which was acquired with a hyperspectral scanner. These instruments acquire data in 224 contiguous channels of approximately 10nm bandwidth. They are spanning the visible, near-infrared and mid-infrared portion of the electromagnetic spectrum

hypertrophy - the over-development of a structure

hypertrophy - the excessive enlargement or development of an organ or tissue, with increase in cell size but without increased cell division

hypha - one of the long, branching filaments that forms the mycelium of a fungus

hypo- - under, below, beneath, lower than, small size, deficiency

hypobranchial gland - a gland in the mantle cavity of mollusks that secretes mucus

hypocenter - the point under the earth's surface where the energy of an earthquake is first released. The point directly above the hypocenter on the earth's surface is the epicenter

hypolithic - living on lower surfaces of rocks

hyposaline - referring to water with a salinity lower than that of natural seawater

hypostome - in cnidarians, the circular raised area of a hydrozoan polyp that lies between the tentacles and the mouth. The term is also used to describe mouthparts in other phyla

hypothermia - a condition when the body temperature is colder than normal (37 degrees C/98.6 degrees F in humans)

hypothesis - a tentative assumption made for the purpose of empirical scientific testing. A hypothesis becomes a scientific theory when repeated testing and the great body of evidence suggests that the hypothesis has a strong probability of being correct

hypoxic - deficient in oxygen

hypural plate - in fishes, the flattened bony plate at the posterior end of the vertebral column



The hypural plate is the expanded ends of the hypurals that form a wide, fan-like plate onto which the caudal fin rays are attached (Illustration: Fishbase)

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site
All of NOAA

Glossary of Terminology: I

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

ichno - a prefix meaning "trace"

ichnogenus - a genus based on the fossilized work of an organism

ichnologist - a scientist whose area of study and research is ichnology

ichnology - the branch of paleontology that deals with traces of organismal behavior. The division of ichnology dealing with trace fossils is paleoichnology, while neoichnology is the study of modern traces

ichnospecies - a species based on the fossilized work of an organism

ichnotaxon - a taxon based on the fossilized work of an animal, including fossilized trails, burrows, and tubes

ichthyo- - pertaining to fishes

ichthyochory - the dispersal of plant seeds or spores by fishes

ichthyology - the scientific study of fishes



The diver is studying the behavior and ecology of squirrelfishes on a Caribbean coral reef. (Photo: Dr. Anthony R. Picciolo, NOAA)

icon - a small picture displayed on a computer monitor that identifies a command or file.

iconel tag - a metal tag that is attached to the trailing edge of a seaturtle's flipper to provide a means of unique identification

iconotype - in taxonomy, a drawing or photograph of a type specimen

icosahedral - a many sided, three dimensional, hexagonal shape made up of many small triangles

ICRI (International Coral Reef Initiative) - an environmental partnership and network that brings all the stakeholders together with the objective of sustainable use and conservation of coral reefs for future generations. ICRI is an informal mechanism that allows representatives of over 80 developing countries with coral reefs to sit in equal partnership with major donor countries and development banks, international environmental and development agencies, scientific associations, the private sector and non-governmental organizations (NGOs) to decide on the best strategies to conserve the world's coral reef resources

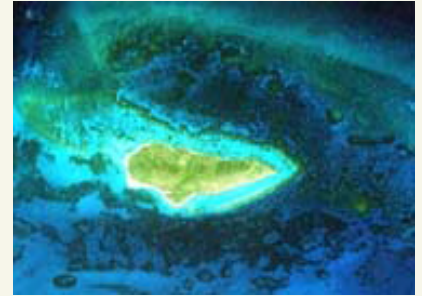
Icriforum - the official web site of the International Coral Reef Initiative (ICRI). Information relative to ICRI and its secretariat are available under this section, such as the current secretariat, the ICRI Meetings, the history of ICRI, and the ICRI Partners

idiopathic - denotes a disease of unknown cause or origin

IDL (Interactive Data Language) - a commercial array-oriented language with numerical analysis and display features, first released in 1977. It supports interactive reduction, analysis, and visualisation of scientific data

igneous rock - a rock formed by the cooling and crystallization of molten magma

IKONOS satellite - high-resolution (1-2 meter resolution) imaging satellite; the world's first commercial satellite for imagery of this type



Four-meter true color IKONOS image of Buck Island Reef National Monument shows an extensive underwater coral reef ecosystem.

illicium - a "fishing rod-like" appendage on the head of some fishes, usually a modified dorsal fin spine



Illustration depicting the "fishing rod-like" appendage on the head of the above fish

imagery - visible representation of objects and (or) phenomena as sensed or detected by cameras, infrared and multispectral scanners, radar, and photometers

imbricate - with overlapping parts, such as scales

imitation - a behavior that occurs when an animal immediately mimics the actions of another animal while they are in each other's presence

immature - describes an animal that has not reached sexual maturity, regardless of size or age

immersed corallite - a corallite that is embedded in the surrounding coenosteum

immune system - a system that provides the organism with a defense against infection. In higher organisms it is afforded by the presence of circulating antibodies and white blood cells. Antibodies are manufactured specifically to deal with the antigens associated with different diseases as they are encountered. White blood cells attack and destroy foreign particles in the blood and other tissues

immunogen - any substance that can elicit an immune response

immunosuppressive compound - a compound that suppresses the body's immune system. Immunosuppressive compounds are medically important in cases of hypersensitivity to certain antigens or organ transplantations. A number of immunosuppressive molecules have been isolated from marine sponges

impact - a change, caused by external sources, in the chemical, physical (including habitat) or biological quality or condition of a habitat or environment

imperforate corals - corals which have solid skeletons with no connections between the polyps

impermeable - having the property of restricting the passage of substances across a membrane

imposex - the imposition of male characteristics on female organisms, as caused by some pollutants. For example, a pseudo-hermaphroditic condition in female gastropods (development of a false penis) caused by tributyltin (TBT), a biocide used in anti-fouling paints

imprimis - in the first place

in adnot. - in an annotation (*in adnotatio*)

in hospite - within the host

in litt. - in correspondence or communicated in writing; used for an unpublished source of information (*in litteris*)

in situ - in the natural or original position

in situ data - measurements made at the actual location of the object or material measured, in contrast to remote sensing

in situ hybridization - a method of detecting the presence of specific nucleic acid sequences within a cytological preparation. A DNA or RNA probe is labeled, radioactively or chemically, and hybridized to a cytological preparation to detect RNA, or to a denatured cytological preparation to detect complementary DNA. The hybridization is detected by autoradiography (for radioactive probes) or by chromogenic reactions or fluorescence (for chemically-labeled probes)

in syn. - in synonymy (*in synonymis*)

in vitro - a laboratory experiment or study performed outside the body of a living organism in a test tube, petri dish, or other vessel

in vivo - studies conducted in intact living organisms or cells

inbreeding - reproduction among closely related individuals

inbreeding depression - a reduction in fitness and vigor of individuals as a result of increased homozygosity through inbreeding

inc. sed. - of uncertain taxonomic position or affinities (*incertae sedis*)

incidence - pertaining to disease, the number of new cases of a specific disease occurring during a certain time period, or number of diseased individuals in a population

incident command system (ICS) - a management system used to organize emergency response. ICS offers a scalable response to an emergency (incident) of any magnitude, and provides a common framework within which people can work together

incidental parasite - an accidental parasite

incipient population - a small population that is just beginning to reproduce and become established in an area or community

incipient species - a geographically isolated population. With time, the accumulation of genetic differences in the incipient species population produces isolating mechanisms which inhibit the reproductive potential of the incipient population and its conspecific parent population

incisiform tooth - a chisel-shaped tooth used for cutting. Typically, it wider than it is thick

incomplete dominance - in genetics, an interaction between alleles in which both alleles are expressed more or less equally. The expression for a phenotype for a given trait exhibits a blending of the genetic messages from the allele partners controlling that trait. An example may be a cross between a homozygous red trait (AA) and a homozygous white trait (aa), where neither the red (A) nor white (a) trait is dominant. The phenotypic expression of the offspring is pink (Aa), the intermediate phenotype

incomplete protein - a protein which does not supply all the essential amino acids

incorporated territory - equivalent to Territory, a United States insular area, of which only one territory exists currently, Palmyra Atoll, in which the United States Congress has applied the full corpus of the United States Constitution as it applies in the several States. Incorporation is interpreted as a perpetual state. Once incorporated, the Territory can no longer be de-incorporated

incubation - the period of time from when an egg is fertilized until hatching; the maintaining of eggs under conditions favorable for hatching; the time between exposure to an infectious organism and the appearance of clinical systems of disease

incurrent canal - in sponges, an inpocket of the epidermis (pinacoderm) which opens into a choanocyte chamber via a small opening, the prosopyle

independent assortment - the random alignment of homologous chromosomes during meiosis. Each member of a pair of homologous chromosomes separates independently of the members of other pairs so the results are random

independent variable - a variable controlled by the experimenter

indeterminate cleavage - cleavage where the fate of the resulting daughter cells is not determined after the initial division of a fertilized egg. If the cells separate, each has the potential to develop into an entire organism and the resulting individuals are genetically identical (identical twins). Indeterminate cleavage is characteristic of deuterostomes

indicator species - any organism that by its presence or absence, its frequency, or its vigor, indicates a particular property of its surrounding environment; a species whose presence is a sign that certain environmental conditions exist

indigenous - native to a particular country or area

Indo-Pacific - a vast region encompassing the tropical Indian and Pacific Oceans from Africa in the west to Hawaii and French Polynesia in the east. This area represents the largest marine biogeographic region in the world

inductive reasoning - the process of observing data, recognizing patterns, and making generalizations from the observations; reasoning from particular facts to a general conclusion

inert - refers to unmoving or unchanging. In chemistry, a substance which does not or rarely combines with other substances. In medicine, it means a substance that has little or no effect on the human body

infauna - animals that inhabit the sandy or muddy surface layers of the ocean bottom, i.e., those that live buried or dig into the substrate

infection - the invasion of an organism's body tissues by disease-causing microorganisms, which may produce tissue injury

infectious - capable of spreading disease

infectious agent - an organism capable of spreading disease

inference - a conclusion derived either by logical reasoning from premises and/or evidence, or by insight or analogy based on evidence

inferior - anatomically beneath, lower, or toward the bottom (e.g., the mouth is inferior to the nose)

inflammation - a nonspecific, localized protective immune response of tissues to irritation, injury, or infection, characterized by pain, redness, swelling, and sometimes loss of function. Inflammation may be acute or chronic

inflated - swollen or expanded

informatics - the management and analysis of data using advanced computing techniques

information management - the integration of a variety of activities designed to manage information and information resources throughout their life cycle. Activities include planning, budgeting, organizing, directing, training, promoting, and controlling the information and information resources throughout the process of collecting, processing, transmitting, disseminating, and disposing of information; the manipulation, reorganization, analysis, graphing, charting, and presentation of data for specific management and decision-making purposes

Information Technology (IT) - a very general term referring to the entire field of Information Technology - anything from computer hardware to programming to network management

infra- - a prefix meaning "below"

infrared scanner - an instrument that detects infrared radiation and converts the detected energy to an electrical signal for recording on another medium

infrasonic - sound waves that have a frequency that is lower than what humans can hear (i.e. below about 20 hertz). Some baleen whales and elephants produce infrasounds to communicate over long distances

infraspecific name - in taxonomy, a general term for any name below the rank of species. The term includes subspecific and infrasubspecific names

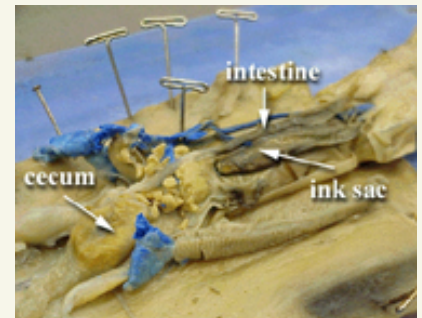
infrasubspecific - in taxonomy, a category below the subspecies level

infundibuliform - funnel-shaped

ingestion - the intake of water or food substances by "swallowing" them, taking them into the body cavity or into a cell vacuole

inhalant system - in sponges, part of the aquiferous system between the ostia and prosopyle

ink sac - a diverticulum of the rectum of most cephalopods, where an 'inky" melanin solution is stored. The ink is ejected from a duct opening at the base of the siphon. It serves to cloud the water, and enable these animals to escape from predators



Ventral view of a dissected squid revealing the ink sac. (Photo: Biology Dept., Fairfield University, Fairfield, CT)

innate - not established by conditioning or learning; "an unconditioned reflex"; a genetic behavior pattern

innate releasing mechanism - in ethology or animal behavior, an innate system within an animal that responds to a stimulus in the environment to produce a genetic stereotyped behavior; a stimulus-response mechanism

inner cell mass - the cluster of cells inside the mammalian blastocyst. These cells give rise to the embryonic disk of the later embryo and, ultimately, to the fetus

inorganic matter - chemical substances of mineral origin which contain no organically produced carbon

inquilinism - a symbiotic association in which one symbiont lives in close association with another, generally in its shell, tube or burrow, or actually within a body cavity of the host

inquilinism - a symbiotic association in which one symbiont lives in close association with another, generally in the tube or burrow or actually within a body chamber of the host

inserted gene - a gene introduced into the DNA of a recombinant organism which is not present at the same position in the DNA of the organism before genetic modification

insolation - the amount of solar radiation received on a given body or in a given area

instar - a discreet, in-between molt stage, during the metamorphosis of an arthropod from larva to adult

instinct - an unlearned, genetically coded behavior pattern that is internally motivated and characteristic of the species; the innate capacity of an animal to respond to a given stimulus in a relatively fixed way

insular - relating to, or characteristic of, or situated on an island

insular area - a jurisdiction that is neither a part of one of the several States nor a Federal district. This is the current generic term to refer to any commonwealth, freely associated state, possession or territory or Territory and from July 18, 1947, until October 1, 1994, the Trust Territory of the Pacific Islands. Unmodified, it may refer not only to a jurisdiction which is under United States sovereignty but also to one which is not, i.e., a freely associated state or, 1947-94, the Trust Territory of the Pacific Islands or one of the districts of the Trust Territory of the Pacific Islands

integer - a number without a decimal (0, 1, 25, 173, 1032, etc.). Integer values can be less than, equal to, or greater than zero

integrated coastal zone management - the process of combining all aspects of the human, physical and biological aspects of the coastal zone within a single management framework

Integrated Coral Observing Network (ICON) - As of October 2005, the coral research program at NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) was titled the "Integrated Coral Observing Network" (ICON), rather than the Coral Reef Early Warning System (CREWS). ICON is focusing upon: (a) Integrating data from diverse independent sources into value-added products supporting research, modeling and management decisions with respect to Marine Protected Areas and other ecosystem approaches to management issues, (b) Consistency with Integrated Ocean Observing System (IOOS) and Coral Reef Ecosystem Integrated Observing System (CREIOS) goals and objectives, (c) International partnerships to enhance the global ICON network, (d) Facilitation of development and transition to operations of promising relevant in situ instrumentation (e.g., PAM-fluorometry, pCO₂, acoustic and optical particle detection and size fractionation, and acoustic telemetry), and (e) The hand-off of responsibility for the in situ coral reef station network infrastructure to a NOAA operational line

Integrated Ecosystem Assessment - a critical tool to enable NOAA's ecosystem approach to management. An IEA is a synthesis and quantitative analysis of information on relevant physical, chemical, ecological and human processes in relation to specified ecosystem management objectives. IEAs focus not on collecting new observations or conducting new research, but on integrating existing datasets to produce more useful assessments, build ecological forecast models, and develop other ecological decision support tools

integrated observing system - a planned, organized, and structured system of interoperable earth observing systems, which, when networked, provide an expanded range of capabilities satisfying user information and product needs. An integrated observing system holds some common goals and adopts common solutions to achieve them

Integrated Ocean Observing System (IOOS) - IOOS is a system of systems that routinely and continuously provides quality controlled data and information on current and future states of the oceans and Great Lakes from the global scale of ocean basins to local scales of coastal ecosystems. It is a multidisciplinary system designed to provide data in forms and at rates required by decision makers to address societal goals

intensity - pertaining to sound, the average amount of sound power (sound energy per unit time) which is transmitted through a unit area in a specified direction. The magnitude of the intensity is often referred to as the intensity, without specifying the direction from which the sound is travelling

intention movement - an incomplete behavior pattern that provides information about the activity a particular animal is about to perform, and acts as a signal to others

interannual - refers to a climatic process that re-occurs every three to ten years. El Niño is an example of a climatic process that re-occurs every 4-6 years

interface - the common boundary between two substances such as a water and a solid, water and a gas, or two liquids, such as water and oil

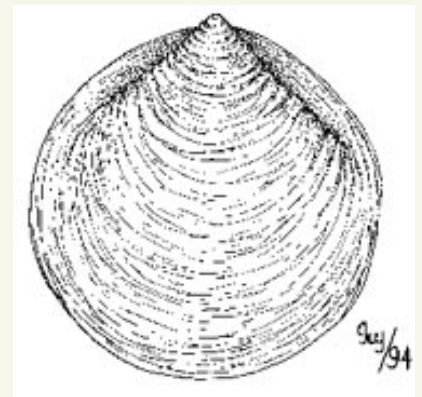
interference competition - competition in which one species prevents another from having access to a limiting resource

interferon - a family of small proteins that stimulate viral resistance in cells

interglacial period - a warm period between glacial epochs

interleukin - a family of proteins produced naturally to stimulate an organism's immune system by stimulating the growth and activities of certain kinds of white blood cells

intermediate form - a fossil or modern species that possesses characters definitive of two or more different taxa, or that displays characters morphologically intermediate between two different taxa



Some experts believe that the "living fossil" genus *Neopilina*, an internally segmented mollusk in the class Monoplacophora, is an evolutionary link between mollusks and other more obviously segmented invertebrates, such as annelid worms. (Graphic: BIODIDAC)

intermediate host - in a parasite's life cycle, it is a host organism in which a parasite undergoes a stage of asexual development

intermittent spawning - spawning at intervals

internal transcribed spacer (ITS) - a sequence of RNA in a primary transcript that lies between precursor ribosomal subunits and is removed by splicing when the structural RNA precursor molecule is processed into a ribosome. These sequences are coded by ribosomal DNA. Eukaryotic organisms have two internal transcribed spacers; ITS-1 is located between the 18S gene and the 5.8S gene, and ITS-2 is located between the 5.8S and the 28S gene. Ribosomal genes and spacers occur in tandem repeats that are thousands of copies long. The ITS region is widely used in molecular phylogenetics and taxonomy

International Code of Botanical nomenclature (ICBN) - the set of rules and recommendations dealing with the formal scientific names that are given to plants. The ICBN applies not only to plants, as they are now defined, but also to other organisms traditionally studied by botanist

International Code of Zoological Nomenclature (the Code) - in taxonomy, an authoritative document containing a system of rules and recommendations to be followed in giving a scientific name to an animal or animal group. It has been adopted by the International Congresses of Zoology (more recently the International Union of Biological Sciences) and is administered by the International Commission on Zoological Nomenclature. The most recent version of the Code is the Fourth Edition published in September 1999 and took effect on January 1, 2000; usually referred to as the "Code"

International Commission on Zoological Nomenclature (ICZN) - the judicial body empowered to enforce and interpret the International Code of Zoological Nomenclature

International Committee on Taxonomy of Viruses (ICTV) - a committee which authorizes and organizes the taxonomic classification of viruses. They have developed a universal taxonomic scheme for viruses and aim to describe all the viruses of living organisms

International Coral Reef Action Network (ICRAN) - established in 2000, ICRAN is a global partnership of coral reef experts who are working to halt and reverse the decline of the health of the world's coral reefs. Made up of some of the world's leading coral reef scientists and conservation groups, ICRAN partners have created a globally integrated action plan to manage and protect coral reefs, based on recommendations from the International Coral Reef Initiative (ICRI). The International Coral Reef Action Network is a coordinated response to ICRI's urgent call to protect coral reefs. There are three main interlinked components of ICRAN: reef management, global coral reef monitoring and assessment , and communications and knowledge dissemination

International Zoological Congresses - the legislative bodies responsible for the rules of the International Code of Zoological Nomenclature and for authorization of the activities of the International Commission on Zoological Nomenclature

interesting - as it pertains to marine turtles, the interval between a successful nest and the next nesting attempt

Internet Service Provider (ISP) - a company or organization that provides access to the Internet

interoperability - the ability of two or more systems to exchange and mutually use information

interorbital - the space between the eyes

interoreceptor - a neurological receptor that is located within the organism's body and detects physiological changes, e.g. pH, temperature, chemicals in blood

interpolated name - in taxonomy, a name placed within parentheses (after a generic name to denote a subgenus; after a genus-group name to denote an aggregate of species, or after a specific name to denote an aggregate of subspecies. Names used in this way are not counted as one of the names in a binomen or trinomen

interradial - in fishes, between the rays (or spines), e.g. interradian pigment is pigment on the membrane between the rays.

interradial canal - one of four branched ciliated canals in scyphozoan medusae that originates from the gastric pouches and move materials from the ring canal back toward the stomach and gastric pouches

interradial membrane - in fishes, the tissue between the fin rays or spines

interradial pigment - in fishes, interradian pigment is pigment on the membrane between the fin rays

intersex - an organism which possesses a mixture of male and female characteristics

intersexual - involving both sexes, male and female

interspecific - between members of different species

interspecific competition - competition between individuals of different species

interspinous membrane - in fishes, the membrane between fin spines

interstices - the openings or pore spaces in a rock, soil, and other such material

interstitial - refers to the interstices or pore spaces in rock, soil, or other material subject to filling by water; fluid-filled spaces between cells in tissues

interstitial fauna - animals that live in the spaces within sediment particles (interstitial spaces)

interstitial water - water in the pore spaces of soil or rock

intertidal zone - the region between the highest water line and the mean low tide level



Sea anemones crowd a rocky intertidal zone
(Photo: Nancy Sefton)

intertropical convergence zone - the zone of low pressure near the equator where the trade winds converge and create heavy convectational precipitation; also known as "intertropical front (ITF)

intolerant organism - an organism (or species) that is not adaptable to human alterations to its environment and thus declines in number where alterations occur

intranet - a private network inside an organization that uses the same kinds of software found on the public internet, but which is only for internal use

intrasexual - involving only one of the sexes, male or female

intraspecific - among members of the same species

intraspecific competition - competition between individuals of the same species

intratentacular budding - a type of asexual reproduction where daughter corallites grow from the inside wall of parent corallites, usually by division of the parent corallite

intrinsic - belonging to a thing by its very nature; the essential nature or constitution of a thing; inherent; in and of itself

intrinsic value - a value placed on the inherent qualities of a species, independent of its value to humans

introgression - the movement or incorporation of genes from one population into another through hybridization followed by backcrossing. Usually refers to movement of genes from one species to another or among sub-species that have been geographically isolated then brought back together by changes in the species ranges or planting of exotic populations

introgressive hybridization - the spread of genes of one species to another species through hybridization. The hybrids are able to breed back into one of the parental populations. This allows the reintroduction of alleles that may have been lost during the speciation process

intromittent organ - a copulatory structure employed by the males of species that practice internal fertilization to transfer sperm cells into the reproductive tube of the female, e.g., the clasper of a shark, skate or ray; penis; modified anal fin (gonopodium) of live-bearer fishes

intron - DNA sequences that interrupt the protein-coding sequence of a gene; introns are transcribed into mRNA but the sequences are eliminated from the RNA before it is used to make protein; junk DNA; in eukaryotic cells, a sequence of DNA that is contained in the gene but does not encode for protein. The presence of introns "splits" the coding region of the gene into segments called exons

invagination - an inward folding of a layer of cells forming an interior pocket



The cells at the vegetal hemisphere of this starfish blastula have begun to push into the blastocoel (invagination), forming a diploblastic embryo with a new cavity, the primitive gut, or archenteron. The cells lining the archenteron are endodermal cells. (Photo: Dr. Anna E. Ross, Christian Brothers)

invalid name - in taxonomy, any name for a given taxon other than the valid name

inversion - a chromosomal re-arrangement that reverses the order of a linear array of genes on the chromosome

invert - to turn inward; turn inside out or upside down

invertebrate - an animal that lacks a vertebral column (backbone)



Feathery invertebrate tube worms in the Caribbean Sea (Photo: Dr. Anthony Picciolo).

invertivore - an animal or plant that eats invertebrates

investigative behavior - the sensory inspection of the environment

involute - rolled inwards from the edges

ion - a positively or negatively charged atom produced through loss or gain of one or more electrons

ion channel - a pore in a cell membrane, formed by an integral protein, that selectively regulates the diffusion of ions into and out of the cell. An ion channel switches between open and closed when the protein undergoes a conformational change. Ion channels are usually selective for a specific ion type (e.g., Na, or K, or Cl, or Ca)

ionic bond - a chemical bond in which one atom loses an electron to form a positive ion and the other atom gains an electron to form a negative ion

ionizing radiation - high-energy radiation capable of producing ionization in substances through which it passes, i.e., radiation that has enough energy to eject electrons from electrically neutral atoms, leaving behind charged atoms or ions; examples are alpha particles (helium nuclei), beta particles (electrons), neutrons, and gamma rays (high frequency electromagnetic waves, x-rays)

ionocyte - a type of cell commonly found in the gills of fishes and some crustaceans. They play a role in regulating the salt concentration of cells in relation to the external environment, and differ greatly between freshwater and saltwater organisms; also called "chloride secretory cell"

IOOS (Integrated Ocean Observing System) - a "user-driven" integrated system of observations, data management and communications, and data analysis and modeling that provides data and information required to achieve seven societal goals: 1) Improve predictions of climate change and variability (weather) and their effects on coastal communities and the nation; 2) Improve the safety and efficiency of marine operations; 3) More effectively mitigate the effects of natural hazards; 4) Improve national and homeland security; 5) Reduce public health risks; 6) More effectively protect and restore healthy coastal marine ecosystems; and 7) Enable the sustained use of marine resources

IR (infrared) radiation - earth-emitted radiation over thermal wavelengths: 3-15 micrometers. Used for satellite remote sensing because it can be used to monitor weather and oceanographic conditions 24 hours a day

iridescent - exhibiting rainbow colors



This deep-sea fish called a "green eye" (Chlorophthalmidae)

exhibits a beautiful iridescent pattern around its large eyes and head. (Photo: NOAA Ocean Exploration)

iridiophore - a colorless chromatophore which contains purines, mostly guanine in the form of large, nonmotile crystals

isauxisis - equality in growth; isometry

ischemia - a condition in which a tissue or organ does not receive a sufficient supply of blood

island arc - a curved chain of islands that rise from the sea floor, usually near a continent. The convex side usually faces the open ocean, while the concave side usually faces the continent, e.g., the Aleutian Islands

isobath - a line on a map or chart that connects all points having the same depth below a water surface

isoenzyme - one of a group of enzymes that are very similar in catalytic properties, but may be differentiated by variations in physical properties, such as isoelectric point or electrophoretic mobility; also called 'isozyme'

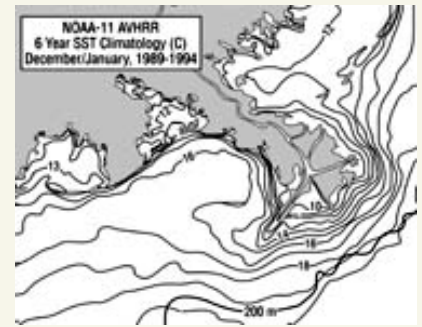
isogamous - having haploid gametes that are similar in size, structure and motility. An isogamete can unite with another to form a zygote

isogenic chromosome - in a diploid organism, a chromosome in which both alleles at every locus are identical on both copies

isohyetal line - a line drawn on a map or chart joining points that receive the same amount of precipitation

isolecithal - an egg cell in which the total amount of yolk is small and the yolk granules are fairly uniformly distributed throughout the cytoplasm, and cleavage completely bisects the cell, e.g., the egg of a starfish. A synonym is "homolecithal"

isoline - a line on a surface connecting points of equal value



Isobars are utilized to depict NOAA-11 AVHRR SST climatology in this diagram.

isometric contraction - a muscular contraction in which tension increases while the length of the muscle remains constant

isometric growth - growth that occurs at the same rate for all parts of an organism so that its shape is consistent throughout development

isometry - change in overall size that maintains the same relative proportional shape

isomorphic - having the same morphology for all stages of a life cycle

isopleth - a general term for a line connecting points of equal value of some quantity. Isobars, isobaths, isotherms, etc. are all examples of isopleths; also called an isoline

isorhiza - a form of cnidocyst (nematocyst) in which the tube is open and has the same diameter along its length. It responds to mechanical stimuli, and is also used in anchoring the animal when it walks on its tentacles

isotonic contraction - a muscular contraction in which tension is constant while the length of the muscle changes

isotope - one of two or more species of atoms of the same chemical element that have the same atomic number and occupy the same position in the periodic table. They are nearly identical in chemical behavior, but they differ in atomic mass or mass number. Therefore, they behave differently in the mass spectrograph, in radioactive transformations, and in physical properties, and may be separated or detected by means of these differences

isthmus - a narrow strip of land connecting two larger land masses, such as the isthmus of Panama

ITCZ (Intertropical Convergence Zone) - the region near the equator where the trade winds of the Northern and Southern Hemispheres converge

iteroparity - the reproductive condition in which individuals reproduce several times during their lifetime

iteroparous - a life history in which individuals reproduce more than once in a lifetime

ITIS (Integrated Taxonomic Information System) - a partnership of U.S., Canadian, and Mexican agencies, other organizations, and taxonomic specialists cooperating on the development of an online, scientifically credible, list of biological names. ITIS is also a participating member of Species 2000, an international project indexing the world's known species

IUCN (International Union for the Conservation of Nature and Natural Resources) - the world's largest conservation network. The Union brings together 82 States, 111 government agencies, more than 800 non-governmental organizations (NGOs), and some 10,000 scientists and experts from 181 countries in a unique worldwide partnership. The Union's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. IUCN is a multicultural, multilingual organization with 1000 staff located in 62 countries. Its headquarters are in Gland, Switzerland. " Since 1990, the IUCN has been known as the "World Conservation Union" but the full name and the acronym are often used together as many people still know the Union as IUCN

IUCN Categories I-VI - in the IUCN classification system for protected areas, Categories refer to higher levels of protection: Category I - Strict Nature Reserve/Wilderness Area: protected area managed mainly for science or wilderness protection; Category Ia - Strict Nature Reserve: protected area managed mainly for science; Category Ib - Wilderness Area: protected area managed mainly for wilderness protection; Category II - National Park: protected area managed mainly for ecosystem protection and recreation; Category III - Natural Monument: protected area managed mainly for conservation of specific natural features; Category IV - Habitat/Species Management Area: protected area managed mainly for conservation through management intervention; Category V - Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation; Category VI - Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: J

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

J curve - a J-shaped growth curve that depicts exponential growth

Jaccard distance - a statistic which measures dissimilarity between sample sets. It is obtained by dividing the difference of the sizes of the union and the intersection of two sets by the size of the union, or, simpler, by subtracting the Jaccard coefficient from 1

Jaccard index - a statistic used for comparing the similarity and diversity of sample sets; also known as the Jaccard similarity coefficient

Jack - any species of bony fishes in the family Carangidae (which also includes the pompanos). Jacks are cosmopolitan in warm and temperate marine waters, some even venturing into brackish and fresh water. As a group, they are swift and strong predators. Typically, jacks have a series of lateral scutes along each side of the caudal peduncle. In some species, these scutes extend along the lateral line. Some are important game and food fishes



A pack of crevalle jacks swimming over a Caribbean reef. Note the characteristic line of bony scutes along the lateral surface. (Photo: Anthony R. Picciolo, Ph.D./NOAA)

Jaspaquinol - an antiinflammatory drug derived from the marine sponge *Jaspis splendens*

Java - a programming language created by Sun Microsystems which allows the user to create programs which run well in a networked environment (such as the World Wide Web). Java programs are commonly called "applets" and can be used to add anything from calculators to animated images to web sites

jawfish - species of small bony fishes belonging to the family Opistognathidae. Jawfishes inhabit sandy, rubble-strewn areas on the reefs where they dig burrows into which they retreat when danger threatens. They hover over their burrows and feed on small animals that swim or drift by. The entrances to their burrows are lined with small pebbles or coral rubble and they are continually "grooming" the burrow by shoveling out mouthfuls of sand. They frequently raid neighboring jawfish's burrows to steal pebbles. Males are mouth breeders, carrying fertilized eggs in their mouths until they hatch

jetsam - objects that have been thrown overboard in order to lighten a ship when it is in trouble

jetty - a structure extending into the ocean to influence the current or tide in order to protect harbors, shores, and banks



A jetty protecting the shore line. (Photo: NOAA)

Johnson-Sea-Link (JSL) Submersible - the Johnson-Sea-Link (JSL) I and II submersibles are owned and operated by the Harbor Branch Oceanographic Institution. At 23.6 ft long, 10.9 ft high and 8.3 ft wide, these highly maneuverable submersibles can dive to a depth of 3,000 ft and travel at a maximum speed of one knot

joint - the place where two articulating segments meet

joint probability - the probability of two or more things occurring together

Jordan's Rule - In general, closely related species do not have identical ranges, but often their ranges are not very far apart. They are usually adjacent but separated by some kind of a geographic barrier, such as a mountain, desert, or river. A second Jordan's Rule is: fishes develop more vertebrae in cold environments than in warm ones

JPEG (Joint Photographic Experts Group) - the original name of the committee that wrote the standard. It is a lossy compression technique for color images. Although it can reduce files sizes to about 5% of their normal size, some detail is lost in the compression

jugostegalia - a basket-like structure formed midventrally by overlapping branchiostegals in some families of eels

jugular - pertaining to the throat area



Blennies have their pelvic fins in the jugular position, anterior to the pectoral fins. (Photo: South Florida Water Management District)

junior homonym - in taxonomy, the younger, or most recently established taxonomic name

junior synonym - in taxonomy, the younger name of two synonyms

junk DNA - a term used to describe the excess DNA which is present in the genome beyond that required to encode proteins. The term is misleading since these regions are likely to be involved in gene regulation, and other not yet known functions; a non-coding sequence of DNA; an intron

juvenile - a young animal that has not reached sexual maturity

juxtaposed - placed near together

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site
All of NOAA

Glossary of Terminology: K

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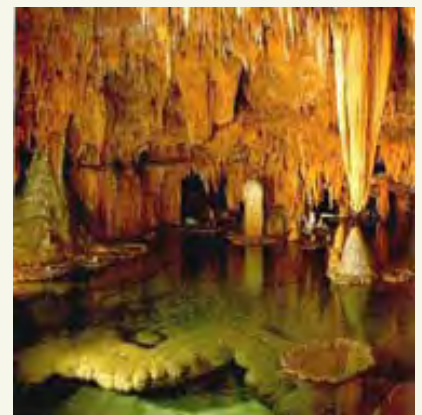
Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

kairomone - a class of pheromone which is an interspecific chemical secretion that benefits the receiver but not the emitter; also defined as a pheromone produced by organisms to attract a mate, though in some cases can also undesirably attract the attention of a predator

Karst - a limestone terrain characterized by sinks, caverns, abrupt ridges, protuberant rocks and drainage characteristics due to greater solubility of limestone in natural waters than is common. The term is derived from the geographical name of part of Slovenia

Karst cave - a cave caused by dissolution of limestone by water



A karst cave. Karst ecosystems are rich in water and mineral resources, and provide unique habitats to numerous fish and wildlife. (Photo: USFWS)

karyogamy - a process of fusion of the nuclei of two sex cells or gametes; the second step in syngamy

karyokinesis - the cellular process of nuclear division

karyology - the study of the nucleus of a cell

karyolysis - the disintegration and dissolution of a cell nucleus upon death of the cell

karyorrhexis - the rupture of a cell nucleus, releasing disintegrated chromatin

karyotype - the entire chromosome complement of an individual cell, as seen during the mitotic phase

Kelvin scale - an absolute scale of temperature in which each degree equals one kelvin. Water freezes at 273.15 K and boils at 373.15 K

kenozooid - a small bryozoan heterozooid that strengthens and supports the colony, as well as fill spaces; long, branching, tubular, transparent stolons which extend above the substratum and to which the feeding individuals (autozooids) are attached

keramidine - a bioactive compound isolated from the marine sponge *Agelas* sp. It is a neurosuppressive compound (a serotonergic receptor antagonist that blocks serotonin-mediated communications among neurons) which has potential as a drug for treatment of neurological disorders

ketone - any of a class of organic compounds that is produced during fat metabolism. Ketones contain a carbonyl group, CO, attached to two alkyl groups, such as CH₃COCH₃

key - a small, low coastal island or emergent reef of sand or coral; flat mound of sand and admixed coral fragments built upon a reef flat or just above high tide level. A synonym of **cay**



A number of small keys (cays) in Jobos Bay, Puerto Rico.

key character - in taxonomy, a diagnostic character used in a taxonomic key

key factor analysis - a statistical treatment of population data designed to identify factors most responsible for change in population size

key stimulus - in ethology or animal behavior, the stimulus which releases a fixed action pattern

keystone predator - the dominant predator or the top predator that has a major influence on community structure

keystone species - a species that is disproportionately important in the maintenance and balance of its community integrity

kilobase (kb) - a length unit equal to 1000 base pairs of a double-stranded nucleic acid molecule; 1000 pairs of nucleotide bases in DNA

kinetic energy - energy associated with motion

kinetics - the study of acceleration, motion, or rate of change

kinetochore - a structure forming at the centromere during mitosis for binding microtubules; a platelike structure necessary for chromosomal movement during mitosis; it develops on the centromere and links the chromosomes to the mitotic spindle

kingdom - in taxonomy, the highest ranked category in the taxonomic hierarchy. All organisms are classified into one of five kingdoms: Monera (the prokaryotic Kingdom. Includes archaeobacteria, eubacteria and cyanobacteria); Protista (unicellular eukaryotes); Fungi (yeasts and mushrooms); Plantae (plants); and Animalia (animals). Some scientists recognize slightly different classification schemes

kinocilium - a minute short cellular hair-like process (microvillus) responsible for locomotion in motile unicellular organisms, or in higher forms, generates a current of fluid

kleptoparasitism - stealing from one animal by another; also called "piracy"

knee root - an aerial root of a mangrove that emerges from the ground then loops back in. It is also called a peg root. It is not clear whether knee roots have a role in respiration

knob - a circular, rounded projection or protuberance that sticks out from a surface; a projecting structure on the reef margin or reef front wherein the upper surface flares outward, giving the surface a greater diameter than the basal section

knoll - a small reef within the lagoon or on shallow shelves

knot - The unit of speed used in navigation that is equal to 1 nautical mile (6,076.115 ft or 1,852 m) per hour

Knowledge Management (KM) - an emerging management discipline oriented toward creating and applying an organization's knowledge assets; a new branch of management for achieving breakthrough performance through the synergy of people, processes, and technology. Its focus is on the management of change, uncertainty, and complexity. KM caters to the critical issues of organizational adaptation, survival, and competence in face of increasingly discontinuous environmental change. It embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings

Koch's Postulates - to establish the specificity of a pathogenic microorganism, it must be present in all cases of the disease, inoculations of its pure cultures must produce disease in animals, and from these it must be again obtained and be propagated in pure culture

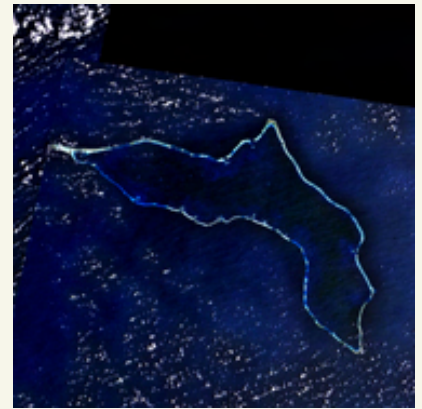
Krebs cycle - a series of enzymatic reactions in mitochondria involving oxidative metabolism of acetyl compounds to produce high-energy phosphate compounds that are the source of cellular energy ; also known as the tricarboxylic acid (TCA) cycle and as the citric acid cycle

Kure Atoll - the most remote of the Northwestern Hawaiian Islands, and the northern-most coral atoll in the world, located at the extreme northwest end of the Hawaiian archipelago. The atoll has almost 80,000 acres of coral reef habitat with 28 species of stony corals so far documented. Kure Atoll is an important pupping and resting area for Hawaiian Monk seals. The island is also a nesting area for many species of sea birds, and a wintering area for a variety of migratory bird species from North America and Asia



Photos: (Left) The Kure Atoll Reserve Preservation Area includes approximately 17 square nautical miles (57 square kilometers) of submerged coral reef habitats; (Right) An endangered Hawaiian monk seal and her pup. (Photos: NOAA)

Kwajalein Atoll - the largest atoll in the Republic of the Marshall Islands. Kwajalein Atoll has the world's largest lagoon (839.30 km²) and is comprised of 97 islets with a land area of 6.33 km² . Kwajalein Atoll has been used as a U.S. military base since 1944



Kwajalein Atoll - NASA NLT Landsat 7 (Visible Color) Satellite Image. (Photo: NASA)

Kyoto Protocol - an agreement made under the United Nations Framework Convention on Climate Change (UNFCCC). Nations that ratify this protocol make a commitment to reduce their emissions of carbon dioxide and and five other greenhouse gases or engage in emissions trading if they maintain or increase emissions of these gases

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: L

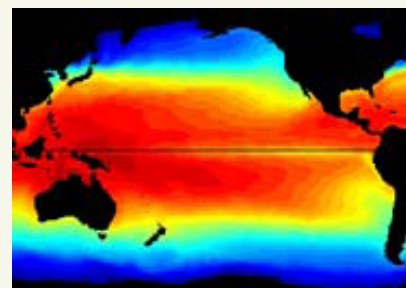
The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

La Niña - a phenomenon characterized by unusually cold ocean temperatures in the eastern Equatorial Pacific, compared to El Niño, which is characterized by unusually warm ocean temperatures in the eastern Equatorial Pacific



Graphic showing December 1998 La Niña event.

label - a compound or atom that is either attached to, or incorporated into, a macromolecule and is used to detect the presence of a compound, substance, or macromolecule in a sample; also called a 'tag'

labeled - to mark substances in a way that they can easily be identified. In an organism, substances may be labeled using stable isotopes or harmless radioactive components so that they can be traced, analyzed or measured

labial - pertaining to the lips

labium - any lip-like structure

Lacey Act - the Lacey Act, passed in 1900, and amended several times, makes it unlawful to import, export, transport, sell, buy, or possess fish, wildlife, or plants taken, possessed, transported, or sold in violation of any federal, state, foreign, or Native American tribal law, treaty, or regulation

lacriform - tear-drop shaped; also called "dacriform"

lacuna - a cavity ("little lake") in a matrix-like substance. For example, cartilage cells (chondrocytes) are located in lacunae in the cartilagenous matrix; bone cells (osteocytes) are located in lacunae in bone matrix

lagoon - a warm, shallow, quiet waterway separated from the open sea by a reef crest



A lagoon in Bora Bora.
(Photo: Dr. Anthony Picciolo/NOAA)

lagoon slope - the back reef on a barrier or atoll reef

lambert - unit of brightness of light

lanceolate - spear-shaped, tapered at both ends

lanceolate - shaped like a lance head

lanciform - lance-shaped

lander system (benthic lander) - a scientific instrument system designed for temporary deployment on the sea floor in order to monitor environmental parameters. It is an unmanned vehicle that falls to the seafloor unattached to a cable, and then operates autonomously on the bottom. At t



A lander system being deployed. The part with the large yellow structures is the floatation rack
(Photo: KC Denmark)

Landsat satellite - U.S. satellite used to acquire high-resolution (500-800m) remotely sensed multi-spectral images of the earth's land surface and surrounding coastal regions



Artist's rendition of LANDSAT satellite.

langley - unit of solar radiation

lappet - a sensory structure in some jellyfish (Scyphozoa), associated with a rhopalium, which responds to touch (pressure); a fleshy lobe

Large Marine Ecosystems (LMEs) - Large marine ecosystems are natural regions of ocean space encompassing coastal waters from river basins and estuaries to the seaward boundary of continental shelves and the outer margins of coastal currents. They are relatively large regions of 200,000 km² or greater, the natural boundaries of which are based on four ecological criteria: bathymetry, hydrography, productivity, and trophically related populations. The NOAA-Fisheries Large Marine Ecosystems (LMEs) Program has been engaged in the development and implementation of an ecosystem-based approach to support the assessment and management of marine resources and their habitats. A five theme modular approach has been developed for monitoring and assessing changes in productivity, fish and fisheries, pollution and ecosystem health, socioeconomics and governance of LMEs in relation to recovery, sustainability and management of marine resources and their habitats. The 10 United States LMEs are the Northeast Shelf, Southeast Shelf, Gulf of Mexico, California Current, Gulf of Alaska, Chukchi Sea, Beaufort Sea, East Bering Sea, Insular Pacific-Hawaii, and the Caribbean Sea). A global effort is underway by NOAA in partnership with the World Conservation Union (IUCN), the Intergovernmental Oceanographic Commission of UNESCO (IOC), and other UN agencies to improve the long-term sustainability of resources and environments of the world's 64 LMEs and linked watersheds

larva - a sexually immature juvenile stage of an animal's life cycle. However, there are a few exceptions, where the larval form never metamorphoses into the adult stage and is sexually mature (neoteny)



Microscopic photograph of a crab larva (megalops stage) from a plankton collection.

laser line scan (LLS) - an electro-optic imaging technique which provides the efficiency and spatial coverage of a remote survey system, at an image resolution approaching that of visual observations. LLS produces high contrast underwater light field images, at millimeter to centimeter scale resolution and at two to five times the range of conventional video and photographic systems. Resolution and area covered by the images (swath width) vary with water clarity and tow height above the bottom

lasonolide - a marine pharmaceutical, extracted from the sponge *Forcepia* sp., which possesses anti-tumor properties

lateral - refers to the side or flank of an animal

lateral display - a type of threat or reproductive behavior exhibited by many species of fishes, in which two male fish align beside each other, spread their dorsal, anal, and pelvic fins, and intensify the coloration of their bodies. These threats are usually accompanied by tail beats and body quivering

lateral line scale - one of a series of scales that bear the pores and tubes of the lateral line system

lateral line system - a series of sense organs that detect pressure or vibrations along the heads and sides of cyclostomes, fishes, and some amphibians. It consists of a network of sensory hair cell clusters (neuromasts) and small water-filled canals that lie immediately beneath the skin and extend along the sides of its body. This network is sensitive to external motion



Note the lateral line of the Caribbean red snapper (*Lutjanus purpureus*) with 49 to 53 scales, which extend onto the base of the caudal fin. (Photo: U. S. Food and Drug Administration)

latitude - the angular distance between an imaginary line around the Earth, or any spherical body, parallel to its equator and the equator itself; an imaginary line around the Earth parallel to the equator

launch - to start up any computer program by clicking on its icon or selecting it from the Start menu

Law - a description of how a natural phenomenon will occur under certain circumstances; a statement that summarizes the results observed in an experiment that is repeated many times by many different scientists. A scientific law is widely accepted as true or as a fact, such as Newton's Laws of Gravitation

Law of Conservation of Energy - energy can be transferred from one system to another in many forms, however, it can not be created nor destroyed. Thus, the total amount of energy available in the universe is constant

Law of Parsimony (Occam's Razor) - when you have two competing theories which make exactly the same predictions, the one that is simpler is the better; also called "Occam's Razor"

Law of the Minimum - the growth of a population is limited by the resource in shortest supply. Also known as 'Liebig's Law'

law of tolerance - the presence, number, and distribution of species in an ecosystem are determined by whether the levels of one or more physical or chemical factors fall within the range tolerated by the species

leaching - the movement of liquid into another material

lead line - a line with a lead weight on the end used to measure depth. The lead is dropped into the water and marks on the line are read to determine the current water depth. The lead usually has a cavity to return a sample of the bottom type (mud, sand, etc.)



A lead line on the deck of a ship (Photo: Ocean Institute)

least squares - a statistical criterion for the estimation of the goodness of fit in correlation analysis. Least squares methods aim to minimize the sum of squared differences between the observations and the predictions from a model

lecithotrophic larva - a planktonic larva that gains its nutrition from yolk (semi-crystalline phospholipoprotein granules). In most bony fishes, yolk is supplied by the yolk sac, a bag-like ventral extension of the gut containing yolk granules

lectotype - in taxonomy, one of several syntypes, designated by any author after the original publication of a species name as the 'type specimen' for the taxonomic name. Designated only where there was no original holotype

LED (light emitting diode) - a very small light often used in electronic instrumentation

lee - sheltered

leeward - referring to the side of an island or reef that faces away from the prevailing wind

lek - a polygynous mating system where a number of males aggregate at a particular site during the breeding period and engage in courtship behavior, especially displays. Females attracted to the site "select" males for mating and subsequent fertilization of eggs. Once mated, the females usually go elsewhere to lay their eggs or to complete gestation. Lekking behavior (also called arena behavior) has been observed among cuttlefish, fishes, birds, antelope, and insects. Lekking species tend to stay at a single lek throughout a breeding season and to return to the same lek site from breeding period to breeding period

lenticel - aerial roots (pneumatophores) of mangroves contain spongy tissue connected to the exterior of the root via small pores called lenticels. During low tide, when lenticels are exposed to the atmosphere, oxygen is absorbed from the air and transported to and even diffused out of the roots below ground. This diffusion of oxygen maintains an oxygenated microlayer around the roots that enhances nutrient uptake.

leptocephalus larva - a long, ribbon-like larval form that is characteristic of eels, tarpons, and bonefishes

lepton - a class of subatomic particles that constitute matter which have no measurable size and do not interact with the strong nuclear force. The charged leptons are the electron, the muon, the tau and their antiparticles. Neutral leptons are called neutrinos

lesion - any pathological or traumatic discontinuity of tissue, or loss of function of a part

lesion severity - the semiquantitative, subjective ranking of the degree of damage or extent of pathological change in the tissues of an organism

lethal gene - a mutant form of a gene whose phenotypic effect eventually results in the death of the bearing organism. Death from different lethal genes may occur at any time, from fertilization of the egg to advanced age. Lethal genes may be dominant, incompletely dominant, or recessive; also called a 'lethal allele'

leucocyte - a cellular component of blood. Leucocytes help to defend the organism's body against infectious disease and foreign materials as part of the immune system; also called "white blood cell"

leuconoid - the body form of highest complexity in sponges. The leuconoid form is highly irregular, displays the greatest degree of folding of the body wall, and has lost radial symmetry. The choanocytes line the pockets formed by the convoluted body wall



Leuconoid sponges represent the most complex body form. The canal system is extensively branched. Usually there are many oscula in each sponge. (Illustration: www-biol.paisely.ac.uk)

leucophore - a colorless chromatophore which contains purines, usually guanine, in the form of small, motile crystals in the cell's cytoplasm

levee - a raised embankment along the edge of a river channel. Natural levees result from periodic overbank flooding, when coarser sediment is immediately deposited because of a reduction in river velocity. Levees are often constructed by humans living in low-lying areas as protection against flooding

library - in genomics, an unordered collection of clones (i.e., cloned DNA from a particular organism) whose relationship to each other can be established by physical mapping

LIDAR (Light Detection And Ranging) - a remote-sensing technique that uses a laser light source to probe the characteristics of a surface target. A laser emission may be directed downward from a low flying aircraft. Information about the target is derived from back-scattered reflectance or fluorescence of the target. Chlorophyll pigments in coral reef organisms (e.g., algae, seagrasses, coral), when excited by shorter (blue or green) wavelength light, emit light at longer (red) wavelengths, i.e., it fluoresces

life - there is no universal definition of life. Different scientists have proposed a variety of similar definitions which describe life as a process that exists within cells and has the following attributes: homeostasis, organization, metabolism, growth, reproduction, response to stimuli, and adaptation to the environment

life cycle - the complete succession of developmental changes undergone by an organism during its life, from fertilized egg (zygote) to maturity when another fertilized egg can be produced

ligand - a molecule, such as a hormone or growth factor, that binds to a specific site on a receptor protein

ligase - an enzyme used to join DNA (DNA ligase) or RNA (RNA ligase) segments together

light trap - a stationary or floating collecting apparatus that contains a light source, e.g., a chemical glow light, which attracts larval, juvenile, and adult fishes, as well as invertebrates. The animals enter the trap through small holes or funnels and then are unable to find their way out



A light trap. At night, adult and larval fishes are attracted to chemical light sticks or fluorescent lights inside the traps and are able to enter through openings on the sides. They are then unable to find their way out. (Photo: Australian Museum)

limnology - the study of the physical, chemical, meteorological and biological aspects of fresh waters

limoniform - lemon-shaped

limu - general Hawaiian name for all kinds of aquatic plants and soft corals; also terrestrial algae growing in any damp place on the ground, on rocks, and on other plants

limu kohu - the Hawaiian name for the red alga, *Asparagopsis taxiformis*, an edible species that is no longer common in the Main Hawaiian Islands, but is relatively abundant the shallow waters of some of the Northwestern Hawaiian Islands

line intercept transect - a linear transect protocol where a tape is secured at each end of the transect with the tape draped over the reef in between. Observations are collected on each species and substrate component and their length under the tape

line precedence - in taxonomy, when two different names for the same taxon are first published in the same publication, then the one which appears on the earlier line has line precedence. Line precedence does not necessarily mean priority as well. This is determined by the action of the first reviser

lineage - a genetically continuous line of evolutionary descent

linear acceleration - the rate of change of velocity in a linear direction (along a straight line) with respect to time

linear reef - a linear coral formation that is oriented parallel to the shore or the shelf edge

linear regression - regression in which the relationship is linear

linear relationship - a situation in which the best-fitting regression line is a straight line

linear transect - a line of specified length laid out within a study site. They are generally positioned parallel to the shore along depth contours. Measurements and observations may be taken along the entire surface beneath the line (line intercept transect) or at specified intervals along the line (point intercept transect)



A NOAA scientist laying out a linear transect line.

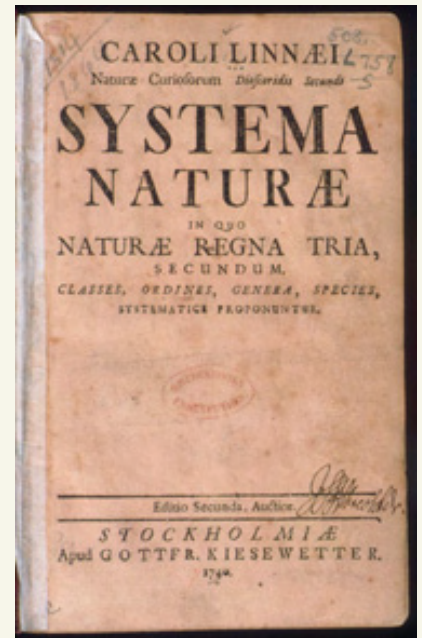
linguiform - tongue-shaped

linkage - the proximity of two or more markers (genes, etc.) on a chromosome; the closer together the markers are, the lower the probability that they will be separated during DNA repair or replication processes, and hence the greater the probability that they will be inherited together

linked genes - genes that are so closely associated on a chromosome that the allelic forms found on a chromosome are inherited together by an offspring at least 80 percent or more of the time

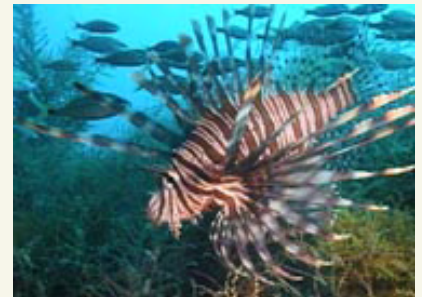
Linnaean tautonymy - in taxonomy, the identical spelling of a new genus-group name and a pre-Linnaean (i.e., before 1758) one-word name cited as a synonym of only one of the species or subspecies originally included in that genus

Linnaeus, Carolus - the 18th century Swedish botanist (1707-1778) who established the modern binomial system of biological nomenclature for plants and animals. His non-latinized name was Carl von Linne



In the 18th century, Linnaeus made a great contribution to science by developing systems of classification and nomenclature to organize the explosion of information on plants and animals. The tenth edition (1758-59), of Linnaeus's classic work, *Systema Naturae*, was chosen as the starting point for zoological nomenclature. (Photo: Smithsonian Institution Libraries)

lionfish - the red lionfish (*Pterois volitans*) is a venomous coral reef fish belonging to the scorpion fish family (Scorpaenidae). Native to the Indian and western Pacific oceans, lionfish are now an invasive species found in the western Atlantic Ocean from southern Florida to New York and Bermuda. They appear to be reproducing along the southeastern U.S. coast; Other common names are turkeyfish, dragonfish, and firefish



The lionfish, *Pterois volitans*, is a recent invasive species in the western Atlantic Ocean. Like some other members of the scorpion fish family, the lionfish is a venomous animal, possessing venom glands at the base of the dorsal, anal and pelvic fin spines. The venom is injected in a potential predator via the spines.

The genus *Pterois* contains eight species variously referred to as lionfishes, turkeyfishes, or firefishes. The lionfish is an inhabitant of near and offshore coral and rocky reefs. During the day, it seems to prefer shelter under ledges or in caves or crevices. (Photo: Paula Whitfield, NOAA Beaufort Laboratory)

lipase - an enzyme, secreted by the pancreas and the glands of the small intestine, that breaks down fats into glycerol and fatty acids during digestion

lipid - a group of organic compounds, including the fats, oils, waxes, steroids, and triglycerides, that are insoluble in water but soluble in common organic solvents, and are oily to the touch. Together with carbohydrates and proteins, lipids constitute the principal structural materials of cells

lipopolysaccharide - a compound containing a lipid bound to a polysaccharide

liposome - an artificial, single or multilaminar vesicle, made from a lipid, that is used for the delivery of a variety of biological molecules or molecular complexes to cells, e.g., drug delivery and gene transfer. Liposomes are also used to study membranes and membrane proteins

Listserv ® - the most common kind of maillist found on the internet

lithoherm - a type of deep water reef composed of surface hardened layers of lithified sandy carbonate sediments supporting a diverse array of benthic fauna, including deep water corals

lithosphere - the outer solid part of the earth, including the crust and uppermost mantle. The lithosphere is about 80-100 km thick, although its thickness is age dependent. The lithosphere below the crust is brittle enough at some locations to produce earthquakes by faulting, such as within a subducted oceanic plate

Lithothamnion ridge - a synonym for algal ridge. The algal genus *Lithothamnion* is important in maintaining reef integrity by cementing various pieces of calcium carbonate

littoral - intertidal; between low and high tide levels



This sea slug is a denizen of northwest U.S. rocky littoral (intertidal) zones.

live rock - calcareous rock which is removed from the vicinity of a coral reef with some of the life forms on it still living. These may include bacteria, coralline algae, sponges, worms, crustaceans and other invertebrates. Live rock is commonly used in reef aquaria because it contains bacteria that can help filter the water through nitrification



Live rock from Tonga, crated for shipping to an aquarist. (Photo: <http://www.reefscience.com>)

liveaboard - a commercial dive boat with sleeping and eating accommodations. Scuba divers live aboard the boat for several days and usually visit dive locations inaccessible to other divers



A liveaboard dive boat designed and constructed with divers and underwater photographers in mind. A vessel such as this may accommodate up to 20 passengers in private cabins, all with full bathrooms. It is fully air-conditioned with a state-of-the-art dive center, and complete photo and video labs with daily E6 processing. Wide dive platforms provide easy

water entries and exits.
(Photo: *Belize Aggressor*)

living tag - a type of tagging method for marine turtles in which a small piece of tissue is taken from the white plastron of a hatchling and implanted in one of the dark scutes of the carapace. The white patch grows with the scute, and the particular scute which has been marked, codes for the year that the turtle was tagged

lobate - lobe-shaped



This comb jelly (ctenophore) possesses a lobate shape. (Photo: NOAA)

lobe - a rounded projection

Local Action Strategy (LAS) - a U.S. Coral Reef Task Force led initiative to identify and implement priority actions needed to reduce key threats to valuable coral reef resources in each U.S. coral reef jurisdiction. In 2002, the Task Force adopted the "Puerto Rico Resolution" which calls for the development of three-year LAS by each of the seven U.S. jurisdictions containing coral reefs: Florida, Puerto Rico, the U.S. Virgin Islands, Hawaii, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. These LAS are locally-driven roadmaps for collaborative and cooperative action among federal, state, territory, and non-governmental partners

local extinction - the disappearance of a population from a local area. Local extinctions can accumulate into regional extinctions

Locally-Managed Marine Area (LMMA) - an area of nearshore waters actively being managed by local communities or resource-owning groups, or being collaboratively managed by resident communities with local government and/or partner organizations. An LMMA can vary widely in purpose and design; however, two aspects remain constant: a well-defined or designated area; and substantial involvement of communities and/or local governments in decision-making and implementation

Locally-Managed Marine Area (LMMA) Network - a group of LMMA practitioners involved in various marine conservation projects around the globe who have joined together to increase the success of their efforts. The LMMA Network is a learning network, meaning that participating projects use a common strategy and work together to achieve goals. The Network is interested in learning under what conditions using an LMMA strategy works, doesn't work, and why. Network members share knowledge, skills, resources and information in order to collectively learn how to improve marine management activities and increase conservation impact

locomotion - the act of moving, or the ability to move, from place to place

loculus - the calcified area or fiber-filled space within the axis of a gorgonian or an interseptal space within the gastrovascular cavity of an anthozoan; a small cavity or space within an organ of a plant or animal

locus - the position of a gene, DNA marker, or genetic marker on a chromosome

logarithmic phase - the steepest slope of the growth curve of a culture; the phase of vigorous growth during which cell number doubles every 20-30 minutes; also called 'log or exponential growth phase'

logarithmic scale - a constant ratio scale in which equal distances on the scale represent equal ratios of increase. For example, in a logarithmic scale, the distance between 10 and 100 is the same as the distance between 100 and 1000, or between 1000 and 10,000. Logarithmic scales are used when the range of numbers being represented is large

long line fishing - a commercial fishing method which uses hundreds to thousands of baited hooks hanging from a single line, which may be kilometers in length

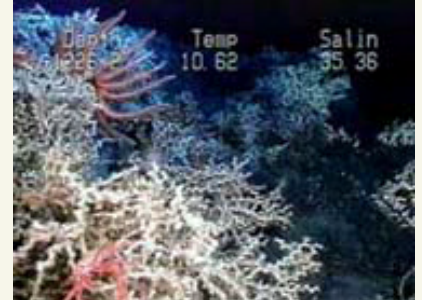
long term monitoring - the repeated surveying of organisms, populations, communities, or environmental parameters over time to help us understand a variety of natural processes

longitude - an imaginary great circle on the surface of the Earth passing through the north and south poles at right angles to the equator; "all points on the same meridian have the same longitude"

longshore current - a current that flows parallel to the shore just inside the surf zone. It is also called the littoral current

Lophelia pertusa - the scleractinian species, *Lophelia pertusa*, is the most important global constituent of deep-water coral reefs, forming massive complexes hundreds of kilometers long and up to 30 meters high. *L. pertusa* is a widespread structure-forming deep-water species occurring in the Atlantic, Pacific, Indian, and Southern Oceans, with a latitudinal range from about 56° S to 71° N and a depth range from 39 to over 1,000 meters

Lophelia reef - a reef formed by *Lophelia pertusa*, a deep-sea coral found in all oceans except the Arctic Ocean



This photo of a *Lophelia* coral garden was taken via a manned submersible on the ocean floor. (Photo: NOAA)

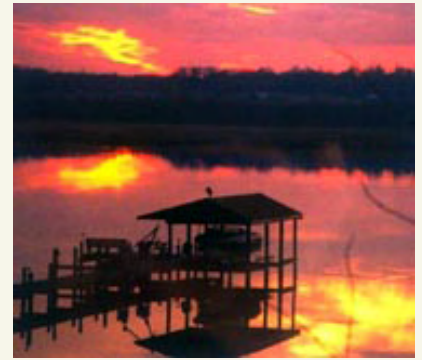
lophocyte - a mobile cell in sponges that produces collagen

lophophorate - an informal taxonomic unit that includes coleomatic metazoans which possess a specialized filter-feeding organ, the lophophore. Almost all lophophorates are marine organisms and all are suspension feeders. Lophophorates are deuterostomes and are typically considered relatively closely related to chordates and echinoderms. There are three lophophorate phyla: Phoronida, Bryozoa and Brachiopoda

lophophore - a feeding organ possessed by lophophorates. It is a disk or horseshoe-shaped structure which surrounds the mouth and bears the tentacles of the Bryozoa (moss animals), Brachiopoda (lamp shells) and Phoronida (horseshoe worms). The tentacles are hollow (coelomic) and covered with cilia which generate water currents that draw food toward the mouth

LORAN (LONG RANGE Navigation) - a navigation system developed in the 1950's based on the time displacement between signals from two or more fixed shore based antennae

lotic - refers to a flowing or running body of fresh water, i.e., streams and rivers



A peaceful lotic environment, the Patuxent River, eastern Maryland, in December 2000. (Photo: Mary Hollinger, NOAA/ National Oceanographic Data Center)

low recruitment - a low influx of new members into a population by reproduction or immigration

low tide - the lowest level of the tide; the minimum height reached by each falling tide



A small island at the mouth of the Amazon River at low tide. See **high tide** for contrast. (Photo: Alessandra and Michael)

lower palmata zone - the part of a reef crest that is seaward of the palmata zone. It consists primarily of elkhorn coral (*Acropora palmata*) at a depth of about 3-6 m in Caribbean reefs



A young *Acropora palmata* colony in St. Croix, U.S. Virgin Islands (Photo: J. Halas)

lower risk - a species or other taxonomic group that has been evaluated but does not face a risk of extinction in the wild

lowland - a general term for low-lying land or an extensive region of relatively low relief; usually applied to coastal regions that do not rise high above sea level

luciferase - the enzyme which activates luciferin, in the presence of ATP, to produce bioluminescence

luciferin - a compound whose activated form emits light. In the presence of the enzyme luciferase and ATP, luciferin is oxidized to produce oxyluciferin and energy given off as cold light (bioluminescence)

lumen - the interior space of a tubular organ, such as a blood vessel or an intestine

lumen - unit of luminous flux

luminous - emitting light.

luminous flux - the rate of flow of light energy

lumisome - in some cnidarians, a small, intracellular membrane-enclosed vesicle which contains all the proteins necessary for bioluminescence

lumper - refers to a taxonomist who focuses more on similarities than differences among taxa, discounting the importance of minor variation among individuals, and who tends to recognize fewer taxa

lunar tide - the portion of the tide that can be attributed directly to attraction to the moon

lunate - crescent-shaped



Blue tangs with lunate-shaped caudal fins.
(Photo: NOAA)

lux - unit of illumination equal to one lumen per square meter

lycra - a spandex textile fiber which has unique elastic qualities in that it can be used in very lightweight, durable fabrics of long-lasting elasticity. It has excellent tensile strength, a long flex life, and high resistance to abrasion and heat degradation. Lycra skin coverings are popular with scuba divers as they give some protection against abrasions and jellyfish and fire coral stings. They also offer (minimal) protection against cold

lysis - the breakdown of a cell caused by rupture of its cell membrane and loss of cytoplasm. Lysis can be caused by viral action, chemical or physical means; to break down

lysosome - an organelle that contains digestive enzymes (acid hydrolases). They digest excess or worn out organelles, food particles, and engulfed viruses or bacteria. The membrane surrounding a lysosome prevents the digestive enzymes inside from destroying the cell

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: M

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

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Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

MAA (mycosporine-like amino acids) - MAAs are a family of compounds which act as nature's sunscreen in the marine environment. Shallow-water environments of tropical coral reefs are characterized by high levels of ultraviolet-A and ultraviolet-B radiation. Corals have developed an efficient defence against the potential damage of long-term solar irradiation, which often includes the production of natural "sunscreen"-type UV-absorbing compounds and related antioxidants. These compounds in shallow-water corals were identified to be a group of mycosporine-like amino acids (MAAs) having absorption maxima in the range 310-360 nm. MAAs are assumed to be produced by the zooxanthellae in coral tissues, since their biosynthesis involves a biochemical pathway not found in invertebrates. The major distribution of MAAs, however, resides within the coral tissues, suggesting that the algal partner of the mutualistic relationship provides UV protection to the whole of the relationship via MAA translocation. MAAs have been identified in a number of taxonomically diverse organisms such as fungi, marine heterotrophic bacteria, cyanobacteria, eukaryotic algae, marine invertebrates, fishes, and a wide variety of other marine organisms

MAC (Marine Aquarium Council) - an international, not-for-profit organization that brings marine aquarium animal collectors, exporters, importers and retailers together with aquarium keepers, public aquariums, conservation organizations, and government agencies. Its mission is to conserve coral reefs and other marine ecosystems by creating standards and certification for those engaged in the collection and care of ornamental marine life from reef to aquarium

macerate - to disintegrate tissues by means of cutting, soaking or enzymatic action to obtain a cell dissociation

macro - a text file containing a sequence of commands that can be executed as one command.

macro lens - in photography, a lens with the ability to focus from infinity to extremely close, allowing it to capture images of very small objects in frame-filling, larger-than-life sizes

macroalgae - algae that project more than one centimeter above the substratum



Macroalgae are important habitat on temperate and northern reefs.

macrobenthos (macrofauna or macroflora) - benthic organisms (animals or plants) whose shortest dimension is greater than or equal to 0.5 mm

macroevolution - evolution on the grand scale resulting in the origin of higher taxa

macrofauna - animals large enough to be seen with the naked eye

macrogamete - the larger of the two gamete types in a heterogametic organism. It is considered as the the female gamete

macroinvertebrate - an invertebrate having a body length greater than 2 mm

macromolecule - a large polymer, such as DNA, RNA, protein, lipid or polysaccharide, made up of thousands of atoms

macronutrient - a nutrient, such as a nitrate or phosphate, that is required by plants in relatively large quantities in order to undergo photosynthesis and growth

macrophage - an amoeboid cell capable of moving through tissues, engulfing and destroying dead cells or bacteria. Certain white blood cells are the most aggressive macrophages

macrophotography - photography of a subject where the image is recorded in the same or larger than actual size; type of photography employing the use of special lenses or attachments allowing close-range photos of a given subject

macrosmatic - pertains to animals with a well developed olfactory (smell) sense

macrotidal - coastal ocean or waterway with a high mean tidal range e. g., greater than 4 meters

macula - a dark spot, blemish; the small, highly sensitive area (of the human eye) which is located in the center of the retina. It is responsible for near and fine detail vision

Madison/Swanson and Steamboat Lumps Marine Reserves - two protected areas in the Northeastern Gulf of Mexico of slightly over 100 nautical square miles each, the Madison-Swanson (high relief area) and Steamboat Lumps (low relief area). Within each area, fishing is prohibited for all species except for highly migratory species. These marine reserves were created primarily to protect a portion of the gag grouper (*Mycteroperca microlepis*) spawning aggregations and to protect a portion of the offshore population of male gag. The areas are also suitable habitat and provide protection for many other species, such as scamp, red grouper, warsaw grouper, speckled hind, red snapper, red porgy, and others

madreporite - a perforated platelike structure in most echinoderms that forms the intake for their water vascular systems



The white spot in the middle of the central disc of the starfish is the madreporite, the opening into the echinoderm's water vascular system.

magenta - reddish purple color

magma - molten rock that forms naturally within the Earth. Magma may be either a liquid or a fluid mixture of liquid, crystals, and dissolved gases

magmatic hotspot - in geology, a hotspot is a location on the Earth's surface that has had volcanism for a long period of time. Geologists have identified some 40-50 such hotspots

magnetic north - the direction a compass needle points when there are no local interfering influences

maillist (mailing list) - a system that allows people to send e-mail to one address, whereupon their message is copied and sent to all of the other subscribers to the maillist. In this way, people who have many different kinds of e-mail access can participate in discussions together

maitotoxin - a neurotoxic compound which is produced by certain marine dinoflagellates and associated with the digestive tract of herbivorous fishes. It is responsible for a form of seafood poisoning in humans eating tropical coral reef fishes

makatea - a fossil coral reef

malacology - the scientific study of mollusks



A Pacific octopus (Mollusca) photographed during the NOAA Submarine Ring of Fire expedition, 2002. (Photo: NOAA Ocean Explorer)

Malacostraca - a class of arthropods in the subphylum Crustacea. The more than 20,000 described species of Malacostraca can be divided into two groups, the Phyllocarida, and the Eumalacostraca. Phyllocarida contains the oldest crustacean known and includes only one living group. The Eumalacostraca consists of all Malacostracan groups other than the Phyllocarida. Eumalacostracans generally possess a well-developed carapace and a long, muscular abdomen. It is the group that contains most of the animals the general public recognize as crustaceans, such as shrimp, crabs, lobsters

malar - pertaining to the cheek region of vertebrates

Malthusian Law - when birth and death rates are constant, a population will grow (or decline) at an exponential rate

Mammalia - a class of warm blooded animals (mammals) whose common characteristics include the presence of hair, milk-secreting glands, a muscular diaphragm between the abdominal and pleural and mediastinal cavities, a lower jaw composed of a single pair of bones, a middle ear containing three bones, and the presence of only a left systemic arch



Dolphins are among the most recognizable marine mammals; this one floats serenely in the Caribbean Sea. (Photo: Copyright Corel Corporation)

mammalian dive reflex - the physiological responses, including bradycardia and shutdown of the peripheral circulation, which occurs during dives by an air-breathing vertebrate

mammalogy - the scientific study of mammals

mandible - pertains to mouth parts; the lower jaw

mangal - relating to a shoreline ecosystem dominated by mangrove trees, with associated mud flats; collective term for a mangrove community

mangrove - a general name for several species of halophyte belonging to different families of plants (including trees, shrubs, a palm tree and a ground fern) occurring in intertidal zones of tropical and subtropical sheltered coastlines and exceeding one half meter in height. The term is applied to both the individual and the ecosystem, the latter of which is termed mangal. Mangroves provide protected nursery areas for juvenile reef fishes, crustaceans, and mollusks. They also provide a feeding ground for a multitude of marine species. Many organisms find shelter either in the roots or branches of mangroves. Mangrove branches are nesting areas for several species of coastal birds. The root systems harbor organisms that trap and cycle nutrients, organic materials and other



Mangrove nursery area, Puerto Rico.

important chemicals. Mangroves also contribute to higher water quality by stabilizing bottom sediments, filtering water and protecting shorelines from erosion. They protect reefs from land runoff sedimentation. Conversely, coral reefs protect mangroves and seagrasses from erosion during heavy storms and strong wave action

manoalide - a marine pharmaceutical isolated from the marine Indopacific sponge *Luffariella variabilis*. It possesses analgesic and anti-inflammatory properties

manta tow technique - a technique used to provide a general description of large areas of reef and to gauge broad changes in abundance and distribution of organisms on coral reefs. The technique, widely used in Australia, involves towing a snorkel diver (observer) at a constant speed behind a boat. The observer holds on to a 'manta board' attached to a small boat by a 17-meter length of rope. This person makes a visual assessment of specific variables during each manta tow (2 minutes duration), and records these data when the boat stops, on a data sheet attached to the manta board. The manta tow technique is used to provide a general description of large areas of reef and to gauge broad changes in abundance and distribution of organisms on coral reefs. The advantage of manta tow over other survey techniques is that it enables large areas of reefs to be surveyed quickly and with minimal equipment

mantle - a membranous or muscular structure in mollusks that surrounds the visceral mass and secretes a shell if one is present

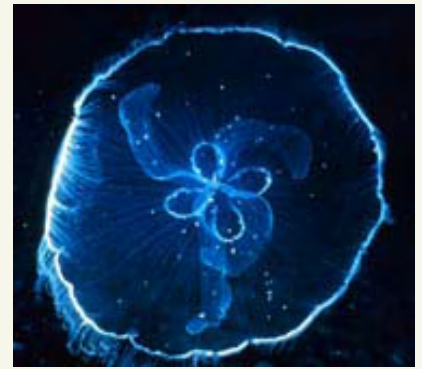


A cowrie, *Cypraea sp.*, with partially extended mantle.

mantle (geology) - the middle layer of the Earth, lying just below the crust and consisting of relatively dense rocks. The mantle is divided into the upper mantle and the lower mantle; the lower mantle has greater density than the upper mantle

mantle cavity - the space between the mantle and the rest of the body parts of a mollusk, which contains several important respiratory and reproductive organs

manubrium - the proboscis of a jellyfish: a tubular structure that connects the mouth to the digestive cavity



The mouth of a jellyfish is at the end of the manubrium, which extends to engulf prey. (Photo: NOAA/Florida Keys National Marine Sanctuaries)

Manzamine A - a marine pharmaceutical, extracted from the marine sponge *Xestospongia ashmorica*, possessing anti-inflammatory, antimalarial, antifungal, and anti-HIV-1 activity. It is also active against the Gram-positive bacteria *Bacillus subtilis* and *Staphylococcus aureus*

marae - in the Marquesas, a Polynesian sacred enclosure or a place of worship . In Hawaii, it is called a "heiau"

MAREANO - a Norwegian program to survey and perform basic studies of the seabed's physical, biological, and chemical environment and to systematize the information in a marine area database that will cover Norway's coastal and marine region

mareogram - a graphic representation of the rise and fall of the sea level, with time as abscissa and height as ordinate, usually used to measured tides; may also show tsunamis; also called 'marigram'

MAREPAC (Marine Resources Pacific Consortium) - MAREPAC is a consortium made up of representatives from nine islands in Micronesia (Marshall Islands, Federated States of Micronesia, Northern Marianas, Guam, Palau, and American Samoa). MAREPAC's mission is to develop regional capabilities, foster collaboration, and disseminate accurate information in support of sound policy development on sustainable use of marine resources of cultural, economic, and scientific value

margin - a boundary, edge, or border of a structure

Marianas Archipelago Reef Assessment and Monitoring Program (MARAMP) - a multi-agency effort that began in 2003 with the first cruise to the Mariana Archipelago. The objective of MARAMP is to rapidly evaluate and map the shallow water reef habitats in the Mariana Archipelago. Scientists on board the National Oceanographic and Atmospheric Administration (NOAA) research vessel Oscar Elton Sette use a variety of techniques to study the oceanography and coral, fish, algae, and benthic habitats around most of the islands and offshore banks of the archipelago

mariculture - the cultivation of marine organisms under controlled conditions; a synonym for marine aquaculture



Shrimp farms and their waste runoff have resulted in the destruction of coastal habitats and added to pollution in critical estuarine waters.

marine - an umbrella term for things relating to the ocean, coastal zones, and tidal areas

marine debris - debris composed primarily of plastics, nets, lines, other fishing gear, glass, rubber, metal, wood and cloth. Sources of debris are people on beaches, storm drains, fishing boats, waste treatment sites, and industrial facilities. These materials have damaging effects on coral reefs



Marine debris, such as this plastic bag, can kill coral. (Photo: NOAA)

marine iguana - the marine iguana (*Amblyrhynchus cristatus*) inhabits the Galapagos Island, an archipelago on the Equator, 800 kilometers west of the Ecuadorian coast. It differs from the mainland iguanas by the shape of the snout and other morphological features. The species probably rafted to the islands many millions of years ago, and developed a new ecological niche. They feed almost exclusively on marine algae and seaweed in the intertidal zone, and some make shallow dives past the breaker zone



A marine iguana from the Galapagos Islands. (Photo: NOAA)

marine insects - insects account for over 75% of all species that have been described by science. Of these, only 3 percent are aquatic in any life stage. Even more rare are the 250 to 350 species (in several orders, the largest being the Diptera) in this aquatic grouping that have independently evolved adaptations to exposure to salt water. Marine insects include pelagic species, species inhabiting tide pools, and beach and marsh-dwelling species. Just five species of sea skaters (*Halobates* sp) are pelagic. Marine midges in the genus *Pontomyia* inhabit tide pools and lagoons in the Indo-Pacific. Some genera of rove beetles live in sand burrows in beach intertidal zones

marine lake - a unique ecosystem which forms when a depression in a porous, calcareous landscape is flooded by rising sea-levels. Connected in various ways to the sea, they form a continuum from complete isolation to lagoon-like. Marine lakes, such as the famous ones of Palau, contain a variety of habitats which foster adaptive radiation and rapid evolution of the biological assemblages. Palau's Jellyfish Lake is perhaps the most famous of these marine lakes, containing an estimated number of 17 million jellyfish (*Mastigias medusae*) in January 2007. The greatest number (estimated) ever recorded was 31 million

Marine Managed Area (MMA) - see: Marine Protected Area

marine pharmaceutical - a bioactive chemical derived from a marine organism which is used to treat disease and other medical conditions

Marine Protected Area (MPA) - any area of the marine environment that has been reserved by federal, state, territorial, tribal or local laws or regulations to provide lasting protection to part or all of the natural or cultural resources within them. Familiar examples of U.S. MPAs include National parks, wildlife refuges, monuments and marine sanctuaries, fisheries closures, critical habitat, habitat areas of particular concern, state parks, conservation areas, estuarine reserves and preserves, and numerous others. Areas which are not MPAs are areas where access is restricted for reasons other than conservation (such as security zones, shellfish closures, sewage discharge areas, and pipeline and cable corridors), or unprotected areas that are logistically inaccessible due to weather, sea state, etc; MPAs are sometimes called Marine Managed Areas (MMA). However, "marine protected area" is a broad, inclusive term which includes both multi-purpose sites with some restrictions as well as the more restrictive "no take marine reserves."

Marine Protected areas (MPA) Network - a system of individual marine protected areas operating cooperatively and synergistically, at various spatial scales, and with a range of protection levels, in order to fulfill ecological aims more effectively and comprehensively than individual sites could alone. The system will also display social and economic benefits, although these may only become fully developed over long time frames

marine reserve - an area in which some or all extractive activities are prohibited

marine sanctuary - as defined by the U.S. government: Multiple-use marine protected areas, protected under the National Marine Sanctuaries Act, that may include breeding and feeding grounds of whales, sea lions, sharks, and sea turtles; significant coral reefs and kelp forest habitats; and the remains of historic shipwrecks. Some sanctuaries are zoned to include no-take areas. (Note: States may have sanctuaries that have a different purpose or are defined differently)

marine snow - dense concentrations of particulate organic detritus and living organisms whose downward drift appears similar to a snowfall

marine toxicology - a broad field of study encompassing the production, fate, and effects of natural and synthetic harmful chemical substances, such as pollutants, in the marine environment

maritime climate - a climate strongly influenced by an oceanic environment, found on islands and the windward shores of continents. It is characterized by small daily and yearly temperature ranges and high relative humidity

marker gene - in genetic engineering, an easily identified gene that is inserted into an organism, along with a desired gene. The presence of the marker gene demonstrates that the transformation was successful

marl - fine-grained carbonate-rich mud; a calcareous clay which contains approximately 30 to 65 percent calcium carbonate

marsh - a soft, wet area periodically or continuously flooded to a shallow depth, usually characterized by a particular group of grasses, cattails and other low plants



Coastal marsh in Monterey Bay National Marine Sanctuary, CA. (Photo: Kip Evans)

marsupium - an abdominal pouch where certain animals carry their young, as in some crustaceans and the brood pouch of the male seahorse

Mascarene Plateau - a submerged volcanic plateau dominating the western Indian Ocean, extending approximately 2,000 km between Seychelles and Mauritius. It covers an area of over 115,000 square kilometers of shallow water with depths ranging from 8 m to 150 m on the plateau, plunging to depths of 4000 m at its edges. It is the major marine ecosystem of the western Indian Ocean

mass coral bleaching - coral bleaching extending over large distances as a result of anomalously high water temperatures

mass extinction - a catastrophic, widespread perturbation where major groups of species become extinct in a relatively short time

mass spawning - spawning events where many different species spawn simultaneously

mass spectrometer - a laboratory instrument that measures the mass-to-charge ratio of individual molecules that have been converted into ions. This information is then used to determine the masses of the molecules

mass spectrometry - an analytical technique where ions are separated according to their ratio of charge to mass. The atomic weight of the particle can be obtained from the mass spectrum produced

massive - having a large compact structure without a definable shape



Scuba divers examine a massive coral colony. (Photo: Australian Institute of Marine Sciences)

massive colony - a coral colony that is solid and typically hemispherical in shape

maternal inheritance - uniparental inheritance in which all offspring have the genotype and phenotype of the female parent

maternal mRNA - messenger RNA found in oocytes and early embryos that is derived from the maternal genome during oogenesis

maxilla - pertains to mouth parts; the upper jaw

maxilliped - one of the mouth appendages of crustaceans, situated behind the maxillae. Crabs have three pairs, but many of the lower crustaceans have only one pair

maximal food chain - a sequence of species running from a basal plant or algal species to another species that feeds on it (a herbivore), and so on to a carnivorous climax predator

maximum sustainable yield - the maximum number of a food or game population that can be harvested without harming the population's ability to grow back; the largest average catch or yield that can continuously be taken from a stock under existing environmental conditions

mean - a statistical measure of central tendency. The sum of a set of observations divided by the number of observations. It is also referred to as 'arithmetic mean' and 'sample mean'

mean high tide - the level to which the water rose on an average day over a previous period of time (years or decades); the average of all the high tides as calculated over a long period of time

mean low tide - the average altitude of all low tides recorded at a given place over a long period of time

mean sea level - the level of the surface of the sea between mean high and mean low tide. It is used as a reference point for measuring elevations

meandroid colony - a massive colony that has corallite mouths aligned in valleys, such that there are no individual polyps

meandroid form - a coral growth form in which the corallites are arranged in multiple series within the same walls

mechanoreceptor - a neurological receptor that responds to mechanical energy, e.g. pressure, touch, and gravity

median - a statistical measure of central tendency. The middle-most value in a set of observations with an equal number of observations lying above and below the median value

median fin - in fishes, an unpaired fin located on the sagittal plane of the body, i.e., the dorsal, caudal and anal fins

medusa - the free swimming stage of some corals, jellyfish, anemones, hydroids and comb jellies, shaped like a bell or umbrella and swims by pulsations of the body



A jellyfish (medusa stage) showing its oral or subumbrella surface. The hanging tentacles bear stinging cells, used for food capture.

medusa bud - one of the buds of a hydroid, destined to develop into a gonophore or medusa. Medusa buds are released from the gonangium through a central opening, the gonopore

medusoid - a body form resembling a medusa; umbrella shaped

megabase (Mb) - unit of DNA or RNA sequence equal to one million (10) pairs of nucleotide bases. Abbreviated Mb

megabyte (mb) - a measure of storage space. One megabyte roughly translates to a million characters of text, or 180,000 words

megafauna - the largest size category of animals in a community

megalops larva - the larval stage in brachyuran crabs that follows the zoea larval stage

megasclere - a large spicule in sponges

meio- - smaller; less than

meiobenthos (meiofauna or meioflora) - benthic organisms whose shortest dimension is less than 0.5 mm but greater than or equal to 0.1 mm

meiosis - a two-stage type of cell division in sexually reproducing organisms that results in the development of sperm and egg cells. In meiosis, a diploid cell divides to produce four haploid cells, each with half the original chromosome content. In organisms with a diploid life cycle, the products of meiosis are called gametes. In organisms with an alternation of generations, the products of meiosis are called spores

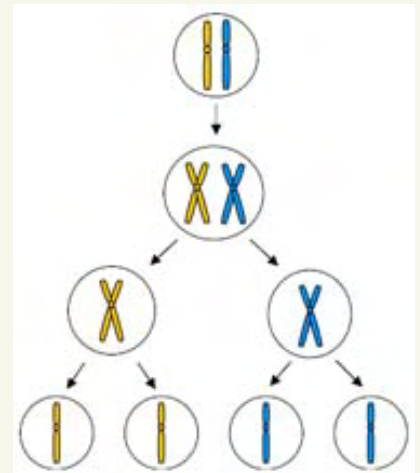


Diagram showing the meiotic division of a diploid cell, which in two divisions, results in the production of four haploid daughter cells. This process is also termed gametogenesis because it results in haploid sperm and egg cells.

Melanesia - a large region of volcanic islands which includes New Guinea, the Solomon Islands, Vanuatu, Fiji, Maluku, the Torres Strait Islands, and New Caledonia. The name "Melanesia" means "black islands", referring to the dark-complexioned inhabitants these islands



Map showing location of Melanesia. (Graphic: Melanesian Cultural Heritage Management Identification Study)

melanic - very dark or black color

melanin - a pigment in the skin of animals which determines skin and coat color. It is found in two chemically different forms: eumelanin (which produces brown and black) and pheomelanin (which produces yellow and red). Melanin also provides protection against the damaging effects of ultraviolet radiation

melanistic - dark or blackish

melanocyte - a cell in the inner layer of the epidermis that produce melanin

melanophore - a chromatophore which contains black and brown pigments called melanin

melon - a lens-shaped fatty deposit lying in the facial depression of many toothed whales, such as the bottle-nosed dolphin. It appears as the bulging forehead just in front of the blowhole. It contains fatty deposits, muscles, and nasal air sacs and passages. The melon is used in focusing a whale's sounds, functioning as an acoustical lens for echolocation. The fatty deposits change shape as the whale is producing sounds

membrane filter - a thin microporous material of specific pore size used to filter bacteria, algae, and other very small particles from water

Mendel's Laws of Heredity - the *Law of Segregation* states that each hereditary characteristic is controlled by two 'factors' (alleles), which segregate and pass into separate germ cells (gametes). The *Law of Independent Assortment* states that pairs of 'factors' segregate independently of each other when germ cells are formed

Mendelian inheritance - one method in which genetic traits are passed from parents to offspring. It is named after the Austrian monk, Gregor Mendel, who first studied and recognized the existence of genes and this method of inheritance; a hereditary process explainable in terms of the behavior of chromosomes, e.g., segregation of chromosomes, independent assortment, and homologous exchange of parts



Gregor Mendel (1822-1884), the "father" of the science of genetics.

Mendelian population - a natural, interbreeding unit of sexually reproducing organisms sharing a common gene pool

menisciform - crescent-shaped

meristem - organized, undifferentiated plant tissue with rapidly dividing cells (mitosis) that differentiate to form new tissues or organs; a specialized area within a plant where rapid cell division occurs, e.g., roots and shoots

meristic - pertains to serially repeated structures which can be counted, e.g. scales, vertebrae, fin rays, fin spines, other spines, myomeres, photophores, scutes, laterel line pores, etc

mermaid's purse - an egg case of a shark or ray, usually oblong in shape with horns or tendrils

meroblastic cleavage - incomplete cleavage of the zygote, restricted to the blastodisc, the non-yolky cytoplasm at one end of the egg; typical of teloblastic eggs

meroplankton - planktonic eggs and larvae which are temporary members of the plankton community

merotrichous - pertaining to a nematocyst with spines confined to one distal region of its thread

mesenchyme - in cnidarians, a primitive "connective tissue" located between the epidermis and the gastrodermis. If it contains no cell components, it is termed "mesoglea"; undifferentiated cells of an embryo, derived from mesoderm, which give rise to connective tissue and the circulatory and lymphatics systems; amoebocytic cells often embedded in a gelatinous matrix

mesenteric filament - the cord of tissue In sea anemones that runs along the edge of incomplete mesenteries and which bear glandular cells and nematocysts; they are used in digestion and become acontia toward the pedal disc

mesentery - a sheet of tissue that envelops, separates, or supports particular organs or body regions; a vertical sheet of tissue that divides the gastrovascular cavity of sea anemones

mesentery, complete - in anthozoans, a mesentery which extends from the body wall to attach to the actinopharynx

mesentery, directive - in anthozoans, one of a pair of mesenteries attached to the actinopharynx in which the mesogleal pleats of the retractor muscles face away from one another, toward the exocoel

mesentery, incomplete - in anthozoans, a mesentery in which the inner edge does not extend to the actinopharynx

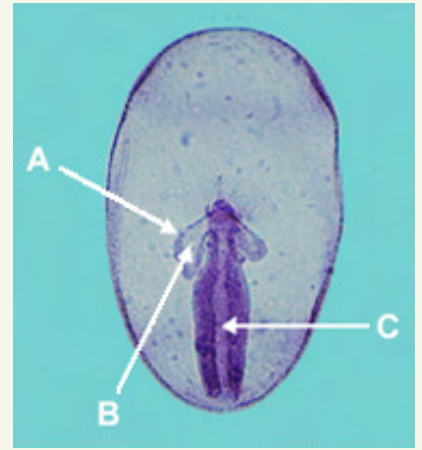
mesentery, nondirective - in anthozoans, one of a pair of mesenteries attached to the actinopharynx in which the mesogleal pleats of the retractor muscles face each other, toward the endocoel

meso- - a prefix meaning 'middle'

Mesoamerican Reef - the largest coral reef system in the Atlantic Ocean and the second largest coral reef in the world. It extends nearly 700 miles from the northern tip of the Yucatan peninsula to the Bay Islands off the coast of Honduras

mesocosm - an experimental apparatus or enclosure designed to approximate natural conditions, and in which environmental factors can be manipulated. Mesocosms characteristically include both natural species assemblages in addition to structured populations

mesoderm - the middle of the three germ layers of a triploblastic embryo that gives rise to the skeletal and support, muscular, blood vascular, urogenital and reproductive systems, and contributions to some glands



Late gastrula. This photograph is a dorsal view of the embryo, with the anterior being toward the animal pole and the posterior toward the vegetal pole. Note the beginning of the formation of enterocoelic (mesodermal) pouches, from which the mesoderm is derived, on the right and left side of the anterior end of the gastrocoel. A - mesoderm; B - coelom; C - archenteron (Photo: Cell and Developmental Biology Online website (University of Guelph) <http://www.uoguelph.ca/zoology/devobio/>)

mesoglea - the connective tissue layer between the epidermis and gastrodermis of cnidarians and ctenophores (comb jellies)



Inner tissues of this Giant Green Anemone (*Anthopleura xanthogrammica*) are separated by the mesoglea. (Photo: Lisa Eschenbach)

mesogleal pleat - in anthozoans, a sheet of longitudinal retractor muscles (myonemes) anchored to the mesoglea and pleated accordion-wise so that the mesoglea is sandwiched between two layers of epithelium within the middle portion of a mesentery

mesohyle - the non-cellular gel layer (also called 'mesenchyme') of sponges. It is located between the epidermis (pinacoderm) and the choanoderm, the cell layer that lines the spongocoel. The mesohyle contains either spicules (supportive needles made of calcium carbonate) or spongin fibers (a flexible skeletal material made from protein); also called mesohyl

mesolamella - a collagenous layer that separates the choanochambers of hexactinellid sponges (glass sponges)

mesolecithal - a moderately telolecithal egg, typical of amphibians

mesopelagic zone - a layer (zone) of the ocean which lies just below the epipelagic zone. It extends from 200-1000 meters. The mesopelagic zone is sometimes referred to as the twilight zone as sunlight this deep is very faint. This zone contains the thermocline, where temperature decreases rapidly with depth

mesotidal - coastal ocean or waterway with a moderate mean tidal range, e.g., between 2 and 4 meters

Mesozoic - an era of time during the Phanerozoic eon lasting from 245 million years ago to 66.4 million ago

metabolic gas - a gas which is released by the body as a result of metabolism. Carbon dioxide is an example of a metabolic gas

metabolic pathway - a set of oriented reactions interacting under given physiological conditions via simple or apparently simple intermediates. There are relatively few metabolic pathways, but each of these can be broken down into many individual, enzyme-specific, catalysed steps

metabolism - the sum of all the physical and chemical processes by which living organised materials are produced and maintained (anabolism), and also the destructive transformation processes by which energy is made available for the uses of the organism (catabolism); the sum of all the enzyme-catalysed reactions occurring in a cell

metabolite - a substance that takes part in the process of metabolism, which involves the breakdown of complex organic constituents of the organism's body with the liberation of energy for use in bodily functioning. The various compounds that take part in, or are formed by, these reactions are called metabolites

metadata - information about data or other information. Metadata or "data about data" describe the content, quality, condition, and other characteristics of data

metagamy - pertains to a reproductive cycle that alternates between sexual and asexual phases

metagenesis - an alternation of sexual and asexual generations. When metagenesis occurs in cnidarians, the polyp is the asexual generation and the medusa is the sexual generation. A generalized life cycle occurs as follows: medusae produce gametes which unite to form zygotes. Each zygote divides repeatedly and develops into a free-swimming planula larva, which eventually settles and develops into a polyp. Each polyp then asexually produces medusae to complete the life cycle

metamere - in biology, any of the homologous segments lying in a longitudinal series that make up the body of certain animals, such as earthworms and lobsters. A metamere is also called a 'somite'

metamerism - in biology, the division of the body into a series of more or less similar segments (metameres), as in an annelid worm or a lobster



A polychaete worm exhibiting metamerism.
(Photo: Rick Gillis, Ph.D.,
Biology Dept., University
of Wisconsin-La Crosse)

metamorphic rock - rock that has been altered physically, chemically, and mineralogically in response to strong changes in temperature, pressure, shearing stress, or by chemical action of fluids

metamorphosis - change of body shape, e.g., the change from a larval form to a juvenile or adult form

metanauplius larva - postnaupliar larva of crustaceans with the same general body and limb morphology as the nauplius, but having additional appendages



Crustacean metanauplius larva. (Photo: Dep.de formation des maitres. Physiologie animale, Universite Pierre & Marie Curie, Paris VI.)

metanephridium - a type of excretory tubule in annelid worms. The metanephridium has internal openings called 'nephrostomes' that collect body fluids and conducts them to the outside through external openings, the 'nephridiopores'

metanephros - the final excretory organ that develops in a vertebrate embryo. In birds, reptiles, and mammals it replaces the mesonephros as the functional excretory organ, and develops into the adult kidney

metapopulation - a group of populations, usually of the same species, which exist at the same time but in different places. The dispersed population can replenish one another with migrants; a set of partially isolated conspecific populations which are able to exchange individuals and recolonize sites in which the species has recently become extinct

metazoa - multicellular animals having cells differentiated into tissues and organs, and usually a digestive cavity and nervous system

metecdysis - the final stage in arthropod molting in which the new cuticle is hardened

meteorology - the science that deals with atmospheric phenomena, especially weather and weather conditions



Meteorologists often study violent weather. (Photo: NOAA)

meter - a unit of length which constitutes the basis of the Metric System. It is one ten-millionth part of the distance measured on a meridian of the Earth from the equator to the pole. One meter equals 39.37 inches

methane - an odorless gas produced by the decomposition of organic matter

methane hydrate - ice that contains a large amount of methane within its crystal structure. Methane hydrates are common constituents of the shallow marine geosphere, huge amounts of which underlie the oceans and polar permafrost. The methane is dominantly generated by bacterial degradation of organic matter in a low oxygen environment. There is an extraordinary amount of energy locked up in methane hydrate deposits, but no one has yet figured out how to extract the methane inexpensively. Methane is also a greenhouse gas and release of even a small percentage of total deposits could have a serious effect on the Earth's atmosphere; also called "methane clathrate" and "methane ice"

method - a description of how data and information are collected

metric system - a decimal system of measures and weights with the meter and the gram as bases

MHC (Major Histocompatibility Complex) - a complex family of genetically inherited proteins that play a critical role in immune response to foreign organisms. It is also involved in autoimmune disease and in transplant rejection. MHC are located on cell surfaces and work like receptors that interact with immune cells; molecules expressed on the surface of cells that identify the cell as being "self" vs "foreign". MHC molecules also bind foreign antigens and present them to the immune system

microarray - in genomics, a tool for studying how large numbers of genes interact with each other and how a cell's regulatory networks control vast batteries of genes simultaneously. A robot is used to precisely apply tiny droplets containing functional DNA to glass slides. Researchers then attach fluorescent labels to DNA from the cell they are studying. The labeled probes are allowed to bind to cDNA strands on the slides. The slides are put into a scanning microscope to measure how much of a specific DNA fragment is present

microatoll - a circular colonial corallum up to 1 m height and 4 m diameter. Growth is mainly lateral, as upward growth is limited by aerial exposure

microbe - a nonspecific term for small organisms that can be seen only with the aid of a microscope. The term encompasses viruses, bacteria, yeasts, molds, and protists. The term, however, is used most frequently in reference to bacteria

microbenthos (microfauna or microflora) - benthic organisms whose shortest dimension is less than 0.1 mm

microbial loop - a micro-food chain that works within (or along side) the classical food chain. In the microbial loop the smallest organisms, the heterotrophic bacteria and picoplankton, use dissolved inorganic material directly as carbon and energy sources. These organisms are grazed upon by flagellates and ciliates. The flagellates and smaller phytoplankton are too small to be preyed on directly by copepods, long considered to be a major predator of microorganisms. Improved detection methods have demonstrated that ciliates provide an intermediate predator level in the microbial loop. These are then consumed by copepods and the process continues up the classical food chain (Marine Science Online)

microbiology - the study of organisms that can be seen only with the aid of a microscope

microbiota - organisms which are invisible, or nearly so, to the naked eye

microclimate - the climate within a very small area or in a particular, often tightly defined, habitat

Microdictyon - a genus of non-calcareous, fleshy green macroalgae which can form green mats or turf on the substrate; also an extinct "armored worm" known from the Early Cambrian Maotianshan shale of Yunnan, China

microecology - the study of the interactions between microorganisms and their environment

microenvironment - a specific set of physical, biological, and chemical factors immediately surrounding the organism

microevolution - relatively minor change in the composition of a species' gene pool over time

microfauna - animals which are invisible, or nearly so, to the naked eye

microflora - plants which are invisible, or nearly so, to the naked eye

microhabitat - a smaller part of a habitat that has some internal interactions allowing it to function self-sufficiently within a generally larger habitat, such as a patch reef in a lagoon

micrometer - an instrument for measuring very small distances

micron (μ) - a unit of length equivalent to a micrometer (μm), one-millionth of a meter or 0.00003937 inch

Micronesia - a region situated between the Mariana Trench in the west and the Line Islands in the east. The name "Micronesia" means "tiny islands." the Federated States of Micronesia consists of the states of Yap, Chuuk, Pohnpei, and Kosrae. This region is composed of thousands of small islands, mostly atolls



Map of Micronesia.
(Graphic: U.S. CIA)

micronutrient - a nutrient, such as iron, copper, or zinc, that is required in very small amounts by plants in order to photosynthesize and thrive

micropyle - the minute aperture in the egg membrane for the entry of the sperm cell

microsatellites - loci (or regions within DNA sequences) where short sequences of DNA nucleotides are repeated in tandem arrays (the sequences are repeated one right after the other). The lengths of sequences used most often are di-, tri-, or tetra-nucleotides. In the literature they can also be called simple sequence repeats (SSR), short tandem repeats (STR), or variable number tandem repeats (VNTR). Microsatellites are inherited in a Mendelian fashion. They are widely used in the following applications: forensic identification and relatedness testing; diagnosis and identification of diseases; population studies (by looking at the variation of microsatellites in populations, inferences can be made about population structures and differences, genetic drift, genetic bottlenecks and even the date of a last common ancestor); and conservation biology where they can be used to detect sudden changes in population, effects of population fragmentation, and interaction of different populations. Microsatellites are useful in identification of new and incipient populations

microclere - a small spicule in sponges

microsmatic - pertains to animals with a poorly developed olfactory (smell) sense

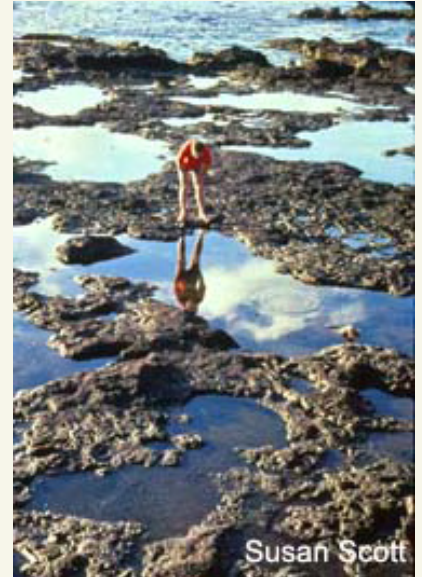
microtidal - coastal ocean or waterway with a low mean tidal range, e.g., less than 2 meters

microtubule - a long, hollow rod composed of the protein, tubulin. Microtubule networks make up portions of the cytoskeleton of all eukaryotic cells, aiding in cell structure and shape. They also function in intracellular transport of materials and organelles and are main components of cilia and flagella. Microtubules also participate in the formation of spindle fibers during cell division (mitosis)

microvillus - any of the minute hairlike structures projecting from the surface of certain types of cells

microwave - any electromagnetic radiation having a wavelength in the approximate range from one millimeter to one meter, the region between infrared and short-wave radio wavelengths

midlittoral zone - the portion of the intertidal zone that is covered and uncovered by water each day



Tidal pools in the midlittoral zone. (Photo: Susan Scott)

midnight zone - the layer of the ocean beneath the twilight zone, extending from 1000-4000 meters. No light penetrates this zone; see "bathypelagic zone"

midocean ridge - an uplifting of the ocean floor that occurs when convection currents beneath the ocean bed force magma up where two tectonic plates meet at a divergent boundary. The mid-ocean ridges of the world are connected and form a single global mid-oceanic ridge system that is part of every ocean and also by far the longest mountain range on Earth

migrant - an animal that makes seasonal trips between breeding and non-breeding areas

migration - the large-scale movement of a population for some specific purpose



Humpback whales (*Megaptera novaeangliae*) migrate from near the poles to tropical waters. (Photo: R Wicklund)

milliammeter - an instrument for recording very small electrical currents

millipore filter - a thin membrane composed of cellulose fibers that is used, for example, as a filter in the bacteriological examination of water

milt - the testes of fishes when filled with semen; fish seminal fluid



The testes of this male adult salmon produce milt when ready to spawn. The milt becomes a liquid, containing sperm cells, and exits through the vent opening to fertilize eggs. (Photo: Pacific Streamkeepers Federation)

mimicry - the appearance or characteristics of one organism that copies or "mimics" another in order to gain some advantage; the organism may resemble some other natural object as an aid in concealment

Minamata disease - mercury poisoning of humans from eating contaminated seafood

mineral accretion - a technique used to grow corals on artificial reefs using electricity to accrete minerals thereby cementing coral colonies to the substrate. Applying a low voltage to a metallic structure causes calcium carbonate (CaCO_3) to build on the metal, upon which coral larvae can attach, settle and feed. This greatly speeds the coral reef growth process. The voltage is low enough that it can easily be generated by floating solar panels or from wave action



This effective method of growing corals with electricity, currently used in worldwide research and holds high potential for restoring coral reefs damaged by causes of reef destruction (Photo: Great Barrier Reef Marine Park Authority)

mineral deposit - an accumulation of naturally occurring minerals

mineralization - the process in which organic compounds (e.g., dead plant or animal materials) are converted to inorganic compounds

mini-atoll - a ring-shaped patch reef with a central area (lagoon) containing sand

minimum viable population (mvp) - the smallest isolated population having a good chance of remaining extant for a given number of years despite the foreseeable effects of demographic, environmental, and random genetic events and natural catastrophes

minisatellites - segments of repeated DNA often used as genetic markers for individual identification

Minor Outlying Islands - United States Minor Outlying Islands are: Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Islands, Wake Island, Palmyra Atoll, and Navassa Island (disputed with Haiti)

misspelling - in zoological nomenclature, a citation of a name in the literature that is incorrectly spelled

mitigation - the act of making less severe or intense; measures taken to reduce adverse impacts on the environment

mitigation plan - a proposal to reduce or alleviate potentially harmful impacts

mitochondrial DNA (mtDNA) - DNA that is located in the mitochondria of cells. Mitochondrial DNA is maternally inherited and is a powerful tool for tracking matrilineage

mitochondrial genome - the genetic material of the mitochondria. It is similar in structure to that of the prokaryotic genetic material, formed of a single circular DNA molecule. The mitochondria of sexually-reproducing animals usually comes only from the maternal side, and is essentially the same as that of the mother. Sometimes mitochondria from spermatozoa are also passed on to offspring. Mitochondrial DNA has been studied to trace lineage far back in time

mitochondrial RNA (mtRNA) - RNA that is located in the mitochondria of cells

mitochondrion - an organelle found in the cells of most eukaryotes. Mitochondria are sometimes described as cellular "power plants" because their primary function is to manufacture adenosine triphosphate (ATP), which is used as a major source of cellular energy



Electron micrograph of a single mitochondrion showing the organized arrangement of the protein matrix and the inner mitochondrial membranes. (Photo: U.S. Dept. of Health and Human Services/National Institutes of Health)

mitogen - any substance that causes cells to begin dividing by mitosis

mitosis - the process of nuclear division in eukaryotic cells that produces two daughter cells from one mother cell, all of which are genetically identical to each other. See cell division -

mitotic spindle - a network of fiber-like microtubules that forms in a cell's nucleus during mitosis (nuclear division) which connects the centrosomes to the kinetochores and helps move the chromosomes around

mixed layer - near-surface waters subject to mixing by the action of wind and waves. There is little variation in salinity or temperature at depths below the mixed layer

mixed zone - the populous region of most bank/barrier reefs seaward of the lower palmata zone. It begins at a depth of 6-8 m

MJO (Madden Julian Oscillation) - a major perturbation of tropical convection which moves and completes a global circuit every 30 to 60 days. It is a dominant cause of intraseasonal variability in tropical equatorial regions

MLCD (Marine Life Conservation District) - a designated area for the conservation and replenishment of marine resources. MLCDs allow only limited fishing and other consumptive uses, or prohibit such uses entirely. They provide fishes and other aquatic life with a protected area in which to grow and reproduce, and are home to a great variety of species

MMM (Maximum Monthly Mean SST climatology) - the highest expected (climatological) monthly SST expected at all ocean locations based on 15 years of monthly mean SST data (serves as the input threshold for the Coral Bleaching HotSpot charts)

mode - a statistical measure of central tendency. The number that appears most in a sequence of numbers. A list of numbers can have more than one mode

model - a mathematical approximation or simulation of a real system, process, or object that omits all but the most essential variables, developed to understand its behavior or to make predictions

Modern Synthesis - the synthesis of natural selection and mendelian inheritance

modifier gene - a gene that modifies the effect produced by another gene

moiety - a component part of a complex molecule

molar - a large flat or ridged-topped tooth adapted for crushing or grinding



The teeth of this fish (*Colossoma nigripinnis*) are molar-like. Although they may have cusps, they are designed to crush food materials (Photo: Florida Fish and Wildlife Commission)

molar solution - an aqueous solution that contains one mole (gram-molecular weight) of solute per liter

molariform - shaped like a molar tooth, being rounded and flattened. In fishes, molariform teeth are used for crushing mollusks and crustaceans

mole - the mass of a compound in grams numerically equal to its molecular weight. Also, the mass of a compound containing Avogadro's number of molecules

molecular biology - a branch of biology that studies the biology of a cell at the molecular level. Molecular biological studies are directed at studying the structure and function of biological macromolecules and the relationship of their functioning to the structure of a cell and its internal components. Great attention is given to genetic aspects such as replication, transcription and translation

molecular clock - a technique in genetics, based on the molecular clock hypothesis (MCH), which is used to date when two species diverged. It deduces elapsed time from the number of minor differences between their DNA sequences

molecular clock hypothesis (MCH) - the principle that any gene or protein has a near-constant rate of evolution in all branches of a clade, which means that the amount of sequence divergence between two sequences will be proportional to the amount of time elapsed since their shared ancestor existed

molecular evolution - the process of evolution at the scale of nucleic acids (DNA and RNA) and proteins

molecular genetics - the study of how genes function to control cellular activities

molecular phylogeny - the use of the structure of molecules to gain information on an organism's evolutionary relationships. The result of a molecular phylogenetic analysis is expressed in a phylogenetic tree

molecular systematics - the process of using data on the molecular constitution of organisms' DNA and/or RNA (nucleotide sequencing) in order to resolve questions in systematics and phylogeny

molecular weight - the sum of the atomic weights of the atoms in a molecule

molecule - a small particle composed of two or more atoms. Molecules are a stable configuration of atomic nuclei and electrons bound together by electrostatic and electromagnetic forces. They have characteristic physical and chemical properties, different from the atoms of which they are composed

Mollusca - an animal phylum that includes bivalves, squids, octopuses and snails. They are distinguished by a muscular foot, a calcareous shell secreted by the underlying body wall (the mantle) and a feeding organ (the radula). Many species are common inhabitants of coral reefs



Atlantic deer cowrie (*Cypraea cervus*) grazing in the Flower Garden Banks National Marine Sanctuary. (Photo: Frank and Joyce Burek)

molt - to shed part or all of a coat or outer covering, such as, shell, feathers, cuticle or skin, which is replaced periodically by a new growth

monaxon - a linear spicule in sponges; a single rod or ray with a pointed, hooked, or knobbed end

Monera - the Kingdom composed of prokaryotic organisms. They have a cell wall, and lack both membrane-bound organelles and multicellular forms. The Archaeobacteria, the most ancient of this Kingdom, are so different that they may belong to a separate kingdom. Monera include the cyanobacteria and eubacteria

moniliform - contracted at short, regular intervals like a string of beads; bead-like

monitoring - the systematic collection of data over time

monk seal - an endangered species of seal (*Monachus schauinslandi*) normally found on the leeward (southwest) sides of the Northwestern Hawaiian Islands, and occasionally sighted in the Main Hawaiian Islands. It is estimated that fewer than 1500 Hawaiian monk seals exist today. The Hawaiian monk seal was officially designated endangered 1976 and is protected by the Endangered Species Act and the Marine Mammal Protection Act. It is illegal to kill, capture or harass monk seals. A critically endangered species of monk seal (*Monachus monachus*) is found in the Mediterranean Sea. The Caribbean monk seal (*Monachus tropicalis*) is thought to be extinct



A Hawaiian monk seal foraging on a coral reef in the Northwestern Hawaiian islands. (Photo: NOAA/NMFS)

mono- - a prefix meaning one

monocarpic - refers to plants that flower and bear fruit only once; semelparous

monoecious - having combined sexes. Individuals of monoecious species contain the reproductive systems of both males and females

monofilament - a single large filament or threadlike structure of a synthetic fiber, such as a monofilament fishing line

monogamy - a male and a female mating only with each other

monomer - in chemistry, a single molecule that is the subunit of a polymer; in genetics, a character determined by a gene or genes at a particular locus

monomorphic - occurring in only one form

monopectinate gill (ctenidium) - in mollusks, refers to having gill lamellae on one side of the ctenidial axis

monophagous - eating one kind of food only

monophyletic group - a group of organisms descended from a common ancestor

monopodial growth - growth of a coral colony in which the trunk of the colony is made by the oldest polyp. The trunk grows during growth of new polyps. The oldest polyp is always on top of the colony

monosaccharide - a sugar that does not hydrolyse to produce other sugars; the simplest group of carbohydrates

monotype - in taxonomy, a situation where a genus group taxon is established with only one immediately subordinate taxon, e.g., a genus containing only one species

monsoon - a periodic wind caused by the effects of differential heating, with the largest being the Indian monsoon found in the Indian Ocean and southern Asia

Montastraea - a genus of hard (stony) coral that includes the boulder coral and the great star coral



Great star coral
(*Montastraea cavernosa*)
is one of four species of
Montastraea found at the
Flower Garden Banks in
the Gulf of Mexico. (Photo:
Dr. Stephen Gittings)

montiform - mountain-shaped

Montreal Protocol on Substances that Deplete the Ozone Layer - an international treaty designed to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion

moorish idol - a bony fish species (*Zanclus cornutus*) in the family Zanclidae. The moorish idol is the only species in the family. It has a long, white, sickle-shaped dorsal fin, two broad vertical black bars on the body, and a yellow-orange saddle across the s



A Moorish Idol (*Zanclus cornutus*) on an Indopacific reef (Photo: NOAA)

moray eel - any of numerous chiefly tropical, brightly colored marine eels of the family Muraenidae that commonly inhabit coral reefs



A spotted moray (*Gymnothorax moringa*) with a cleaning shrimp (*Lysmata grabhami*) (Photo: Tom Doeppner, Ph. D./ Brown University)

morbidity - illness or disease; the incidence and prevalence of a specific disease

morgan - unit of inferred distance between genes on a chromosome

morph - a distinct genetic form or variant of a particular species. For example, a distinct color phase of a species that exhibits more than one color; a specific form, shape, or structure

morphogenesis - a change in the shape or structure of an organism through growth and differentiation

morphological species - a typological species distinguished solely on the basis of morphology; also called "morphospecies"

morphology - a branch of biology that deals with the form and structure of organisms, apart from their functions (physiology)

morphometric character - a measurement of a body part, e.g., head length or eye diameter

morphospecies - the traditional way to distinguish one species from another is to use differences in morphology which could involve size, shape, body part proportions, or color of external and/or internal body structures. Species named in this way may be referred to as "morphospecies." Different morphospecies, however, may not conform to the usual definition of a biological species. Many geographically isolated morphospecies that are viewed as being closely related may be just genetic varieties within a species

mortality - the death rate; the ratio of the total number of deaths to the population of a specified area in a given time period

morula - a stage of embryonic development in which the cleaving cells (blastomeres) appear as a cluster of blastomeres without a cavity; precedes the blastula stage of embryonic development

mosaic evolution - the evolution of different characters within a lineage or clade at different rates, hence more or less independently of one another

mosaic teeth - the series of rows of flat teeth found in rays, skates and some sharks. They are used for crushing hard foods as mollusks and crustaceans; also called "pavement teeth"

motile - capable of self-locomotion in organisms

motu - a coral island in the lagoon of an atoll

MOU (Memorandum of Understanding) - an interagency agreement defining the role and responsibility which each agency has in dealing with particular issues

mound - an elongate offshore ridge of unconsolidated substrate; rocky remnants of eroding headlands (bars; shallow masses of limestone deposited by corals and coralline algae (shallow reefs)

mouth brooder (oral brooder) - a fish which broods or protects the eggs or young by taking them into the mouth cavity

mouthparts - a collective term for the appendages around the mouth of crustaceans which are concerned with feeding: mandibles, maxillae and maxillipeds

MPRSA (Marine Protection, Research, and Sanctuaries Act) - the MPRSA (1972) provides protection for many coral reefs by authorizing NOAA to designate areas as marine sanctuaries and promulgate regulations for the conservation and management of those areas. Since the Act was passed, thirteen sanctuaries have been designated, several of which contain coral reef communities. Coral research, monitoring, and management activities are conducted in these sanctuaries, as well as in the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, which is currently (June 2004) under consideration to become the nation's fourteenth sanctuary

mRNA (messenger RNA) - an RNA molecule that encodes the amino acid sequence of a protein. It is the mediating template between DNA and proteins. The encoded information from a particular gene is transferred from a strand of DNA by the construction of a complementary template strand of RNA (mRNA) through the *transcription* process. Next, three nucleotide segments of RNA, called tRNA (transfer RNA), which are attached to specific amino acids, match up with the template strand of mRNA to order the correct sequence of amino acids. These amino acids are then bonded together to form a protein in a process, called *translation*. Translation occurs in the ribosomes, which are composed of proteins and a third kind of RNA, rRNA (ribosomal RNA)

MSS (Multispectral Scanner) - a scanner system that simultaneously acquires images of the same scene in various wavelength bands

muciferous - producing or containing mucus

mucocyte - a mucus-secreting cell

mucophagy - feeding on the mucus of fishes or invertebrates

mucus - a gelatinous material secreted by specialized mucous cells. In corals, it functions in protection from bacterial invasion, food capture, and removal of sediment particles. Mucus is usually moved by cilia (motile hair-like extensions of the cell membrane)

mucus cell - a cell which secretes mucin, which, when mixed with water forms mucus

mud - a fine sediment often associated with river discharge and buildup of organic material in areas sheltered from high-energy waves and currents

mud flat - a relatively level area of fine silt along a shore (as in a sheltered estuary) or around an island, alternately covered and uncovered by the tide, or covered by shallow water

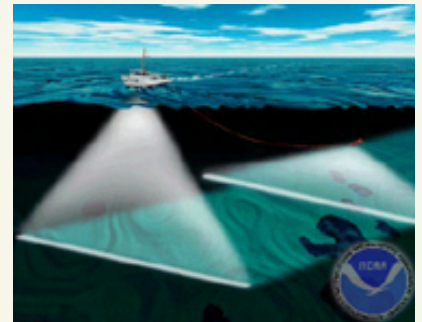


Nutrient-rich mudflats at the Gulf of the Farallones National Marine Sanctuary in California. (Photo: Dan Howard)

Muller's ratchet - a term given to the process by which the genomes of an asexually reproducing population accumulate deleterious mutations in an irreversible manner because of the lack of genetic recombination

Mullerian mimicry - a form of protective mimicry in which noxious species evolve through convergent evolution to resemble each other

multibeam sonar - sonar signals arriving at a target, or the towfish, from a single source but along different paths. The multibeam sonar system consist of a transducer, motion sensor, gyrocompass, and navigation system. When collected in slightly overlapping swaths (fanlike coverages from sonar scans), multibeam sonars can produce a sonar data set that represents nearly 100 percent acoustic coverage of the seafloor



Hull-mounted multibeam sonar (left) and towed side scan sonar (right)
(Graphic: NOAA)

multicellular - refers to organisms that are made up of more than one cell. Multicellular organisms have differentiated cells that perform specialized functions

multienzyme - a protein possessing more than one catalytic function contributed by distinct parts of a polypeptide chain, or by distinct subunits, or both

multimedia - the use of computers to present video, sound, graphics, and text

multimodal distribution - a distribution with more than one mode

multiple use MPA - often employed over larger areas, multiple-use areas allow for integrated management of complete marine ecosystems, usually through a zoning process

multispecies fish spawning aggregation - a fish spawning aggregation containing multiple species spawning in the same area over time

multivariate - a term that describes statistical, mathematical, or graphical procedures that involves two or more variables simultaneously

multivariate analysis of variance - an analysis of variance with two or more dependent variables

multivariate community analyses - statistical methods for analyzing physical and biological community data using multiple variables

municipal discharge - discharge of effluent from waste water treatment plants, which receive waste water from households, commercial establishments, and industries in the coastal drainage basin

municipal Sewage - wastes (mostly liquid) originating from a community; may be composed of domestic wastewaters and/or industrial discharges

muon - a charged lepton about 200 times more massive than an electron; an elementary particle with a negative charge and a half-life of 2 microsecond; decays to electron and neutrino, and antineutrino

mutagen - an agent that causes a permanent genetic change in a cell other than that which occurs during normal genetic recombination

mutation - changes in the nature of single genes or segments of chromosomes, which are then inherited by successive generations

muton - the smallest mutable site within a cistron; the smallest part of a gene (a single nucleotide pair) that can be involved in a mutation event

mutualism - a symbiotic interaction between two species in which both derive some benefit

MYA - an acronym for "million years ago"

mycelium - the mass of filamentous growth (hyphae) from which the vegetative part of a fungus develops



Drawing of the mycelium of a fungus. (Photo: Jon Houseman\BIODIDAC)

mycobacteriosis - in fishes, mycobacteriosis is a disease caused by bacteria within the genus *Mycobacterium*. There are many different species of *Mycobacterium* that also cause diseases in birds, reptiles, and mammals. Some also cause important diseases in humans. the *Mycobacterium* species in fishes are referred to as non-tuberculous mycobacteria and do not cause major disease in healthy humans. However, while rare, transmission from infected fishes to humans is possible and may cause a skin infection referred to as "fish handler's disease" or "fish tank granuloma"

mycophage - an animal which primarily eats fungi

mycosis - any disease caused by a fungus

myocin - one of two proteins responsible for muscle cell contraction (the other is the globular protein, actin). Myosin bundles intermesh with actin bundles, and contraction occurs when the two protein bundles slide over each other

myoepithelial cell - a contractile cell in cnidarians

myoglobin - an oxygen-binding protein found in the muscle cells of animals. It functions as an oxygen storage unit, providing oxygen to the muscles. Diving marine mammals, such as seals and whales are able to remain submerged for long periods because they have greater amounts of myoglobin in their muscles than other animals do. There is a close chemical similarity between myoglobin and hemoglobin, the oxygen-binding protein of red blood cells

myoneme - a contractile fibril found in the cytoplasm of certain protozoans; a contractile fibril of epitheliomuscular cells of anthozoans

myotome - any segment of embryonic mesoderm that develops into skeletal (voluntary) muscle in the adult; any of the segmentally arranged blocks of muscle in lower vertebrates, such as fishes

mytiliform - in the shape of the mussel shell (genus *Mytilus*)

myxopterygium (clasper) - the copulatory organ or clasper of sharks, rays, skates and chimaeras

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site
All of NOAA

Glossary of Terminology: N

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

nacre - the iridescent innermost layer of a molluscan shell that is secreted by the mantle. It is also called the mother-of-pearl layer



A mussel shell showing the nacre or mother-of-pearl layer.

NACRI (Netherlands Antilles Coral Reef Initiative) - NACRI was established in 2000 as part of an effort to improve nature conservation and management in the Netherlands Antilles in general, and specifically targeting coral reefs in order to give more attention to, and better coordinate protection of the coral reefs of the islands. Beginning in 2004, NACRI plans to establish a central monitoring node and database for the Netherlands Antilles as part of the Global Coral Reef Monitoring Network (GCRMN), to complement other existing sub-regional nodes in the Caribbean. A catch survey of reef fisheries in all islands is also planned. The Netherlands Antilles consists of five islands in the Caribbean: Bonaire and Curacao just over 100 km off the Venezuelan mainland, and Saba, St. Eustatius and St. Maarten about 900 km to the north-east in the arc of the Lesser Antilles. The Netherlands Antilles is a so-called territory of the Kingdom of the Netherlands, although it is an independent state

naked skin - pertains to a fish whose body lacks scales; scaleless

nanobiology - biological studies at the extremely small to molecular levels. Many fundamental biological functions are carried out at the level of molecular machineries that have the sizes of 1-100 nm. The emergence of nanobiology allowed understanding of the functions of these machineries, with the invention of nano- technology, e.g., scanning probe microscopy, modern optical techniques, and micro- manipulating techniques

nanometer - a unit of length equal to 0.001 microns (one thousandth of a micron), 0.000001 millimeters, or 0.000000001 meters; also called a millimicron

nanoplankton - minute phytoplankton organisms with a body diameter between 0.2 and 20 micrometers

nanoscience - the extension of existing sciences into the realms of the extremely small, as in nanomaterials, nanochemistry, nanobiology, nanophysics, nanoengineering, etc

nanozooid - a small zooid in tubuliporid bryozoans which bears a single tentacle and a reduced alimentary sac

nape - the area behind the head of a fish, extending from the back of the skull to the origin of the dorsal fin

nare - nostril; an opening, external and internal, of the nasal passage. Nares (pl) in fishes lead to blind olfactory sacs and do not connect with an internal passageway. There is an incurrent aperture and an excurrent aperture. Movement of water into the olfactory sacs is for smelling rather than respiration

NARS (Natural Area Reserve System) - the State of Hawai'i created the Natural Area Reserves System, or NARS, to preserve and protect representative samples of Hawaiian biological ecosystems and geological formations. The diverse areas found in the NARS range from marine and coastal environments to lava flows, tropical rainforests, and even an alpine desert. One can find rare plants and animals within these areas, many of which are on the edge of extinction. The reserves also protect some of the major watershed areas which provide vital sources of fresh water

nasal - pertains to the nose

nascent - commencing development; immature; coming into existence; emerging

natal homing - the behavior by which an animal returns, for reproductive purposes, to the place where it was born or hatched

natant - swimming or floating

National Benthic Inventory (NBI) - a quantitative database on benthic species distributions and a corresponding taxonomic voucher collection of preserved benthic specimens obtained from studies conducted by the National Oceanic and Atmospheric Administration (NOAA) and partnering institutions in estuarine and other coastal areas of the United States. Both the NBI and the reference collection are maintained in the Benthic Ecology Laboratory of the Coastal Ecology Program at NOAA's Center for Coastal Environmental Health and Biomolecular Research in Charleston, SC

National Biological Information Infrastructure (NBII) - a broad, collaborative program to provide increased access to data and information on the nation's biological resources. The NBII links diverse, high-quality biological databases, information products, and analytical tools maintained by NBII partners and other contributors in government agencies, academic institutions, non-government organizations, and private industry

National Estuary Restoration Inventory (NERI) - a NOAA online database of habitat restoration projects. The purpose of the inventory is to: provide information on monitoring and restoration techniques in order to advance the science of restoration, track acres of habitat restored toward the million acre goal of the Estuary Restoration Act (ERA), and provide information for reports transmitted to Congress

National Marine Protected Areas Center - the National Marine Protected Areas (MPA) Center's mission is to facilitate the effective use of science, technology, training, and information in the planning, management, and evaluation of the nation's system of marine protected areas. The MPA Center, located within the National Oceanic and Atmospheric Administration (NOAA), develops operational and program policy, supports the MPA Federal Advisory Committee, manages national, regional, and international MPA coordination, conducts outreach and education, consults with federal agencies, state agencies, tribal agencies, fishery management councils, and others, maintains the U.S. MPA website, and oversees the collection of data for the marine managed areas inventory

National Monument - a protected area of the United States that is similar to a U.S. national park. The President of the United States can quickly declare an area of the United States to be a national monument without Congressional approval. On June 15, 2006, President George W. Bush declared the Northwestern Hawaiian Islands a National Monument, creating the largest protected marine reserve in the world

National Oceanographic Partnership Program (NOPP) - a collaboration of fifteen U.S. federal agencies to provide leadership and coordination of national oceanographic research and education initiatives

National Priorities List (NPL) - locations throughout the U.S. where hazardous wastes have been found in the environment and the initial evaluation shows a significant risk of harm to human health or the environment. NPL sites are frequently called "Superfund" sites, because Superfund money can be used by the U.S. Environmental Protection Agency (USEPA) to investigate and clean up these sites

native species - a species that occurs naturally in a given area. Therefore, one that has not been introduced by humans either accidentally or intentionally; also called an indigenous species

natural climate record - a record of climatic events found by examining the natural environment (e.g., coral growth bands, tree rings, layers of ice in glaciers)

Natural Heritage Network - the network of Conservation Data Centers and Natural Heritage Programs throughout the Americas. All network members use the same methodology and database to track the rare elements of biodiversity in their jurisdictions

natural occurrence - the presence of a substance in nature, as distinct from presence resulting from inputs from human activities

natural selection - a natural process by which organisms (and their genes) that adapt to their environment survive while those that do not adapt become eliminated progressively

Nature Conservancy, The - a private, international conservation group whose mission is to preserve plants, animals, and natural communities that represent the diversity of life on earth by protecting the lands and waters they need to survive

NatureServe - an organization dedicated to providing reliable information on species and ecological communities for use in conservation and land use planning. NatureServe is an independent nonprofit organization created in collaboration with the network of Natural Heritage Programs and Conservation Data Centers and The Nature Conservancy

NAUI (National Association of Underwater Instructors) - a scuba diving certifying and instruction agency

nauplius larva - a free-swimming, planktonic larval stage of many crustaceans

nautical chart - a chart used to navigate bodies of water

nautical mile - the length of a minute of arc, 1/21,600 of an average great circle of the Earth. Generally one minute of latitude is considered equal to one nautical mile. The accepted United States value as of 1 July 1959 is 1,852 meters (6,076.115 feet)

Navassa - a small (35 km²) isolated and uninhabited island located at 18°25'N, 75°05'W, approximately 55 km west of the Tiburon Peninsula of Haiti and 220 km northeast of Jamaica. Navassa was designated as a United States National Wildlife Refuge in 1999. Corals and sponges grow on large underwater rocks that have broken off from the cliffs

navicular - boat-shaped

naviform - boat-shaped

NCBI (National Center for Biotechnology Information) - established in 1988 as a national resource for molecular biology information, NCBI creates public databases, conducts research in computational biology, develops software tools for analyzing genome data, and disseminates biomedical information - all for the better understanding of molecular processes affecting human health and disease. NCBI is a division of the National Library of Medicine (NLM) at the National Institutes of Health (NIH)

neap tide - a tide that occurs when the difference between high and low tide is least; the lowest level of high tide. Neap tide comes twice a month, in the first and third quarters of the moon

near threatened - a species or other taxon likely to become Critically Endangered, Endangered or Vulnerable in the near future

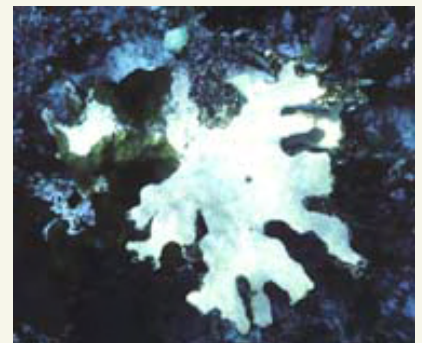
necrolysis - the decomposition of an organism's body after it dies

necromass - the weight of dead organisms, usually expressed per volume of water or per unit of land surface or volume

necrophagy - feeding on dead animals or carrion

necropsy - an examination and dissection of a body of a dead organism in order to determine the cause of death or changes produced by disease

necrosis - the death of living tissues due to infection or injury



Elkhorn coral, suffering from recent necrosis.
(Photo: U.S. Geological Survey)

nectophore - a highly modified medusa that remains with a floating hydrozoan colony and pulsates for locomotion of the colony

nectosome - the region of a siphonophore colony that bears nectophores (medusae specialized for propulsion)

Needham's sac - a sac that stores spermatophores in cephalopods

negative binomial regression model - a useful empirical methodology when data are overdispersed, that is, when the variance of the distribution is considerably larger than the mean

negative charge - an electrical charge created by having more electrons than protons.

negative phototropism - the tendency to move away from a light source

nekton - organisms with swimming abilities that allow them to move actively through the water column and to move against currents



Fish are a large component of marine nekton. (Photo: Dr. Anthony Picciolo)

nematocyst - a specialized stinging cell (cnida) found in cnidarians. It is a double-walled capsule containing an elongated tubule which everts upon mechanical or chemical stimulation to deliver a toxin or entangle prey or predators. There are several different morphological types of nematocysts

nematode - any unsegmented roundworm of the phylum Nemata, having a tough outer cuticle. The phylum includes free-living forms and disease-causing parasites

nematozoid - a hydrozoan defense polyp

Nemertea - a phylum of elongated, often flattened marine worm-like animals comprising nearly 1000 species which range in size from less than an inch to nearly 30 m. They are carnivorous and feed upon annelid worms as well as other marine animals. Their most distinctive structure is a proboscis which is used for food capture, defense, and burrowing into the soft substrate. The sexes are separate in most species and fertilization is external. Many are capable of reproducing asexually by fragmentation of the body. They are also called "ribbon worms"



The Nemertea are voracious carnivores, and its body wall musculature is not well developed; when picked up they can stretch to many times their original length (Photo: Bill Rudman, Ph.D.)

neo-Darwinism - the unification of natural selection and Mendelian genetics; also called the Modern Synthesis

neocotype - in taxonomy, a replacement syntype, q.v., designated in the absence of the original type or type series

neonate - a newborn animal

neoplasia - the pathological process that results in a neoplasm, an abnormal tissue whose cells proliferate more rapidly than normal and which may become malignant

neoplasm - a cancerous growth

neoprene - a synthetic rubber with good resistance to oil, chemical, and fire. Wet suits and other "rubber" diving accessories used by scuba divers are made of neoprene

neotype - in taxonomy, a specimen selected as type specimen subsequent to the original description in cases where the original holotype, or lectotype, or all paratypes, or all syntypes are lost or destroyed, or suppressed by the Commission (Zoology)

NEPA (National Environmental Policy Act) - passed in 1969, the purposes of NEPA are: to declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality

nephelometer - an instrument for measuring the turbidity of a fluid by measuring the scattering function of particles suspended in the fluid

nephelometric turbidity unit (NTU) - unit of measure for the turbidity of water. Essentially, a measure of the cloudiness of water as measured by a nephelometer

nephridium - a simple excretory organ of many invertebrates, consisting of a tube through which waste products pass to the exterior

nepionotype - in taxonomy, the type larva of a species

neritic - refers to the ocean environment landward of the shelf-slope break

neritic zone - the relatively shallow water zone that extends from the high tide mark to the edge of the continental shelf

nerve - a bundle of neurons (nerve cells); specifically, a bundle of axons which are the motor processes of neurons which carry nervous impulses in the direction away from the cell bodies

nerve net - the non-centralized, disorganized network of nerve cells under the epidermis, and sometimes the gastrodermis, of cnidarians. It is comprised of multipolar cells with multiple synaptic junctions, but no polarization. Impulses pass either way across the synapse. Both neuron endings of a synapse have secretory vesicles

nerve net - a diffuse, two-dimensional plexus of interconnected bipolar or multipolar neurons with no central control organ; found in cnidarians

nerve ring - the center of the nervous system of some higher invertebrates that encircles the esophagus. It is composed largely of nerve fibers and associated ganglia; also called the "supraesophageal commissure"

NESDIS (National Environmental Satellite, Data and Information Service) - the NOAA agency that operates and manages the U.S. civilian weather satellites and the national environmental data centers, such as the National Oceanographic Data Center (NODC), the National Climatic Data Center (NCDC), and the National Geophysical Data Center (NGDC)

nest - a structure in which animals lay eggs or give birth to their young and/or provide a place to raise their offspring

nest fauna - the invertebrate inhabitants of bird's nests

nesting - the act of constructing a nest

net photosynthetic rate - the total rate of photosynthetic CO₂ fixation minus the rate of loss of CO₂ during respiration

net plankton - plankton captured in a 80 µm net

net primary productivity - the total amount of chemical energy fixed by the processes of photosynthesis minus the chemical energy lost through respiration; same as 'net photosynthetic rate'

network - a wide variety of systems of interconnected components; two or more computers connected together so that they can share resources. Two or more networks connected together is an internet

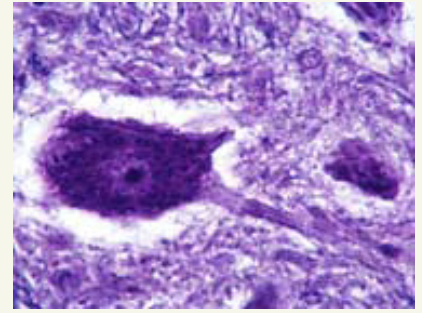
Network for Endangered Sea Turtles (N.E.S.T.) - a non-profit organization dedicated to the preservation and protection of the habitats and migration routes of sea turtles and other marine animals on the Outer Banks of North Carolina from the Virginia border to Oregon Inlet

neural - pertains to the nervous system of an organism

neuritis - inflammation of the nerves

neuromast - a sensory cell with a hair-like process capable of detecting motion or vibrations in water

neuron - a nerve cell; a specialized cell that can react to stimuli and transmit impulses. A neuron consists of a cell body which contains the nucleus; dendrites, which are usually short sensory branches off the cell body that receive incoming impulses; and a single, long axon which carries impulses away from the body (motor function) and to the next neuron, gland or muscle



A neuron in a mammalian brain. (Photo: University of Kansas Medical Center)

neurophysiology - the branch of neuroscience that studies the physiology of the nervous system

neuropodium - a lobe of the parapodium closer to the ventral side in polychaete worms

neuroscience - the scientific disciplines concerned with the development, structure, function, chemistry, pharmacology, clinical assessments and pathology of the nervous system

neurotoxin - a toxic substance which interferes with the electrical activities of nerves and inhibits, damages or destroys the tissues of the nervous system, especially neurons (nerve cells)

neurotransmitter - a chemical substance ("messenger") produced in and released by one neuron that carries a nervous impulse across a synapse (the small gap between the axon and dendrite of communicating neurons). They relay nervous impulses among neurons and between neurons and other types of cells, such as in muscle and glandular tissues. Neurotransmitters can excite or inhibit another neuron or receptor organ. There are more than 300 known neurotransmitters. A few of the more common ones are acetylcholine, dopamine, norepinephrine, and serotonin

neuston - planktonic organisms associated with the air-water interface

neutralism - the lack of any interaction between two organisms or species in a shared habitat. Neither has any effect on the other

neutrino - a lepton with no electric charge. Neutrinos participate only in weak (and gravitational) interactions and therefore are very difficult to detect. There are three known types of neutrino, all of which have very low or possibly even zero mass

new combination - in taxonomy, when a species is transferred to a different genus for the first time

NGO (Non-governmental Organization) - a non-profit group or association organized outside of institutionalized political structures to obtain particular social objectives (such as environmental protection) or serve particular constituencies

niche - the role of an organism in an ecological community; the environmental requirements and tolerances of a species; sometimes seen as a species' "profession" or what it does to survive

niche overlap - an overlap in resource requirements by at least two species

Nicotinamide adenine dinucleotide phosphate (NADP) - NADP is a reducing agent (electron donor) important in the preliminary reactions of photosynthesis. NADPH is the reduced form of NADP

nictitating eyelid - a movable eyelid found in sharks that can be closed over the eye to protect it from damage. Sharks also have non-moving upper and lower eyelids

nictitating membrane - a semi-transparent membrane which can be drawn across the eye in birds, reptiles and many mammals. It functions to either moderate the effects of strong light or to sweep away dust and similar particles from the surface of the eye

nidifugous - pertaining to an animal that leaves its nest shortly after birth or hatching

nitrogen narcosis - a hazardous condition that scuba divers may experience at depths usually in excess of 80 ft (24.38 m). It occurs when nitrogen builds up in the body tissues and replaces some of the oxygen required by the brain. The longer a diver with conventional scuba stays at a deep depth, the more nitrogen accumulates. As the brain is deprived of oxygen, the ability to think and function clearly diminishes. It may progress from a slightly confused feeling to an almost intoxicated state, where thinking and judgement is severely impaired. If the diver does not ascend to a shallower depth and off-gas nitrogen, nitrogen narcosis may eventually cause death. Although this can happen at any depth, it is especially a problem with dives in excess of 80 feet. Nitrogen narcosis is also called 'rapture of the deep'

nitrox - any mixture of nitrogen and oxygen that contains less than the 78 percent nitrogen as found in ordinary air

no take zone - a marine protected area that is completely (or seasonally) free of all extractive or non-extractive human uses that contribute impact (some exceptions may be permitted for scientific activities); also called "marine reserve" or "fully protected area"

NOAA (National Oceanic and Atmospheric Administration) - the National Oceanic and Atmospheric Administration (NOAA) is a federal agency within the US Department of Commerce that is dedicated to predicting and protecting the environment. NOAA's overall mission is to understand and predict changes in the Earth+s environment, protect life and property, provide decision makers with reliable scientific information, conserve and manage the Nation+s living marine and coastal resources to meet our Nation+s economic, social, and environmental needs, and foster global environmental stewardship. To achieve its mission, NOAA+s focus through 2008 will be on four mission goals:

1. Protect, restore, and manage the use of coastal and ocean resources through ecosystem-based management
2. Understand climate variability and change to enhance society+s ability to plan and respond
3. Serve society+s needs for weather and water information
4. Support the Nation+s commerce with information for safe, efficient, and environmentally sound transportation



The National Oceanic and Atmospheric Administration (NOAA) is a federal agency within the U.S. Department of Commerce that is dedicated to predicting, protecting, and providing information about the marine environment.

NOAA Coral Reef Conservation Program - a NOAA program whose purposes are: (1) to preserve, sustain, and restore the condition of coral reef ecosystems; (2) to promote the wise management and sustainable use of coral reefs; (3) to develop sound scientific information on the condition of coral reef ecosystems and the threats to such ecosystems; (4) to assist in the preservation of coral reefs by supporting conservation programs, including projects that involve affected local communities and nongovernmental organizations; (5) to provide financial resources for those programs and projects; and (6) to establish a formal mechanism for collecting and allocating monetary donations from the private sector to be used for coral reef conservation projects

NOAA Diving Program - the NOAA Diving Program is administered by NOAA and is headquartered at the NOAA Diving Center in Seattle, WA. The Program trains and certifies scientists, engineers and technicians to perform the variety of tasks carried out underwater to support NOAA's mission. With more than 300 divers, NOAA has the largest complement of divers of any civilian federal agency. In addition, NOAA's reputation as a leader in diving and safety training has led to frequent requests from other governmental agencies to participate in NOAA diver training courses

NOAA's Center for Sponsored Coastal Ocean Research (CSCOR) - NOAA's Center for Sponsored Coastal Ocean Research (CSCOR) develops and improves predictive capabilities for managing the Nation's use of its coastal resources through competitive research programs. CSCOR also supports efforts to translate the results of its research investments, and those of others, into accessible and useful information for coastal managers, planners, lawmakers, and the public to help balance the needs of economic growth with those of conserving the resources of our Nation's Great Lakes, estuaries, and coastal ocean. Its mission is to provide the highest quality research in support of coastal management decisions through competitive, peer-reviewed research and holistic ecosystem studies

NOAA's Coral Reef Conservation Grant Program - each year, subject to the availability of funds, NOAA publishes its Coral Reef Conservation Grant Program Funding Guidance, as authorized by the Coral Reef Conservation Act of 2000, to solicit proposals for coral reef conservation activities. The Act authorizes the Secretary of Commerce, through the NOAA administrator and subject to the availability of funds, to issue matching grants of financial assistance for broad-based coral reef conservation activities, consistent with the purposes of the Act

NOAA's Coral Reef Watch (CRW) Satellite Bleaching Alert (SBA) system - an automated coral bleaching e-mail alert system designed to monitor the status of thermal stress conducive to coral bleaching via the use of the CRW global satellite near-real time HotSpot suite of products. The SBA was developed by the NOAA as a tool for coral reef managers, scientists and other interested people. The SBA became operational in July 2005

NOAA's National Marine Fisheries Service (NOAA Fisheries) - NOAA Fisheries is the federal agency responsible for the stewardship of the nation's living marine resources and their habitat. It is responsible for the management, conservation and protection of living marine resources within the United States' Exclusive Economic Zone (water three to 200 miles offshore). Using the tools provided by the Magnuson-Stevens Act, NOAA Fisheries assesses and predicts the status of fish stocks, ensures compliance with fisheries regulations and works to reduce wasteful fishing practices. Under the Marine Mammal Protection Act and the Endangered Species Act, it recovers protected marine species (i.e. whales, turtles) without unnecessarily impeding economic and recreational opportunities. With the help of the six regional offices and eight councils, NOAA Fisheries is able to work with communities on fishery management issues. NOAA Fisheries works to promote sustainable fisheries and to prevent lost economic potential associated with overfishing, declining species and degraded habitats. It strives to balance competing public needs and interest in the use and enjoyment of

our oceans' resources. For more information, see: <http://www.nmfs.noaa.gov/>

NOAA's National Ocean Service (NOS) - NOS is a scientific and technical organization of NOAA whose mission is to preserve and enhance the nation's coastal resources and ecosystems along 95,000 miles of shoreline and 3.5 million square miles of coastal ocean. At the same time, it works to support economic growth for the long-term benefit of the nation. This theme is central to the sustainable development agenda of both NOAA and the U. S. Department of Commerce (DOC). For detailed information, see: <http://www.oceanservice.noaa.gov/about/welcome.html>

NOAA's Office of Ocean Exploration (OOE) - NOAA's center for new activities to explore and better understand our oceans. This office (OOE) supports expeditions, exploration projects, and a number of related field campaigns for the purpose of discovery and documentation of ocean voyages. Bringing scientists to ocean frontiers requires rigorous planning, mission staging, and well coordinated marine operations. Education and outreach rank high as office priorities. Through ocean exploration, NOAA is committed to raising America's science literacy and developing the next generation of ocean explorers, scientists and educators. Four crucial components comprise the NOAA Ocean Exploration Mission: (1) Mapping the physical, biological, chemical and archaeological aspects of the ocean; (2) Understanding ocean dynamics at new levels to describe the complex interactions of the living ocean; (3) Developing new sensors and systems to regain U.S. leadership in ocean technology, and; (4) Reaching out to the public to communicate how and why unlocking the secrets of the ocean is well worth the commitment of time and resources, and to benefit current and future generations. OOE is a major program office within NOAA's Office of Oceanographic and Atmospheric Research

NOAA's Office of Oceanic and Atmospheric Research (NOAA Research) - the Office of Oceanic and Atmospheric Research (OAR) or "NOAA Research" works in partnership with NOAA's National Weather Service, National Ocean Service, National Environmental Satellite Data Information Service and National Marine Fisheries Service as the research and development organization of the agency. It is through NOAA Research that work results in better weather forecasts, longer warnings for natural disasters and an overall greater understanding of our oceans, climate and atmosphere. NOAA Research explores the Earth and atmosphere from the very surface of the sun to the depths of the ocean. Its role within NOAA is to provide products and services that describe and predict changes in the environment. NOAA Research results allow decision makers to make effective judgments in order to prevent the loss of human life and conserve and manage natural resources. Research is conducted, with its partners in academia, in three major areas: atmosphere, climate, and ocean and coastal resources. For more information, see: <http://www.research.noaa.gov/>

nociceptor - a sensory receptor which responds to potentially harmful stimuli; produces a sensation of pain

nocturnal - being primarily active at night

node - a knob or swelling; a branching point on a dendrogram (phylogenetic tree); any single computer connected to a network; in a geographical information system (GIS), a node is the beginning, connecting and ending point of an arc

nodular - having small knobs, protuberances or nodule-like projections

nodule - a swollen, knob-like structure

nodulose - with small nodules, knobs or swellings

noise - unwanted sound

nomen illegitimum - in taxonomy, an illegitimate name; a validly published name that must be rejected for the purposes of priority in accordance with the International Code of Zoological Nomenclature

nomen negatum - in taxonomy, a denied name: an unavailable name which has incorrect original spellings as defined by the International Code of Zoological Nomenclature

nomen novum - in taxonomy, a new name which is published to replace an earlier name (and valid only if the latter is preoccupied) and which is expressly proposed as a replacement name; a new name, not to be confused with a new species, or a new genus, etc., which represent new taxa. It is commonly applied to names proposed to replace junior homonyms

nomen nudum - in taxonomy, a naked name, i.e., a name that, if published before 1931, was not accompanied by a description, definition, or indication, or if published after 1930, is not accompanied by a statement that purports to give characters differentiating the taxon; or is not accompanied by a definite bibliographic reference to such a statement; or is not proposed expressly as a replacement for a pre-existing available name. A *nomen nudum* is not an available name

nomen nullum - in taxonomy, a null name, i.e., an unavailable name which, as defined by the International Code of Zoological Nomenclature, is a non-demonstrably intentional change of an original spelling, i.e. a form of incorrect subsequent spelling

nomen oblitum - in taxonomy, a forgotten name; an unused senior synonym rejected under the provisions of the International Code of Zoological Nomenclature

nomen oblitum - in taxonomy, a forgotten taxonomic name

nomen vetitum - in taxonomy, an impermissible name; an unavailable name published for divisions of the genus group other than genus and subgenus, which are not accepted by the International Code of Zoological Nomenclature

nomenclature - the description of new taxa or alterations to the concept of previously described taxa which involve changes in the names of taxa

nominal taxon - in taxonomy, a named taxon, objectively defined by its type taxon. Thus the nominal family Chaetodontidae is always the one to which its nominal type genus, *Chaetodon*, belongs

nominate subordinate taxon - in taxonomy, a subordinate taxon which bears the same names as its immediate higher taxon. Thus *Badis badis* is the nominate species of the genus *Badis*

non-coding linker sequences - short pieces of DNA between genes which do not direct protein synthesis or perform a regulatory function

non-coding RNA (ncRNA) - any RNA molecule that is not translated into a protein. Examples of non-coding RNAs are transfer RNA (tRNA) and ribosomal RNA (rRNA)

non-extant - no longer existing

non-point source pollution - a pollution source without a single point of origin, or not introduced into a receiving stream from a specific outlet. It occurs when rainfall, snowmelt, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, and coastal waters or introduces them into ground water. Common nonpoint sources are agriculture, forestry, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets

nonallele - a gene that is not a competitor at the same locus (specific location on the chromosome)

nonbiodegradable material - a material that cannot be broken into simpler chemicals by living organisms

noncoding DNA - DNA that does not encode any product (RNA or protein). The majority of the DNA in plants and animals is noncoding

nondegradable pollutant - a polluting substance that is not broken down by natural processes

nonessential amino acid - an amino acid which can be synthesized by the organism's body, and not required in the nourishment source. Humans can make 13 nonessential amino acids

nonindigenous organism - an organism which is not native to the area in which it occurs. it was either purposely or accidentally introduced; also called exotic, nonnative, introduced, and alien

nonionizing radiation - radiation that carries enough energy to excite an atom or molecule, but not enough energy to remove an electron from the atom or molecule. This type of radiation does not cause damage to cells and tissues; examples include radio waves, microwaves, infrared light, and ordinary light

nonpoint - not from a single, well-defined site

nonrenewable resource - an environment resource which is not replaced or replenished by natural processes at a rate comparable to the use of the resource; a resource depleted or exhausted by use

nonseptate - lacking cross walls (septa); also termed "aseptate"

nonsynonymous substitution - in molecular biology, a nucleotide substitution that results in a replacement of an amino acid

nonvascular plant - a plant which lacks tissues to conduct water and nutrients. Nonvascular plants do not produce flowers or seeds

North Star - Polaris, the North Star, is visible in the northern hemisphere and indicates the direction of north. In the southern hemisphere the Southern Cross is used to find the direction of south

Northwestern Hawaiian Islands Marine National Monument - On June 15, 2006, The President of the United States declared the Northwestern Hawaiian Islands a National Monument, enabling nearly 140,000 square miles of the Northwestern Hawaiian Islands to receive the Nation's highest form of marine environmental protection. The monument will preserve access for Native Hawaiian cultural activities; provide for carefully regulated educational and scientific activities; enhance visitation in a special area around Midway Island; prohibit unauthorized access to the monument; phase out commercial fishing over a five-year period; and ban other types of resource extraction and dumping of waste. This marine national monument is the largest single area dedicated to conservation in the history of the United States and the largest protected marine area in the world

not evaluated - a species or other taxon whose conservation status in the wild has not been evaluated

notch - an indentation

notochord - a flexible rodlike structure that forms the supporting axis of the body in the lowest chordates, (e.g., tunicates and lancelets) and lowest vertebrates (e.g., lampreys), and in the embryos of all higher vertebrates, where it is replaced by the vertebral column; a prime defining characteristic of the phylum Chordata

notopodium - a lobe of the parapodium closer to the dorsal side in polychaete worms

notum - the dorsal portion of an arthropod's thoracic segment

nowCOAST - a web mapping portal that provides spatially referenced links to thousands of real-time coastal observations and NOAA forecasts of interest to the marine community. The portal serves as a "one-stop" website to real-time coastal meteorological, oceanographic, and hydrologic observations from a variety of Internet sites within and outside of NOAA, along with NOAA forecasts. NowCOAST is designed as a planning aid for recreational and commercial mariners, coastal managers, HAZMAT responders, marine educators, and researchers, who can discover and display real-time information for their particular needs and geographic area of interest. NowCOAST covers all U.S. coastal waters including the Great Lakes; NowCOAST URL: <http://nowcoast.noaa.gov/>

NOWRAMP (Northwestern Hawaiian Islands Coral Reef Assessment and Monitoring Program) - a multi-agency, multi-year effort that began in 2000. NOWRAMP's objective is to rapidly evaluate and map the shallow water reef habitats in the NWHI. The agencies which contribute to NOWRAMP are: NOAA, the U.S. Fish and Wildlife Service, the State of Hawai'i Department of Land and Natural Resources, the University of Hawai'i, the Bishop Museum, the Hawai'i Maritime Service, the U.S. National Park Service, and scientists from the University of California at Santa Cruz

NPDES (National Pollutant Discharge Elimination System) - a provision of the Clean Water Act (CWA) which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or where delegated, a tribal government on an Indian reservation

nuchal - pertaining to the neck

nuchal organ - a sense organ on upper side of head in many branchiopods; photoreceptor-like sensory cells in the nuchal region (posterodorsal region of the head) of some cephalopods; paired chemosensory structures in some annelids

nuclear family - a monogamous mating pair where both male and female partner share in caring for the eggs and young

nuclease - one of the several classes of enzymes that degrade nucleic acid; an enzyme that can degrade DNA or RNA by breaking phosphodiester bonds that link adjacent nucleotides

nucleic acid - a large molecule found in biological cells composed of nucleotide subunits

nucleic acid isolation - a prerequisite for molecular genetic studies is, by definition, the ability to isolate nucleic acids (DNA and RNA)

nucleoprotein - a conjugated protein composed of nucleic acid and protein; chromosomes are composed of nucleoproteins

nucleoside - a nucleotide without the phosphate group; a purine or pyrimidine base linked to ribose or deoxyribose

nucleosome - the basic unit of eukaryotic chromosome structure; a ball of eight histone molecules wrapped around by two coils of about 220 base pairs of DNA

nucleotide - one of the structural components, or building blocks, of DNA and RNA. A nucleotide consists of a base (one of four nitrogenous bases: adenine, thymine, guanine, and cytosine) plus a molecule of sugar and one of phosphoric acid

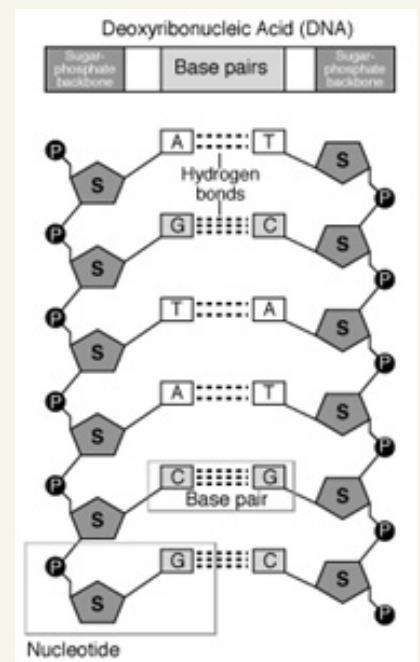
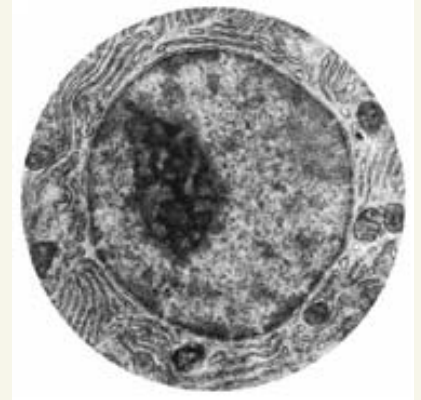


Diagram of DNA shows nucleotide structure.
(Diagram: NIH/Human Genome Project)

nucleus - a central cell structure that contains the chromosomes, and as such, controls the activities of the cell; the center of an atom, containing protons, neutrons, and most of the mass



A cell with a large central nucleus. The dark mass within the nucleus are the chromosomes.

nudibranch - a opisthobranchiate mollusk (sea slugs), having no shell except while very young. The gills are naked and situated upon the back or sides



A Pacific nudibranch.
(Photo: Dr. Bill Rudman)

null hypothesis (Ho) - the statistical hypothesis that states that there are no differences between observed and expected data. The null hypothesis is used in experimental research. It asserts arbitrarily that there is no relationship among the variables being studied. Then statistical tests are used to determine if any relationship shown by the research data is due to chance alone or to alternative hypotheses

numerical prediction model - a computer program designed to represent, in mathematical terms, processes that occur in nature

numerical taxonomy - study of the relationships of taxa by the application of numerical similarity values to characters so as to rank into categories based on degree of overall similarity

numericlature - an attempt to express the natural order (i.e. classification) of organisms in numbers, so that each taxon name is represented by a numerical code, the structure of which indicates its taxonomic position, rank and affinities

nuptial - a term associated with reproductive or breeding behavior, e.g., nuptial coloration, nuptial tubercles (in fishes)

NURP (NOAA National Undersea Research Program) - a unique national service that provides undersea scientists with tools and expertise that they need to work in the undersea environment. Each year, the program supports 200 or more undersea research projects related to NOAA's mission as steward of oceanic resources and environments. A key strength of NURP is its partnership with the nation's science community, carried out primarily through six regional NURP Centers

nursery - an area favored for birth or egg deposition and where juveniles and immature members of a community feed and grow. For example, mangrove root areas serve as nursery grounds for many coral reef fishes

nutrient - any substance assimilated by organisms that promotes growth. Marine scientists typically measure nitrites, nitrates, phosphates, and silicates as nutrients for plant growth

nutrient cycle - the cyclic conversion of nutrients from one form to another within biological communities

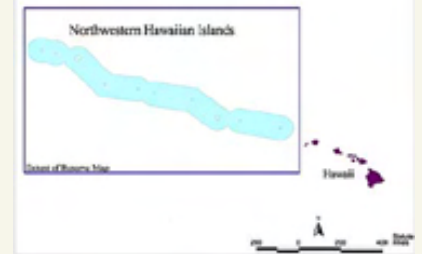
nutrient cycling - all the processes by which nutrients are transferred from one organism to another. For instance, the carbon cycle includes uptake of carbon dioxide by plants, ingestion by animals, and respiration and decay of the animal

nutrient pollution - contamination of water resources by excessive inputs of nutrients. In surface waters, excess algal production is a major concern

nutrient regeneration - the release of nutrients from organic matter by decomposer organisms

NWHI (Northwestern Hawaiian Islands) - the Northwestern Hawaiian Islands (NWHI) are a chain of small islands, atolls, submerged banks, and reefs beginning approximately 120 nautical miles west of the main Hawaiian islands, and stretching northwest for more than 1,079 nautical miles or 2,000 kilometers. This vast archipelago is uninhabited (except for Midway Island) and is surrounded by some of the most extensive and pristine coral

reefs in U.S. waters. On June 15, 2006, President George W. Bush declared the Northwestern Hawaiian Islands a National Monument, creating the largest protected marine reserve in the world



Graphic showing location of Northwest Hawaiian Islands

NWHI Coral Reef Ecosystem Reserve - the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve was established by Executive Order 13178 in December 2000, and January 2001 (Executive Order 13196). It was established to conserve and protect the NWHI coral reef ecosystem and related natural and cultural resources of the area



Reference map of the Northwestern Hawaiian Islands Ecosystem Reserve. (1) Nihoa Island, (2) Necker Island, (3) French Frigate Shoals, (4) Gardner Pinnacles, (5) Maro Reef, (6) Laysan Island, (7) Lisianski Island, (8) Pearl and Hermes Atoll, (9) Kure Atoll, (10) The First Bank immediately east of French Frigate Shoals, (11) Southeast Brooks Bank (the first bank immediately west of French Frigate Shoals), (12) St. Rogatien Bank, (13) The First Bank immediately west of St. Rogatien Bank, (14) Raita Bank, and (15) Pioneer Bank. (Graphic: NOAA)

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: O

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

Oak Foundation - a group of charitable and philanthropic organizations established in various countries. The Oak Foundation commits its resources to address issues of global social and environmental concern, particularly those that have a major impact on the lives of the disadvantaged. It's marine environment program focuses on three main areas: the Mesoamerican reef ecosystem; European marine conservation; and Bering Sea and North Pacific conservation

OBIS (Ocean Biogeographic Information System) - the marine component of the Global Biodiversity Information Facility. It links marine databases around the world to provide an internet accessible, dynamic interface for comparing species level, geo-referenced biodiversity data in relation to ocean habitats. All Census of Marine Life (CoML) field project data will be managed in and accessible through OBIS (www.iobis.org)

obligate mutualism - a mutualistic relationship where one species cannot survive without the presence of the other

obligatory - obligate or required. For example, an obligatory cleaner fish relies entirely on this feeding mode to obtain nutrients; opposite of facultative

oblong - elongated (stretched) from a square or circular shape

observational learning - a learning process where an animal learns by copying the behavior of other animals

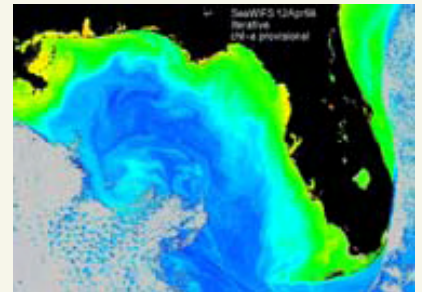
observing system - a collection of one or more sensing elements (human and/or instrument) that reside on fixed or mobile platforms; directly or indirectly measuring environmental parameters on a defined basis meeting data user objectives

obtuse - blunt or rounded at the end

ocean - the salt water surrounding the great land masses, and divided by the land masses into several distinct portions, each of which is called an ocean; the entire body of salt water that covers more than 70 percent of the earth's surface. There are five oceans: the Pacific, Atlantic, Indian, Arctic and Antarctic (Southern Ocean)

ocean acidification - the decrease in the ocean's pH and the resulting increase in acidity as the oceans absorb carbon dioxide released into the atmosphere by human activities

ocean color - a term that refers to the spectral dependence of the radiance leaving a water body



SeaWiFS (Sea-viewing Wide Field-of-view Sensor) ocean color image of chlorophyll-a in the Gulf of Mexico.

ocean color sensor - an instrument for the remote sensing of ocean color, usually from aircraft or satellite



This SeaWiFS (Sea-viewing Wide Field-of-view Sensor) is an ocean color sensor.

Ocean.US - Ocean.US, the National Office for Integrated and Sustained Ocean Observations, was established by the Congressionally-created National Oceanographic Partnership Program (NOPP). Since its establishment on 2000, Ocean.US has catalyzed the coordinated development of an Integrated Ocean Observing System (IOOS), the U.S. contribution to a Global Ocean Observing System (GOOS) and to the Global Earth Observation System of Systems (GEOSS). Ocean.US is a federal interagency office supported by ten agencies

Oceania - a region of the world that usually includes Australia, New Zealand, and Pacific Ocean islands, such as Micronesia, Melanesia and Polynesia

oceanic - associated with sea-water environment seaward of the shelf-slope break

oceanic crust - that part of the Earth's crust underlying the ocean basins. It is composed of basalt and has a thickness of about 5 km

oceanic island - an island in the ocean formed by breaking away from a continental landmass, volcanic action, coral formation, or a combination of sources

oceanic reef - a reef that develops adjacent to deeper waters, often in association with oceanic islands

oceanic zone - the pelagic marine environment beyond the shelf-slope break with a depth greater than 200 m

oceanodromous - used to describe organisms that migrate only within the ocean, usually from spawning grounds to feeding grounds

oceanography - the study of the earth's oceans and their interlinked ecosystems and chemical and physical processes. There are five major divisions within the science: physical oceanography, chemical oceanography, biological oceanography, geological oceanography, and meteorological oceanography

ocellus - an eye-like spot, usually surrounded with a ring of a lighter color, e. g. the ocellus toward the caudal peduncle of some butterflyfish. It may function to deflect attacks to the eyes in agonistic encounters. Ocelli are also present in other animal groups, especially insects



These butterflyfish have a prominent ocellus (pl. ocelli), which may serve to deflect predator attacks from the head region of

the fish.

ochre - yellowish or yellow-brown color

Octocorallia - a subclass of the Anthozoa that contains the sea pens, sea pansies, sea fans, whip corals, and pipe corals. Octocorals always possess 8 tentacles and 8 complete septa (hard corals and anemones possess 12 or more tentacles and septa). They are colonial cnidarians whose polyps are connected by a tissue mass called the coenenchyme. This tissue connects the gastrovascular (digestive) cavities of all the polyps in the colony



An octocorallian (sea fan) with brain coral (sceractinian) in the foreground.

octopus - in scuba, a backup second stage regulator connected to the first stage, intended for the benefit of other scuba divers in case their air supply should fail. It is the alternate air source that forms the basis for the "buddy" system

ocular - pertains to the eye

Oculina Banks - a series of deepwater coral pinnacles and ridges, 15 to 30 miles off the east coast of Florida, extending from Ft. Pierce to Cape Canaveral. Formed by a single species of coral, the Ivory Tree Coral, *Oculina varicosa*, they form pinnacles of up to 100 feet tall, growing below the Gulf Stream at depths of approximately 70 to 100 meters. This is a slow-growing, branching coral often associated with high biodiversity because they provide ideal habitats and spawning sites for numerous species of fishes and invertebrates



The Oculina Banks are deep water coral reefs occurring along the shelf edge off the central east coast of Florida. The *Oculina varicosa* habitat hosts a diverse array of macroinvertebrates and fishes. The habitat also comprises significant spawning grounds for economically important species of reef fishes.

Oculina varicosa - an important deep water coral reef-building species that forms thickets of large branched colonies along the eastern Florida shelf. *O. varicosa* is restricted to the western Atlantic, including the Caribbean and Gulf of Mexico, Florida to North Carolina and Bermuda. The deep-water *Oculina* reefs, however, are only known off the east coast of central Florida at depths of 70-100 m

odontophore - a tooth-bearing structure found in most mollusks, except bivalves. It consists of several muscles and a cartilage which support the radula and radula sac; the term is also applied to the radula alone

off-reef - a synonym of reef slope

Office of Insular Affairs (OIA) - The Office of Insular Affairs (OIA) carries out the Secretary of the Interior's responsibilities for the insular affairs. OIA coordinates Federal policy in the territories of American Samoa, Guam, the U.S. Virgin Islands, and the Commonwealth of the Northern Mariana Islands. With the majority of U.S. coral reefs located in the insular areas, OIA plays an important role in improving the management and protection of the Nations coral reefs. OIA also provides technical and financial assistance to the Federated States of Micronesia, the Republic of the Marshall Islands, and the Republic of Palau which share financial, diplomatic and military ties with the United States through a special relationship known as the Compact of Free Association. The freely associated states have some of the richest coral reef resources in the world and some of the oldest and most effective traditional management systems

official index - in taxonomy, a list of names or works suppressed or declared invalid by action of the International Commission on Zoological Nomenclature

official list - in taxonomy, a list of names or works which have been conserved or declared valid by action of the International Commission on Zoological Nomenclature

offshore current - any current flowing away from shore

offshore wind - a wind blowing seaward from the land in the coastal area.

olfaction - the sense of smell

olfactory - pertaining to the sense of smell (olfaction)

oligo - a prefix meaning "few"

oligomer - a molecule of intermediate relative molecular mass, the structure of which essentially comprises a small plurality of units derived, actually or conceptually, from molecules of lower relative molecular mass; a polymer that consists of two, three, or four monomers

oligonucleotide - a short sequence (usually 2-50 bases) of DNA. Oligonucleotides of up to 30 bases are routinely synthesized for use as PCR primers or as probes for their sequence complements in a complex mixture of DNA

oligopeptide - a peptide which consists of a small number of amino acids linked together, as opposed to a polypeptide

oligosaccharide - a carbohydrate which consists of three to ten monosaccharide molecules joined by glycosidic linkages

oligotrophic - refers to water bodies with low concentrations of nutrients

omega animal - in animal behavior, the animal which has the lowest social rank in its linear hierarchical group

omega-conotoxin MVIIA - a marine pharmaceutical extracted from the cone snail, *Conus magnus*. It is a potent pain-killer (analgesic) which acts by interfering with calcium ion flux, thereby reducing the release of neurotransmitters

omegoid - horse shoe-shaped

omnivore - an organism whose diet consists of a wide variety of foodstuffs, including plants and animals

oncogene - a gene thought to be capable of causing cancer

oncology - the science dealing with the physical, chemical and biological properties and features of cancer, including the causes and progression of the disease

one-gene--one-polypeptide hypothesis - the concept that one gene in DNA codes for a sequence of amino acids in a specific polypeptide

online - a general term for when one computer is interacting directly with another computer

Online Positioning User Service (OPUS) - OPUS provides Global Positioning System (GPS) users, such as scientists, engineers, and professional surveyors, the ability to obtain highly accurate positioning coordinates for the purposes of transportation, construction, navigation, surveying, and other activities. OPUS allows GPS users to submit their GPS data files via the Internet to NOAA, where the data are processed to determine a position using NOAA's computers, software and national coordinate system. OPUS is managed and operated by NOAA's National Geodetic Survey (NGS), which defines and manages a national coordinate system. This network, the National Spatial Reference System (NSRS), provides the foundation for transportation and communication; mapping and charting; and a multitude of scientific and engineering applications

onomatophore - in taxonomy, a specimen which acts as the name bearer; a nomenclatural type (holotype, syntype, lectotype, neotype)

onshore - a direction landward from the sea

onshore wind - a wind blowing landward from the sea in the coastal area

ontogenesis - the entire development of an individual organism from fertilization to completion of its life history

ontogeny - the development, growth, and maturation of an individual

oocyte - a female gametocyte that develops into an ovum after two meiotic divisions; the female reproductive cell, also called an egg or ovum

ooecium - a brood chamber for developing embryos in the Ectoprocta (bryozoans); one of the special zooids of ectoprocts destined to receive and develop ova; an ovicell.

oogamous - characterized by reproducing by the fusion of small motile male gametes and large nonmotile female gametes

oogamy - the union of a large nonmotile egg with a small motile or nonmotile male sperm cell

oogenesis - the process of ovum (egg) development in female animals, in which the diploid number of chromosomes is reduced by half to the haploid number in the ovum

oolitic limestone - rock composed primarily of petrified corals or the skeletons of other calcareous animals

open circuit scuba - a diving apparatus in which exhaled air is expelled into the water as bubbles; no part is rebreathed by the diver. It is most commonly used in recreational scuba diving

open circulatory system - a circulatory system, characteristic of some invertebrates, e.g., arthropods, in which blood flows through an interconnected system of open sinuses rather than blood vessels. The tissues and cells are directly bathed by the blood for gaseous exchange and nutrient uptake. The circulatory fluid is called the hemolymph

open coast - an unenclosed and exposed coastal margin

open sea - that part of the ocean that extends outward from the continental shelf

open system - a system that exchanges energy and matter with its environment

OPeNDAP (Open-source Project for a Network Data Access Protocol) - OPeNDAP is a framework that simplifies all aspects of scientific data networking, allowing simple access to remote data. OPeNDAP provides software which makes local data accessible to remote locations regardless of local storage format by using OPeNDAP servers. OPeNDAP also provides tools for transforming existing applications into OPeNDAP clients (i.e., enabling them to remotely access OPeNDAP served data); a protocol for requesting and transporting data across the web. The current OPeNDAP Data Access Protocol (DAP) uses HTTP to frame the requests and responses; a community of users working together to use, improve, and extend the OPeNDAP protocol and software; Although OPeNDAP was originally designed and developed by oceanographers and computer scientists for oceanographic data, there is nothing in the design of OPeNDAP that constrains its use to oceanography. It has been adopted by the High Altitude Observatory community and is being considered by segments of the meteorological and space science communities; previously known as "DODS"

operant conditioning - a learning process where an animal learns by connecting its own behavior with a response from its environment

operational taxonomic unit (OTU) - a terminal taxon; a group of organisms used in a taxonomic study without designation of taxonomic rank

operator gene - a region of the chromosome, adjacent to the operon, where a repressor protein binds to prevent transcription of the operon

opercular spine - in fishes, a spine projecting from the operculum (gill cover)

operculate - having an operculum

operculum - a lid or flap covering an aperture, such as the gill cover in most bony fishes; the gill cover; also the horny lid closing the aperture of various species of mollusks



A ventral view of the gill chamber and opercular chamber of a fish. Note the gill (branchial) arches, each with a large number of gill filaments. (Photo: University of California at Davis)

operon - a sequence of genes responsible for synthesizing the enzymes needed for biosynthesis of a molecule. An operon is controlled by an operator gene and a repressor gene

ophiopluteus larva - larva of a brittle star (phylum Echinodermata)

opisthobranch - a marine gastropod, many of which have lost or reduced their shell, mantle and gills

opisthosoma - a short, posterior multi-segmented region of a vestimentiferan polychaete tube worm. The anterior segments of the opisthosoma have rows of hook-like structures that act as anchors for the worm to retract into the tube

opportunistic feeder - a species adapted for utilizing variable, unpredictable or transient environments to obtain food

optical oceanography - the subdiscipline of oceanography concerned with the propagation and interaction of radiation, typically at wavelengths between about 350 and 750 nm, with seawater

optimum - a state that is the best fit for the current situation. All minor changes make the situation worse; in biology, it is the level of some environmental factor, within a species' or population's tolerance range, at which the species or population can function most efficiently or with the greatest positive effect to its physiological or reproductive fitness

oral - pertaining to the mouth



The oral surface of some sea urchins. The central opening is the mouth.

oral cavity - the cavity within the mouth

oral disc - the area around the mouth of an anthozoan polyp that bears from eight to several hundred tentacles

oral pinnule - arms of feather stars (Echinodermata-Crinoidea) bear numerous pinnately arranged branches called "pinnules ." Those pinnules closest to the disk are the proximal, or oral pinnules. They are larger than other types of pinnules and respond to mechanical stimulation. They guard the disk and can arch over it and almost completely cover it. They do not have ambulacra or tube feet. A few pairs of oral pinnules are at the base of each arm. Moving distally from the disk are the genital pinnules which contain the gonads, followed by the the distal pinnules which occupy the outer end of the arm. They are the major feeding structures and always have ambulacra and tube feet

orbit - a bony or cartilaginous eye socket

order - a taxonomic group containing one or more families

organ - a collection of tissues which performs a particular function or set of functions in an animal's body. Organs are composed of tissues, and may be organized into larger organ systems

organ system - collection of organs which have related roles in an organism's functioning. The nervous system, circulatory system, and muscle system are all organ systems

organ-pipe coral - the organ-pipe coral, *Tubipora musica*, is a reef-building (hermatypic) octocoral



The organ-pipe coral, a reef-building octocoral. (Photo: A. Bruckner, NOAA)

organelle - a structurally discrete component of a cell, e.g., the nucleus or a mitochondrion

organic - refers to those substances produced by the metabolism of a living organism, especially carbon-containing compounds

organic act - the body of laws that the United Congress has enacted for the government of a United States insular area; it usually includes a bill of rights and the establishment and conditions of the insular area's tripartite government

organic enrichment - the addition of nutrients from organic matter

organic molecule - a molecule that contains one or more carbon atoms

organically polluted - made unfit for living organisms by excess addition of organic matter

organism - any form of unicellular or multicellular life; a living thing that has (or can develop) the ability to act or function independently

organized territory - a United States insular area for which the United States Congress has enacted an organic act

organogenesis - the process of formation of specific organs in a plant or animal involving morphogenesis and differentiation

organophosphate - organophosphate compounds are a diverse group of chemicals used in both domestic and industrial settings. Examples include insecticides, nerve gases, ophthalmic agents, and antihelmintics. Organophosphate pollution may adversely effect coral health

orientation - the way an organism positions itself in relation to environmental cues; the ability of an animal to be aware of its environment and its position within that environment with reference to time and space

original description - in taxonomy, the description of a taxonomic group when first established

original diagnosis - in taxonomy, a formal statement of characters which distinguish a taxon from other similar or closely related taxa, published at the time of proposal of a new taxonomic name

original spelling - in taxonomy, the spelling of an available name when first published. The original spelling of a name is to be kept as the "correct original spelling" unless it does not meet the requirements of the International Code of Zoological Nomenclature. An incorrect original spelling is an original spelling that is incorrect. Multiple original spellings are two or more different original spellings for the same name

ornamental - a non-food species that is produced and maintained solely for exhibit purposes in home or public aquaria, or in ornamental garden ponds

ornithology - the scientific study of birds



A white tern from Laysan Island, Hawaiian Archipelago. (Photo: NOAA)

oroidin - a cytotoxic family of alkaloids isolated from sponges which possesses anti-tumor properties

orphan receptor - a potential receptor gene identified on the basis of nucleotide sequence similarities with known steroid hormone receptors

ortholog - a gene found in different species that evolved from a common ancestral gene by speciation. Normally, orthologs retain the same function in the course of evolution

orthologous genes - genes that have evolved directly from an ancestral gene. This is in contrast to paralogous genes; two genes are to be orthologous if they diverged after a speciation event, i.e., if a gene exists in a species, and that species diverges into two species, then the copies of this gene in the resulting species are orthologous

orthology - homology (similarity of features based on common descent) that arises via speciation

oscillation - any steady back and forth movements

oscillator - the internal biological clock mechanism that produces a measurable biological rhythm in an organism

osculum - a large opening through which water flows out of a sponge. Sponges may have more than one osculum



Distinct osculi of some Caribbean sponges.
(Photo: Copyright Digital Stock Corp.)

osmole (Osm) - a unit of osmotic pressure used in cell biology and physical chemistry. One osmole is the osmotic pressure of a one molar solution (a solution with a concentration of one mole per liter of solvent) of a substance that does not dissociate, such as glucose, in water. In practice, most measurements are in milliosmoles (mOsm)

osmoregulation - the process of controlling the amount of water in tissues and cells

osmosis - the passage of water through a semipermeable membrane from a solution with a lower concentration of solute to one with a higher concentration of solute

osmotic pressure - the pressure that is needed to counteract the osmotic passage of water molecules across a semipermeable membrane into the more concentrated solute

osmotroph - an organism that obtains nutrients through the active uptake of soluble materials across the cell membrane

osseus - bony

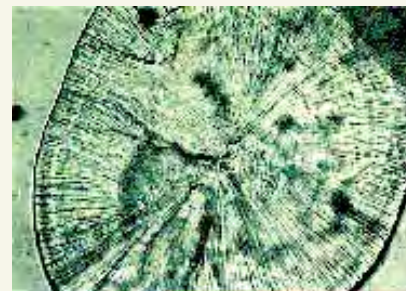
ossicle - one of numerous small calcareous structures that form the exoskeleton of certain echinoderms. Their size, shape and location are highly variable, and they may be movable or fixed in position. They may appear as thin fused plates. In brittle stars they form "vertebrae" in the arms, which with together with their attached muscles, gives the brittle star its serpentine ophiuroid motion. Sea cucumbers hve microscopic ossicles embedded in their dermis. The small, sound transmitting bones in the vertebrate middle ear are also called 'ossicles'

ossified - made or converted into bone

ostium - in sponges, a microscopic pore through which water enters the sponge body

ostracitoxin - a toxin, discharged with mucus into the water, by trunkfishes of the genus *Ostracion* when they are stressed

otolith - a calcareous structure of the inner ear of some animals, such as fishes, that functions in the detection of changes in gravitational forces relative to orientation. Otoliths are used to determine the age of fishes by counting the number of annual rings deposited



A section of an otolith from an early life stage fish. Growth rings are counted and a daily age is determined, this information can be applied to understanding the effects of changes in the environment on growth and survival. (Photo: NOAA)

outbreak - the sudden appearance of a disease in a specific geographic area or population

outbreak - a sudden appearance or increase in something, such as an outbreak of a particular disease in a coral community

outcrop - an exposure of bedrock that can be seen on the surface, i.e., that is not covered by soil or water

outer slope - a synonym of reef slope. It is sometimes used to represent the lower reef slope

outfall - the place where a sewer, drain, or stream discharges

outlying area - the term 'outlying area' refers to the United States Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. It also may include the freely associated states of the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau

outrigger - a floatation device attached to one or both sides of the hull of a boat to help prevent a capsizing

overexploitation - the removal of individuals or biomass from a population at a rate greater than the population is able to compensate for with its own recruitment

overfishing - a level of fishing effort or fishing mortality such that a reduction of this level would, in the medium term, lead to an increase in the total catch; harvesting at a rate greater than the population can sustain

overwash - a deposit of marine-derived sediments landward of a barrier system, often formed during large storms; transport of sediment landward of the active beach by coastal flooding during a tsunami, hurricane, or other event with extreme wave action

ovicell - the brood chamber of a bryozoan (Ectoprocta), usually located at the distal end of the maternal zooid. Embryos are brooded until they develop into non-feeding larvae, which swim briefly, then settle and metamorphose to found a new colony

ovigerous - carrying eggs or modified for carrying eggs

oviparity - the reproductive mode where eggs are released from the body and later hatch

oviposition - the process of depositing eggs



A marine turtle depositing eggs (oviposition) on a tropical beach. (Photo: Seaturtle Preservation Society of Brevard County, FL)

ovoid - egg-shaped

ovoviviparity - the reproductive mode where the eggs hatch and develop in the female's reproductive tract (or a specialized pouch in the males of some species), are not nourished in any way by the female, and are free-swimming when released from the parent

ovulation - the release of an egg from the ovary

ovum - the mature female germ cell (egg; female gamete)

oxidant - an oxidizing agent

oxidation - the combination of a substance with oxygen. Oxidation can also describe a type of reaction in which the atoms in an element lose electrons and the valence is correspondingly increased

oxidative stress - a process whereby the metabolic balance of a cell is disrupted by exposure to environmental substances, resulting in the accumulation of free radicals, which can damage components of cells' membranes, proteins or genetic material by "oxidizing" them

oxygen isotope ratio (18O) - an expression for the ratio of the ^{18}O to ^{16}O atoms in a sample relative to a standard, defined as: $\delta^{18}\text{O} = \frac{(^{18}\text{O}/^{16}\text{O})_{\text{sample}} - ^{18}\text{O}/^{18}\text{O}_{\text{standard}}}{^{18}\text{O}/^{16}\text{O}_{\text{standard}}}$

oxygen isotopes - oxygen atoms that have the same atomic number (protons) but different mass numbers (and different numbers of neutrons). The two stable isotopes of oxygen are ^{16}O and ^{18}O

oyster reef - a dense, highly structured community of individual oysters growing on the shells of dead oysters

ozone - a gaseous molecule that contains three oxygen atoms (O₃), instead of the usual two (O₂). Ozone can exist either high in the atmosphere (stratosphere), where it shields the Earth against harmful ultraviolet rays from the sun, or close to the ground (troposphere), where it is the main component of smog. Ground-level ozone is a product of reactions involving hydrocarbons and nitrogen oxides in the presence of sunlight. Ozone is a potent irritant that causes lung damage and a variety of respiratory problems

ozone shield - the ozone (O₃) layer in the stratosphere that gives protection to the Earth's surface because of intense absorption of harmful solar ultraviolet radiation by the gas

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: P

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

P-value - in a statistical hypothesis test, the P value is the probability of observing a test statistic at least as extreme as the value actually observed, assuming that the null hypothesis is true. This probability is then compared to the pre-selected significance level of the test. If the P value is smaller than the significance level, the null hypothesis is rejected, and the test result is termed significant; the significance of a statistical test. P-values of less than 0.05 are generally considered to be an indicator that a statistical model is significant; a quantitative estimate of the probability that the observed difference between two groups could have happened by chance alone

Pacific Plate - the largest of the tectonic plates of the earth's crust. The Pacific Plate comprises most of the rock beneath the Pacific Ocean and contains the hot spot that has formed the Hawaiian Islands

PADI (Professional Association of Diving Instructors) - the world's largest scuba diving certification agency

paedogenic - sexual reproduction by larval or immature forms

paedomorphosis - phylogenetic retention of juvenile or larval characters in the adult

paedomorphy - the retention of juvenile features in an adult organism



Cope's giant salamander (*Dicamptodon copei*) is an example of paedomorphy. The adult retains the juvenile external gills. (Photo: U.S.D.A. Forest Service)

paedophagous - larvae or embryo eating; larvivorous

page precedence - in taxonomy, when two names for the same taxon are first published in the same publication, the one which appears on the earlier page has precedence

PAH (polycyclic aromatic hydrocarbon) - a class of stable organic molecules made up of only carbon and hydrogen. These molecules are highly carcinogenic, but also very common in the environment. PAHs are formed during the incomplete burning of coal, oil and gas, garbage, and other organic substances, such as tobacco or even charcoal broiled meat. PAHs enter water through discharges from industrial and wastewater treatment plants or through the release of boat engine exhausts. Ultraviolet light (UV) transforms the PAHs into toxic forms that kill crustaceans, polychaetes, and coral larvae

pair bond - the temporary or permanent association formed between a female and male animal during courtship and mating. Pair bonding is characteristic of monogamous species

paired fins - the pectoral and pelvic fins of fishes



Note the paired fins on this Townsend angelfish. The pelvic fins (and pelvic girdle) are in the thoracic position. (Photo: Jackie

Palancar Reef - a Caribbean coral reef located on the southwest side of the Mexican island of Cozumel, off the Yucatan Peninsula. Palancar Reef is part of the Mesoamerican Reef system

palate - roof of the mouth cavity

palatine - a bone in the roof of the mouth of fishes. The palatine is cartilaginous in some primitive bony fishes

paleobiogeography - the distribution of organisms as revealed by the fossil record

paleoclimatology - the study of past climates throughout geological history, and the causes of the variations among them

paleoecology - the study of the relationship of extinct organisms or groups of organisms to their environments



A paleoecological microfossil, this rotifer (*Callindina angusticollis*) is from the Beringia region of the Arctic. (Photo: Wendy Eisner)

paleoenvironmental proxy - an environmental remnant of the past (pollen grains, tree rings, lake sediments, pack rat middens, ice cores, coral skeletons) used to assist researchers in deciphering past climatic conditions

paleopathology - the study of sickness, injuries and other abnormalities in the health of ancient organisms

paleothermometer - a proxy that provides absolute estimates of past temperature. An example is the Sr/Ca ratio found in coral skeletons

Paleozoic - an era of geologic time lasting from 570 to 245 million years ago

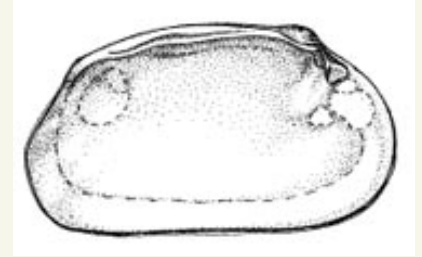
paliform crown - a circle of paliform lobes that surround the columella

paliform lobe - an upright skeletal rod or plate at the inner margin of septa formed by upward growth of the septum

pallial - of or pertaining to a mantle, especially to the mantle of mollusks

pallial chamber - the cavity enclosed by the mantle in mollusks

pallial line - a linear impression which marks the attachment of the mantle on the inner surface of a bivalve shell



One side of a bivalve shell showing muscle scars, pallial line created by the mantle, hinge and hinge teeth. (Graphic: Biodidac)

palmata zone - the region of a reef crest of a bank or barrier reef that is closest to the water surface. It is composed almost completely of elkhorn coral (*Acropora palmata*) in the Caribbean



Acropora palmata in a shallow reef zone.

palmate - hand-shaped

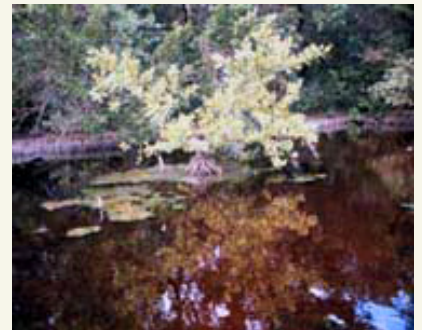
palolo - a polychaete worm (*Palola viridis*) that burrows in the coral reefs of some Pacific Islands. Just before the last quarter of the moon in October and November, they swarm and breed in vast numbers at the sea surface. They are gathered and highly esteemed as food by the islanders. An allied species inhabits the tropical Atlantic and swarms in June or July



The portion containing the reproductive gametes (the epitoke) of the palolo worm, *Palolo viridis*, is considered a delicacy in Samoa and other Pacific islands. (Photo: Smithsonian Institution)

palus - one of several upright slender calcareous processes which surround the central part of the calicle of certain corals; vertical radially arranged plates forming one or more cycles between the septa and the central axis in the scleractinian skeleton

palustrine - pertaining to swamps or marshy habitats



Palustrine habitat in the Jobos Bay National Estuarine Research Reserve. (Photo: NOAA)

palynology - the scientific study of pollen, pollen stratigraphy, paleobotany, and paleoclimatology of plants

palytoxin - an extremely powerful neurotoxin naturally found within the bodies of certain soft corals in the genus *Palythoa* (family Zoanthidae)



a soft-bodied hexacoral, *Palythoa* sp, from American Samoa. The extremely potent toxin, palytoxin, has been isolated from *Palythoa* sp from Hawaii. (Photo: National park Service/Eva DiDonato)

pan-tropical - throughout the tropics

pandemic - an epidemic that is geographically widespread; occurring throughout a region or even throughout the world

Pangea - a supercontinent that existed from about 300 to 200 million years ago. It included most of the continental crust of the Earth

panmictic - refers to random-mating populations; one in which all members are equally likely to interbreed

panmixis - random mating in a population

Papahānaumokuākea - Hawaiian name for the Northwestern Hawaiian Islands Marine National Monument. It refers to Hawaiian genealogy and the formation of the Hawaiian archipelago. The name was adopted through consultation with the Native Hawaiian Cultural Working Group, whose members have a longstanding interest and involvement in the region and come from relevant backgrounds including academic scholars, teachers, cultural practitioners, community activists, and resource managers

Papahānaumokuākea Marine National Monument - the Hawaiian name for the Northwestern Hawaiian Islands Marine National Monument

papilla - a raised bump or nipple-like projection on a tissue surface; a cellular outgrowth. Papillae have the appearance of little bumps or fingers on the surface of cells

papilliform - slender, elongate and pointed

papilliform - nipple-shaped

papillose - covered with papillae

Papuan Bird's Head Seascape - a coastal and marine region of 183,000 square kilometers (approximately 70,657 square miles) located in northwest Papua Province of Indonesia, that stretches from Teluk Cenderawasih in its eastern reaches to the Raja Ampat archipelago in the west and the FakFak-Kaimana coastline in the south. It is home to more than 1,200 types of reef fishes and nearly 600 species of hard corals, plus whales, sea turtles, crocodiles, giant clams, manta rays, and dugongs. Bird's Head is perhaps one of Earth's richest seascapes

PAR (Photosynthetically Active Radiation) - those wavelengths of light that can be absorbed by chlorophyll or other light harvesting pigments

para - a prefix meaning "beside"

parabolic reflector - a portable, disk-like device used to gather, magnify, and focus the sounds of birds and other organisms for the purpose of making high-quality, electronic recordings

paradigm - a pattern or model that provides a framework for interpreting observations

paradox - a statement that seems self-contradictory, yet may nevertheless be true

paralectotype - in taxonomy, any one of the original syntypic series remaining after the selection of a lectotype

parallel evolution - the development of similar forms by related but distinct phylogenetic lineages

paralogous genes - two genes or clusters of genes at different chromosomal locations in the same organism that have structural similarities indicating that they derived from a common ancestral gene and have since diverged from the parent copy by mutation and selection or drift. Two genes are said to be paralogous if they diverged after a gene duplication event

paramagnetism - magnetic property in certain iron-bearing minerals that cause them to be weakly attracted to magnetic fields

parameter - a particular physical, chemical, or biological property that is being measured

parapatric - pertains to the ranges of species that are contiguous but not overlapping; adjacent but non-overlapping distributions

parapatric speciation - speciation in which the new species forms from a population contiguous with the ancestral species' geographic range

parapatric speciation - speciation in which the new species forms from a population contiguous with the ancestral species' geographic range. The evolution of reproductive isolating mechanisms occurred when the population entered a new niche or habitat within the range of the parent species

paraphyletic - a group of taxa that includes an ancestral taxon but not all descendants of that taxon

parapodium - one of the short unsegmented processes located on each side of most of the body segments in many annelid worms. Parapodia (pl) function in locomotion and often also as tactile or branchial organs. In some marine snails (e. g., sea hares and pteropods) it is a broad lateral expansion of either side of the foot, forming a broad swimming organ



A polychaete worm showing a pair of parapodia per segment. Note the bristle-like chaetae borne by each parapodium. (Photo: Dr. Anthony Picciolo)

parasite - an organism that lives in or on the living tissue of a host organism. It gives its host nothing beneficial in return, and often is injurious and even lethal to the host

parasitic spawning - fertilization of eggs by a subordinate male while the female and dominant male are spawning

parataxonomist - a field-trained biodiversity collection and inventory specialist recruited from local areas. Parataxonomists are specialists, locally trained by professional biologists, that collect specimens, prepare them, sort them into morphospecies, and organize associated information into a database

paratype - in taxonomy, every specimen in a type series, other than the holotype, which were before the author at the time of preparation of the original description, and were so designated and indicated there

parenchyma - the primary tissue of higher plants composed of thin-walled cells that remain capable of cell division, even when mature. Parenchyma constitutes the greater part of leaves, roots, the pulp of fruits, and the pith of stems. They are fundamental plant tissues as opposed to more highly differentiated tissues. In animals, the parenchyma constitutes the essential functional part of an organ, as contrasted with the organ's connective tissue, nerves, and blood vessels

parenchyme - in cnidarians, mesenchyme with dense cellular components

parenchymula - a sponge larva which appears as a solid ball with exterior flagellated cells (except at the "posterior end")

parent population - any population considered as the source or origin for the population under study or analysis

paresthesia - abnormal neurological sensations which include: numbness, tingling, burning, prickling and hyperesthesia (increased sensitivity); one possible symptom of ciguatera poisoning

parology - homology (similarity of features based on common descent) that arises via gene duplication

parrotfish - any species of tropical bony fishes in the family Scaridae. Parrotfishes are abundant and common inhabitants of coral reef communities. Their teeth are fused into a sharp "parrot-like" beak strong enough to bite off pieces of stony corals. Some parrotfishes produce an enveloping mucous envelope that surrounds and presumably protects the body at night



Parrotfish are very common inhabitants of coral reef communities (Photo: Keoki and Yuko Stender)

parsimony - the principle that the simplest explanation, the one that requires the fewest hypotheses, is the one most likely to be correct; same as Occam's Razor: the simplest of two competing theories is to be preferred

parthenogenesis - reproduction without fertilization; the development of an unfertilized ovum, seed, or spore. It occurs naturally in several species and may also be induced artificially by chemical or mechanical means

partial pressure - the pressure exerted by a single component of a gas within a gas mixture, or dissolved in a liquid

particulate - a very small solid suspended in water

particulate organic matter - particulate material of biological origin that is suspended in water

partim - in part

parts per million (ppm) - number of parts of a substance found in one million parts of a particular gas, liquid, or solid

parts per thousand (ppt) - number of parts of a substance found in one thousand parts of a particular gas, liquid, or solid

parturition - the process of giving birth

passive integrated transponder (PIT) - a small microprocessor enclosed in glass which is injected into the shoulder muscle or flipper of sea turtles as a method of identifying individuals. The PIT tag transmits a unique number to a hand held scanner when activated by the scanner

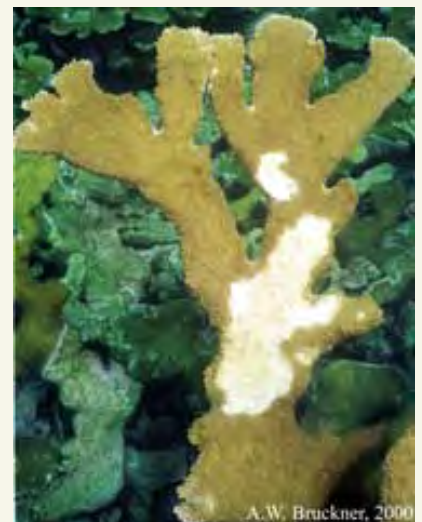
passive search - a feeding strategy where the predator remains more or less stationary and ambushes the prey animal when it comes within range

patch - a nonlinear surface area differing in appearance from its surroundings

patch reef - a coral boulder or clump of corals formed on a shelf, usually of less than 70 m depth, often in the lagoon of a barrier reef or atoll. It is unattached to a major reef structure

patchiness - the condition where organisms occur in aggregations

patchy necrosis - a disease of corals. Colonies with this condition have small (2-10 cm diameter) circular to irregular patches of denuded skeleton that will increase in diameter an additional 1-10 cm over a period of 5-7 days. The disease typically affects the top surface of elkhorn coral (*Acropora palmata*) branches. In most cases most of the affected tissue dies rapidly, and subsequent enlargement of the bare skeletal areas slows after a few days and eventually stops. A bacterium has been identified as a causal agent



Elkhorn coral with patchy necrosis in two locations
(Photo: Andy Bruckner/

Pathfinder - a program that focuses on the processing, reprocessing, maintenance, archiving, and distribution of existing Earth science data sets to make them more useful to researchers. NASA, NOAA, and USGS are involved in specific Pathfinder efforts

pathogen - an organism which causes a disease within another organism

pathogenesis - the origin and development of disease

pathogenicity - the quality of producing or having the ability to produce pathologic changes or disease

pathognomonic - a sign or symptom that is so characteristic of a disease, and not found in any other condition, that it makes the diagnosis

patronym - a taxonomic name derived from the name of a person

pavement - rock exposed at the Earth's surface in the form of a more or less horizontal surface, usually with crevices or joints

PCR (polymerase chain reaction) - a method of creating copies of specific fragments of DNA. PCR rapidly amplifies a single DNA molecule into many billions of molecules

pdf (portable document format) - a file format created by Adobe, initially to provide a standard form for storing and editing printed publishable documents. Because documents in .pdf format can easily be seen and printed by users on a variety of computer and platform types, they are very common on the World Wide Web

pectinate - comb-like; in mollusks, it refers to the comb-like lamellae of the ctenidia (gills)

pectiniform - comb-shaped

pectoral - pertaining to the chest area

pectoral fin - the farthest forward or uppermost of the paired fins of most fishes, usually located in the thoracic position



A flying fish with huge pectoral fins. (Photo: NOAA)

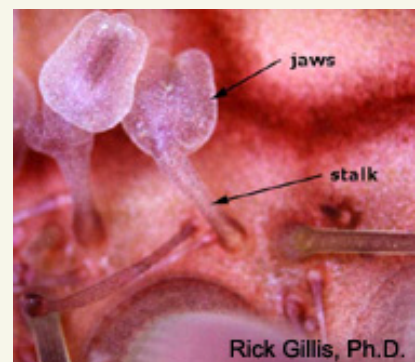
pedal disc - a disc at the aboral end of the body trunk used for attachment. A synonym of basal plate



An anemone maintains its grip on substrate with its pedal disc. (Photo: Copyright Digital Stock Corp.)

pedal laceration - a type of asexual reproduction in some sea anemones in which parts of the pedal disc break off and are left behind as the anemone moves

pedicellarium - a forceps-like organ which occurs in large numbers on starfishes and sea urchins. Pedicellariae, in general, are multifunctional appendages involved in defense, feeding, and cleaning. They are mainly used to keep small organisms from settling on the aboral surface, to capture small prey, and to discourage predators from feeding on soft tissue. The basic structure of pedicellariae consists of a head, neck, and stalk. The head usually has three jaws and, in some pedicellariae, contains poison glands



A single pedicellarium from a starfish. (Photo:

pedunculate - having a stem or stalk

peeler crab - a crab that has just recently shed its exoskeleton, i.e., a recently-molted crab

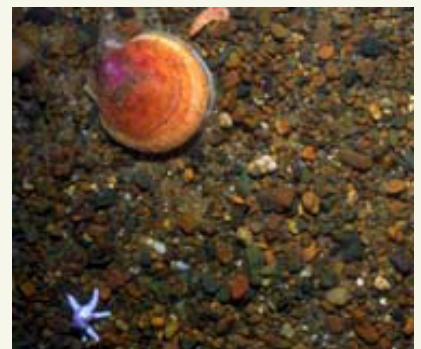
PEET (Partnerships for Enhancing Expertise in Taxonomy) - the National Science Foundation in partnership with academic institutions, botanical gardens, freshwater and marine institutes, and natural history museums, seeks to enhance and stimulate taxonomic research and help prepare future generations of experts. NSF announces a special competition, Partnerships for Enhancing Expertise in Taxonomy (PEET), to support competitively reviewed research projects that target groups of poorly known organisms. This effort is designed to encourage the training of new generations of taxonomists and to translate current expertise into electronic databases and other formats with broad accessibility to the scientific community

pelagic - refers to organisms that inhabit open water, as opposed to benthic



An ocean sunfish, *Mola mola*, is a pelagic species, frequently seen basking at the surface of the water.

Pelecypoda (Bivalvia or Lamellibranchia) - a class of Mollusca that includes clams, oysters and mussels



A member of the Pelecypoda, a live scallop (*Placopecten magellanicus*) in the Stellwagen Bank National Marine Sanctuary. (Photo:

pellucid - transparent

pelvic fin - the paired fin located ventrally beneath, in front of, or behind, the pectoral fin

penicillate - brush-like; having or resembling a tuft or brush of fine hairs

penis fencing - a type of reproductive behavior found in hermaphroditic flatworms (some have two penises and one or more genital pores for receiving sperm cells delivered during copulation). During penis fencing, each flatworm tries to pierce the skin of the other using one of its penises. The first to succeed becomes the de facto male, delivering its sperm into the other, the de facto female

Pennatulacea - an order of soft corals which includes the sea pens and sea pansies. See "sea pen" and "sea pansy"

penniform - feather-shaped

pentamerous - divided into five parts; a characteristic of the body plan of echinoderms



Bright orange seastar
(*Pseudarchaster
myobrachus*) with a
typical pentamerous body
shape.

penultimate - the one before the last; the second from the end

peppered - used to describe a pigment pattern of dark stippling

peptide - two or more amino acids joined by a peptide bond

peptide bond - the bond between two amino acids formed when a carboxyl (-COOH) group of one amino acid joins an amino (-NH₂) group of another amino acid, releasing water in the process

percentile - one of the division points that divides a set of ranked data into one hundred equal points; a value on a scale of zero to one hundred that indicates the percent of a distribution that is equal to or below it. A score in the 95th percentile is a score equal to or better than 95 percent of all other scores

perennial - referring to an organism that lives for more than one year

perforate corals - corals which have porous skeletons with connections between the polyps through the skeleton

peri - a prefix meaning "around"

perianal - near or surrounding the anus

periderm - an external layer of secreted cuticular material in many Anthozoa. The term is synonymous with "cuticle." In woody plants, the periderm is a protective secondary tissue produced by the cork cambium

perigee - the point in the orbit of the Moon or man-made satellite nearest to the Earth; the point in the orbit of a satellite nearest to its companion body

Period - in the geologic time scale, a unit of time less than an era and greater than an epoch

Periodic Table - a chart of the known chemical elements, arranged according to their atomic numbers. Elements with similar physical and chemical properties and similar electron arrangements are in the same column

periostracum - the outside layer or covering of a bivalve (Mollusca) shell

peripatric speciation - speciation which occurs when small populations of organisms become isolated in a new environment. This differs from allopatric speciation in that the isolated populations are numerically much smaller than the parental population. In peripatric speciation, the founder effect causes rapid speciation through both rapid genetic drift and natural selection on a small gene pool; a type of speciation in which a founder or sink population is isolated from the parent or metapopulation, usually via colonization of some new region

periphery - the outermost part or region within a precise boundary

perisarc - the chitinous outer coat of common tissue connecting individuals in some colonial hydrozoans

peristome - the region around the mouth in various invertebrates; in cnidarians, it is the portion of the oral disc surrounding the mouth

peritheca - same as the coenosteum, which is the skeleton between corallites within a colony; the living tissue surrounding or between corallites (the coenosarc)

peritoneum - the mesodermally-derived membrane that lines the coelom and covers the coelomic viscera

peritoneum - a membrane lining the body cavity (coelomic cavity) and covering the viscera

permeable - having pores or openings that permit liquids or gasses to pass through

perradial canal - one of four branched ciliated canals that originates directly from the stomach of scyphozoan medusae and moves partially digested food materials from the ring canal to the stomach

Persistent organic pollutant (POP) - an organic chemical that remains intact in the environment for a long period of time

personal communication - unpublished information communicated to the author verbally

perturbation - a disturbance or abnormality

petabyte - a measure of data size. One petabyte is equivalent to 1,000 terabytes

petaloid - describes a form that is similar to a flower petal

petaloid septa - primary septa which have a tapered or curved shape because they are enclosed by other septa

petrel - seabirds in the bird order Procellariiformes. They occur in four families within that group, which also includes the Albatross family, Diomedidae. The family Procellariidae is the main radiation of medium-sized 'true petrels', characterised by united nostrils with medium septum, and a long outer functional primary. It is dominant in the Southern Oceans, but not so in the Northern Hemisphere

petrochemical - a chemical derived from petroleum or natural gas

petrosaspongiolides M-R - an antiinflammatory drug derived from the marine sponge *Petrosaspongia nigra*

pH - the logarithm of the reciprocal of hydrogen-ion concentration in gram atoms per liter; provides a measure on a scale from 0 to 14 of the acidity or alkalinity of a solution (where 7 is neutral and <7 is acidic and >7 is basic)

phaceloid coral - a coral that has corallites of uniform height which are adjoined toward their base



Eusmilia fastigiata is a phaceloid coral with one corallite per branch.
(Photo: University of Puerto Rico/Morelock)

phage - a virus that infects bacteria; also called a bacteriophage

phagocyte - a cell that engulfs and digests debris and invading microorganisms

phagocytosis - "cell eating." A process in which phagocytes engulf and digest microorganisms and cellular debris; an important defense against infection

pharmaceutical - refers to man-made and natural drugs used to treat diseases, disorders, and illnesses

pharmaco- - pertaining to drugs

pharyngeal arch - one of several columns of mesenchyme found in the neck region of the developing vertebrate embryo. In lower vertebrates, blood vessels formed here become part of the gills; in higher vertebrates derivatives include portions of the jaw and middle ear; also known as branchial arches, gill arches, or visceral arches

pharyngeal basket - a feeding structure in tunicates (sea squirts) which is a type of pharyngeal gill formed into a mesh-like basket. Cilia on the gill draw water into the mouth, through the basket mesh, and out the excurrent siphon



Water entering this sea squirt carries particulate matter which is filtered as water passes through openings in the pharyngeal basket. Food particles are carried to the bottom in mucus and enter the digestive tract. Water that has passed through basket is expelled via the excurrent siphon opening, on right in this illustration. The anus opens at the excurrent siphon so fecal material is carried away. (Photo: Houseman at U. Ottawa; BIODIDAC)

pharyngeal teeth - in fishes, teeth located on the bones in the pharynx, which is the posterior part of the oral cavity

pharyngeal teeth - in fishes, teeth located behind the gills and before the esophagus, and anchored in bone or gill arches. Fishes may use their pharyngeal teeth for sound production

pharynx - the part of the digestive system of many animals immediately behind the mouth and in front of the esophagus; the throat

phenetic classification - classification based on degree of overall similarity

phenetic species - a concept of species in which a species is a set of organisms that are phenotypically similar to one another

phenetics - classification based on grouping by overall similarity, not recency of common descent

phenocopy - an organism whose phenotype (but not genotype) has been changed by the environment to resemble the phenotype usually associated with a mutant organism

phenology - the science dealing with the relationships between climate and periodic biological phenomena that are related to or caused by climatic conditions, such as the seasonal budding of trees and migration of birds

phenotype - the total characteristics of an individual, i.e., its appearance, resulting from interaction between its genotype (genetic constitution) and its environment

phenotypic plasticity - an alteration of phenotype as an organism adapts from one micro-environment to another and as the local environment changes; when an organism activates different phenotypes in response to its environment. Phenotypic plasticity may cause some organisms to look different from each other even though they are genetically identical

pheromone - a hormone-like substance that is secreted by an organism into the environment as a specific signal to another organism, usually of the same species

philopatry - refers to the drive or tendency of an individual to return to, or stay in, its home area

phoenix coral - regeneration of a coral colony from live deep tissues

Phoenix Islands Protected Area (PIPA) - established in 2006 by the Republic of Kiribati, the PIPA is the largest marine protected area in the Pacific Islands and the third largest in the world. Surpassed in size only by Australia's Great Barrier Reef and the Northwestern Hawaiian Islands, the PIPA represents 8 percent of all marine protected areas on Earth and helps safeguard more than 71,300 square miles of nearly pristine marine wilderness. The PIPA encompasses eight atolls, each with a 60 nautical mile protected perimeter, and two submerged reef systems. More than 120 species of coral and 520 species of reef fishes have been identified in the area

phoretic behavior - the use of one organism by another organism as a means of transportation

phospho-diester bond - a bond in which a phosphate group joins adjacent carbons through ester linkages

phospholipase A2 inhibitor - a drug that acts as an antiinflammatory agent by inhibiting the release of arachidonic acid from cell membrane phospholipids. It prevents the enzyme phospholipase A2 from binding to the membranes. Phospholipase A2 inhibition mode of protection has been recorded from many marine sponges

phosphorylation - the addition of a phosphate group to a compound

photic zone - the vertical zone in the ocean extending from the surface to that depth permitting photosynthetic activity

photo-quadrat - a quadrat that is photographed for purposes of later analysis and permanent record for species monitoring or measurement

photocyte - a light-producing cell

photogenesis - light production

photogrammetry - the process of making surveys and maps using photographs

photometer - an instrument for measuring light intensity

photometric - of or relating to photometry; a more precise measurement of the brightness (intensity) of light, which can be digitized and calibrated

photometry - the quantitative measurement of visible radiation, primarily intensity (brightness), from light sources

photomicrograph - a photograph taken through a microscope

photomosaic - an assemblage of photographs, each of which shows part of a region, and put together in such a way that each point in the region appears once and only once in the assemblage, and scale variation is minimized



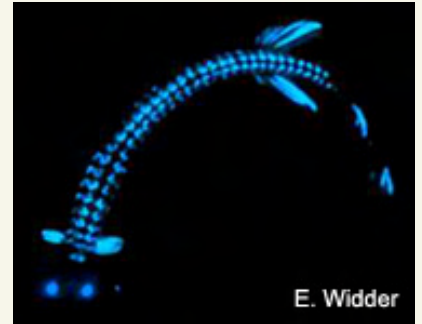
Photomosaic of St. John, U. S. Virgin Islands. Images such as these are valuable in studying and managing coral reefs and other habitats. (Courtesy of NOAA National Ocean Service)

photon - a quantum of light energy, or, more generally, of any form of electromagnetic energy having a single wavelength, direction, and polarization

photophile - an organism which grows or thrives in lighted conditions

photophilous - thriving in conditions of strong light

photophore - a light-producing organ, found especially in marine fishes and cephalopods. Photophores emit light from intrinsic structures, or derive light extrinsically from symbiotic luminescent bacteria



This bright bluish lights are given off by photophores on this black dragonfish (Photo: E. Widder, Harbor Branch Oceanographic Institution)

photophosphorylation - the process during photosynthesis in which light energy captured by photosynthetic organisms is transformed into the phosphate bond energy of ATP

photoreceptor - a nerve ending, cell, or group of cells specialized to sense or receive light

photosynthesis - process by which autotrophic chlorophyll-containing organisms manufacture their own energy sources (simple sugars) from the intracellular chemical reaction of carbon dioxide and water in the presence of sunlight and chlorophyll. Oxygen is a photochemical byproduct of photosynthesis

photosynthetic capacity - the maximum photosynthetic rate per unit of biomass

photosynthetic pigment - a pigment that efficiently absorbs light within the 400-700 nm range and is essential for photosynthesis

phototropism - the response of an organism to light, usually expressed as movement of a part of an organism toward or away from the light stimulus, as when plants grow toward sunlight

phototype - in taxonomy, a photograph of the type or a photograph serving as the type

phreatic water - water below the level at which all voids in the rock are completely filled with water

phycocyanin - a blue, water soluble pigment found in red algae and cyanobacteria

phycoerythrin - a red, water soluble pigment found in red algae and cyanobacteria

phycology - the scientific study of algae

phyletic - evolutionary events that modify a taxon without causing speciation, i.e., daughter species are not produced

phyletic extinction - the evolution of an ancestral species into one or more daughter species, none of which resembles the ancestor

phylliform - leaf-shaped

phyllopod - any of various branchiopod crustaceans having swimming and respiratory appendages that resemble leaves

phyllosoma larva - a larval stage of a spiny lobster. The body is thin, flat, and transparent



Early stage of a rock lobster phyllosoma larva.
(Photo: Russell Bradford/CSIRO)

PhyloCode - a proposed alternative to the Linnaean system of biological classification. The PhyloCode is based explicitly on phylogeny, the evolutionary history of a species or higher taxon. It would name and organize living things based on common ancestry and the branching of the evolutionary family tree. The Linnaean hierarchical system implies evolutionary relationships, but does not formally incorporate phylogeny. The PhyloCode would abandon Linnaean hierarchical ranks and recognize only species and clades (a group of organisms that share a particular common ancestor)

phylogenetic tree - a branching tree-like diagram (dendrogram) used to represent the evolutionary history of a set of taxa, with the leaves (or terminal branches) representing contemporary taxa and the internal branches representing hypothesized ancestors

phylogenetics - the field of biology that deals with the relationships among organisms

phylogeny - the evolutionary relationships among organisms

phylogeography - the study of the geographic distribution of phylogenetic lineages, usually within species and to reconstruct the origins and diffusion of lineages; the attempt to take into account the geographic distribution of species in establishing their phylogeny, and to understand the geographic patterns that may result from divergence, ultimately leading to the evolution of new species

phylogram - a phylogenetic tree that depicts inferred historical relationships among entities. A phylogram differs from a cladogram in that the branches are drawn proportional to the amount of inferred character change

phylum - a major division of a biological kingdom, consisting of closely-related classes; represents a basic fundamental pattern of organization and, presumably, a common descent

physical change - a change from one state to another, as when water changes from ice to its liquid state

physiology - the branch of biology that is concerned with the study of functions of particular structures or organs of organisms

physoclistous - in fishes having the swim bladder closed, with no connection to the gut

physostomous - in fishes having the swim bladder connected by a tube to the gut

phytoplankton - microscopic green plant component of the plankton which is responsible for most of the photosynthetic activity in the ocean



A phytoplankton species of the genus *Ceratium*.

phytotoxin - a substance similar in its properties to an extracellular bacterial toxin

picture element - in a digitized image, this is the area on the ground represented by each digital value. Because the analogue signal from the detector of a scanner may be sampled at any desired interval, the picture element may be smaller than the ground resolution cell of the detector. It is commonly abbreviated as pixel

piebald - with two colors irregularly arranged, usually black and white

piezometer - an instrument for measuring pressure or compressibility

pigment - a wide variety of organic compounds found in organisms which have color (or are colorless in some cases) and perform various functions (e.g., chlorophyll, which aids in the conversion of light energy to chemical energy during photosynthesis; hemoglobin, which carries oxygen in the circulatory system of many animals)

pileated - having a cap or crest

pileiform - umbrella-shaped

piliform - hair-shaped

pinacocyte - a cell type which forms the surface layer (pinacoderm or epidermis) of a sponge. Pinacocytes are capable of synthesising collagen

pinacoderm - the external surface of a sponge, lined with pinacocytes in a single cellular layer

ping - a single output pulse of a sonar system

pinna - a small lateral branchlet on a tentacle of an octocorallian (soft coral); the most visible portion of the outer ear of mammals



The presence of an outer ear flap, or pinna, is one characteristic that separates sea lions from seals. The photograph is of a Steller sea lion pup with mother's milk still on its face. (Photo: Mike Etnier, NMML/ NOAA)

pinnacle reef - a nearly cylindrical reef with vertical sides; may be up to 200 m diameter and 50 m in height

pinnate - having side branches

pinniped - an aquatic mammal in the order Carnivora, such as seals, sea lions and walruses, whose front limbs have evolved to become "flippers"

pinnule - a side branch structure on the tentacle of soft corals, giving them a feathery appearance

pisciform - having the shape of a fish

pisciform - fish-shaped

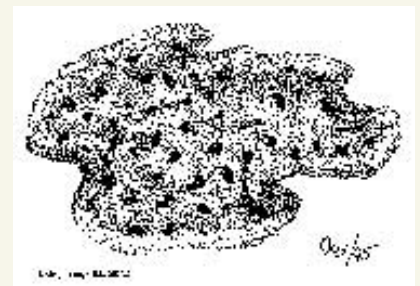
piscivore - an animal that feeds on fishes

pit plug - a small cytoplasm connection between cells in many red algae which may help with nutrient exchange

pixel - abbreviation of picture element

placode - a thickened or plate-like region within an epithelium

Placozoa - a phylum of extremely simple and cryptic marine animals, for which only two species have been described, *Trichoplax adhaerens* and *Treptoplax reptans*. These tiny animals were discovered in Europe in the late 1800's living on the glass walls of an aquarium. Since then, most of what has been learned about their biology has come from studying cultures kept in various laboratories around the world. Their bodies are made up of only a few thousand cells of just four types. They also have the smallest amount of DNA measured for any type of animal. They lack tissues, organs and organ systems. They reproduce asexually, but it is not known if they can also reproduce sexually. Practically nothing is known about them in nature. Some scientists believe they emerged early in metazoan evolution, either before or just after the sponges (Porifera). However, recent DNA studies lead others to believe they emerged after the Cnidaria. Of the two species described, *Treptoplax reptans* has never been seen since its description in 1896, causing some to doubt its existence. However *Trichoplax adhaerens* has been reported from the Mediterranean and many tropical and subtropical locations around the world. It may be that *Trichoplax adhaerens* actually consists of more than a single species



A drawing of the placozoan, *Trichoplax adhaerens*. These tiny marine animals are cryptic inhabitants of tropical and subtropical seas. (Photo: BIODIDAC)

plague (white plague disease) - a coral disease characterized by a sharp line between apparently healthy coral tissue and freshly exposed coral skeleton.-There is no obvious microbial band present.-The infective pathogen is a bacterium. Plague is currently epidemic throughout the Caribbean, and affects stony corals. For more information and illustrations, see: http://www.coral.noaa.gov/coral_disease/white_plague.shtml



White plague disease.
(Photo: Dr. A. Bruckner,
NOAA)

plain - uniformly colored or unadorned with structures or other features

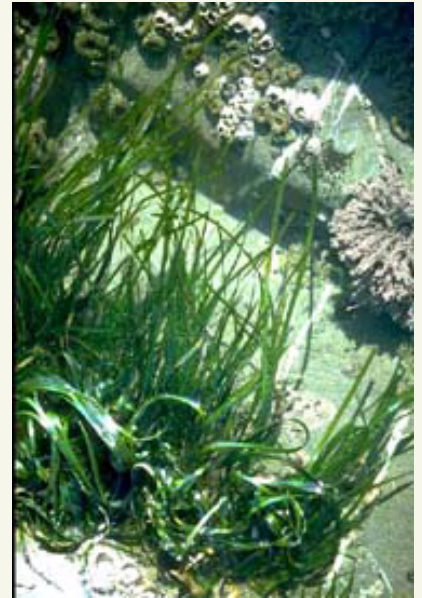
planktivorous - feeding on planktonic organisms

plankton - the passively floating or weakly motile aquatic plants (phytoplankton) and animals (zooplankton)



This large copepod
(*Neocalanus sp.*) is part of
the Arctic marine plankton
community.

Plantae - the kingdom of immobile multicellular eukaryotes that obtain energy through photosynthesis, and have cells encased in cell walls composed of cellulose



Green plants in a Hawaiian intertidal community.

planula - a ciliated planktonic larval form produced by some anthozoans. It undergoes metamorphosis into the adult stage upon settlement on a suitable substrate

plasmid - an autonomous (self-replicating) circular piece of DNA found outside the chromosome in bacteria. Plasmids carry information that give the bacteria resistance to antibiotics. They are often used in genetic engineering as cloning vectors to carry desired genes into organisms



A super coiled plasmid is the predominant *in vivo* form in which the plasmid is coiled around histone-like proteins. Supporting proteins are stripped away during extraction from the

bacterial cell, causing the plasmid molecule to supercoil around itself *in vitro*. (Photo: Stanley Maloy, Ph.D., Director, Center for Microbial Sciences, San Diego State University)

plasmogamy - a process of fusion of the cytoplasm of two sex cells or gametes; the first step in syngamy (fertilization)

plastid - a membrane-bound organelle in plant cells that functions in storage (of food or pigments) or food production. Chloroplasts contain the pigments for photosynthesis

plastron - the ventral (belly) shield or shell of a turtle or tortoise

plate - a rigid part of the Earth's crust and part of the Earth's upper mantle that moves and adjoins another one along a zone of seismic activity

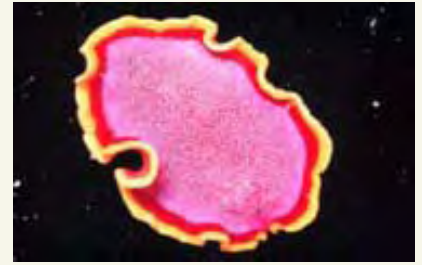
plate like - resembling thin, flat sheets of uniform thickness

plate tectonics - the theory that the Earth's lithosphere consists of large, rigid plates that move horizontally in response to the flow of the asthenosphere beneath them, and that interactions among the plates at their borders cause most major geologic activity, including the creation of oceans, continents, mountains, volcanoes, and earthquakes

platform reef - a large reef of variable shape lacking a lagoon, seaward of a fringing reef and/or a barrier reef, for which the width is more than half its length

platform terminal transmitter (PTT) - a small satellite transmitter attached to a sea turtle, bird, bear, etc in order to monitor its movements and/or behavior. For example, a PTT sends a message to a satellite each time a turtle comes to the surface to breathe. Messages are then received via the satellite regarding the turtle's location

Platyhelminthes - an animal phylum containing four classes of flatworms. Three are parasitic (tapeworms, flukes) and one, the Turbellaria, is free-living and contains coral reef inhabiting species



A free-living polyclad flatworm.

pleiotrophy - in genetics, the condition in which a single gene influences multiple phenotypic traits. Should a new mutation occur in that gene, all traits will be effected simultaneously

Pleistocene epoch - an interval of the Quaternary period, from 1.8 million years before present to 10 thousand years before present

plenary power - in taxonomy, power of the International Commission on Zoological Nomenclature to suspend articles of the Code to settle particular cases

plenary powers - in taxonomy, the International Commission on Zoological Nomenclature (Commission) is empowered by use of its Plenary Powers to prevent the application of a rule of the International Code of Zoological Nomenclature (Code) where such application in a particular case would disturb the stability or universality or cause confusion in zoological nomenclature

pleomorphic - variable in size and shape; polymorphic, occurring in more than one morphological form

pleopod - one of the five paired abdominal appendages used for swimming by shrimps; used for attachment of eggs by female shrimps, lobsters and crabs; also called a swimmeret

plesiomorphy - an ancestral character state

plesiotype - of the same sex as the holotype

pleurite - one of the external lateral processes of a somite (body segment) of a crustacean; also called a 'pleuron'

pleurodont - teeth implanted in the side of a bone, e.g. in parrotfishes and triggerfishes

plexus - a group or network of intersecting nerves and/or blood vessels

plica - a small fold in the skin

plicate - having plicae or a series of folds, grooves or wrinkles in the skin; plaited

plication - a fold

Pliocene epoch - an interval of the late Neogene period, from 5.3 to 1.8 million years before present

plocoid colony - a coral colony which has conical corallites with their own walls; a coral growth form in which the coral colony is composed of more or less cylindrical corallites having distinct walls. The coenosteum separates the corallites within a colony



Plocoid crust coral, *Leptastrea bottae*. (Photo: Dave Krupp/Windward Community College)

ploidy - refers to the number of sets of chromosomes

plug-in - a small piece of software that adds features to a larger piece of software

plumage - the collective term for all the feathers that cover a bird's body

plume - in hydrodynamics, a plume is a column of one fluid moving through another; a long, feather-shaped cloud of steam or gases; a volume of a substance that moves from its source to places farther away from the source; the fluid formation that is created as hydrothermal vent waters are injected into the ocean from the sea floor; an area of chemicals in a particular medium, such as air or groundwater, moving away from its source in a long band or column; the anterior portion of the body of a vestimentiferan tube worm which extends out of the tube into the water. The plume is comprised of hundreds of branchial filaments which are filled with blood vessels. The red hemoglobin in the blood gives the plumes their bright color

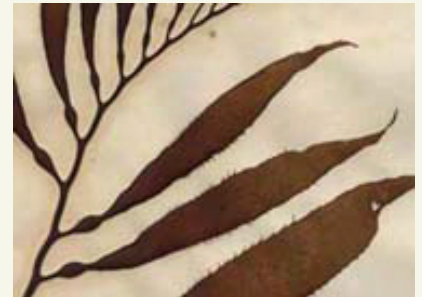
pluripotent - ability of a single stem cell to develop into many different cell types of the body of an organism

pluteus larva - a free-swimming, bilaterally symmetrical, ciliated larva of some echinoderms, such as sea urchins and brittlestars



Pluteus larva of an Australian sea urchin. (Photo: Ellen Popodi and Rudolf A. Raff)

pneumatocyst - one of many gas-filled bladders found in some algae that act as a buoys. In some large brown algae, such as kelp, they act to raise the blades closer to the surface where photosynthesis can occur. Pneumatocysts keep the brown alga, *Sargassum*, afloat in the Sargasso Sea



The pneumatocysts are the swellings at the bases of the blades in this kelp. (Photo: Monterey Bay Aquarium Research Institute)

pneumatophore - a modified aerial root rising above ground that may function as a respiratory organ in plant species such as mangroves, which are subjected to inundation or soil saturation. Such evolutionary adaptations enable trees to obtain oxygen directly from the air and also helps consolidate swamp sediments. They have special air channels (lenticels) for gas exchange in the atmosphere and there is an internal pathway for getting oxygen into

the root and to supply submerged roots. The aerial loop of a mangrove root is sometimes called a "knee" or "peg root"



Mangrove pneumatophores emerging from the sediments. These structures, also known as rhizophores, have bark rich in lenticels to function in gas exchange for roots that are constantly in water-saturated soil. - (Photo: Copyright Dr. Joseph E. Armstrong, Illinois State University)

poacher - a person who hunts or fishes illegally; a family (Agonidae) of small bottom-dwelling cold-water marine fishes

pod - a group of aquatic mammals



A pod of spinner dolphins in the lagoon of Midway Atoll. (Photo: Ocean Futures Society)

point intercept transect - a linear transect protocol where a tape is secured at each end of the transect with the tape draped over the reef in between. Observations are collected on each species and substrate component at specified points along the line

point mutation - a mutation in which a single nucleotide in a DNA sequence is substituted by another nucleotide

point source pollution - origin of a pollutant discharge from a discrete conveyance, such as an effluent from the end of a pipe

PointCount - PointCount for Coral Reefs is a Windows/Win95-based program developed to utilize the random point count method to accurately estimate percent coverage of corals, sponges, and associated substrate from frame grabbed underwater video imagery. See also "Coral Point Count with Excel extensions (CPCe)"

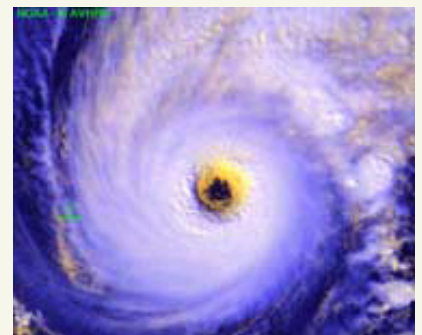
poisonous - an organism that contains poison in its tissues that can be harmful if the organism is ingested



The liver, gonads, intestines, and skin of puffer fish (and other related and unrelated animals) contain high concentrations of tetrodotoxin, a powerful neurotoxin that can cause respiratory paralysis and death, in approximately 60% of persons who ingest it. (Photo: NOAA)

Poisson distribution - a probability distribution of random occurrences in which one occurrence has no influence on any other occurrence. The variance of a poisson distribution is equal to its mean and therefore the standard deviation is equal to the square root of the mean of the distribution

polar-orbiting satellite - a satellite traveling in a near-polar orbit around the globe; civilian satellite program managed and operated by NESDIS



Polar-orbiting satellite data was used to derive this image of Hurricane Erin, September 2001.

polarimeter - an instrument for measuring polarized light

Polaris - see North Star

polariscope - an instrument for detecting polarized light

polarized light - light waves which vibrate in one plane only as opposed to the multi-directional vibrations of normal rays

pollen - the male reproductive cells of flowering plants

poly - a prefix meaning "many"

polyadenylation - the process by which the 3' ends of most eukaryotic mRNAs are formed; the covalent modification of a macromolecule (e.g., mRNA) by the formation of a polyadenyl moiety covalent linked to the macromolecule; post-transcriptional addition of a polyadenylic acid tail to the 3' end of eukaryotic mRNAs; also called 'poly-(A) tailing'

polyadenylic acid - a polymer of adenylic acid that is sometimes attached to eukaryotic mRNA (messenger RNA) and stabilizes the molecule before transport from the nucleus into the cytoplasm

polyandry - a female mating with more than one male

polycarpic - refers to plants that have repeated periods of reproduction; iteroparous

polycentric distribution - the establishment of a population, species or other taxonomic unit in several widely separated geographic places

Polychaeta - a class of the segmented worm phylum Anellida. There are approximately 8,000 species of polychaetes which include errant (free-moving) forms and sedentary ones that live in stabilized burrows, galleries or tubes of various degrees of complexity. Some burrow into coral. Many species are common inhabitants of coral reefs, such as the Christmas tree worms, feather duster worms, fanworms, fireworms, scaleworms, threadworms, and others



A marine polychaete worm grazing on the surface of a coral head. (Photo: Dr. Anthony Picciolo)

polyclad flatworm - a free-living flatworm belonging to the order Polycladida (Class Turbellaria; Phylum Platyhelminthes). Many species are coral reef inhabitants

polyculture - the cultivation of more than one species of organism in an aquaculture system

polygamy - both sexes mating with more than one other individual

polygene - one of many genes of small effect that influence the development of a quantitative trait; results in continuous variation and in quantitative inheritance

polygenic trait - a phenotype controlled by many genes of small effect (polygenes)

polygyny - the mating of a single male with several females

polymer - a compound of high molecular weight consisting of up to millions of repeated linked light and simple molecules

polymerase - a general term for enzymes that carry out the synthesis of nucleic acids

Polymerase chain reaction (PCR) - a technique for quickly making many copies of a specific segment of DNA

polymorphic species - species which have a variety of morphological types

Polynesia - scattered islands of the central and southern Pacific Ocean roughly between New Zealand in the southwest, Hawaii in the north, and Easter Island in the southeast. The larger islands are volcanic, the smaller ones are generally coral formations



The island of Bora Bora in French Polynesia. (Photo: Anthony R. Picciolo, NOAA)

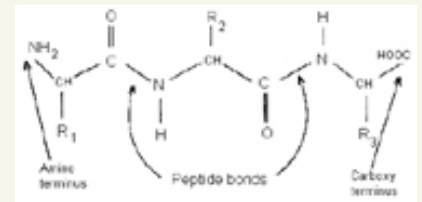
polyp - an individual of a solitary cnidarian or one member of a cnidarian colony



Cnidarian polyp.

polyp bail-out - nonsexual coral reproduction in which a polyp abandons a corallite and reestablishes itself on a new substrate; the dissociation and dispersal of coral polyps from adult colonies

polypeptide - a long chain of amino acids joined by peptide bonds



Amino acids in proteins (or polypeptides) are joined together by peptide bonds.

polyphydont - a type of dentition where the teeth are continuously replaced

polyphyletic group - a group of species that resemble each other but are evolved from different ancestors. A polyphyletic group is composed of members that originated, independently, from more than one evolutionary line

polyploid - cells or organisms having more than twice the haploid number of chromosomes

polypoid - polyp-shaped

polysaccharide - any of a class of carbohydrates whose molecules contain chains of monosaccharide molecules -

polytypic - a taxon including several subordinate taxa, e.g. a polytypic genus is one containing several species

pony bottle - a small, but independent alternate air supply for scuba divers, to be used in case of main air failure. It is a small scuba tank with an attached regulator



A pony bottle attached to the main size cylinder.
(Photo: Aqua Explorers)

population - a group of individuals of the same species living in the same area at the same time and sharing a common gene pool; a group of potentially interbreeding organisms in a geographic area

population (statistics) - any entire collection of animals, plants, people, or things from which we may draw a sample and collect data. It is the entire group we are interested in, which we wish to describe or draw conclusions about. In order to make any generalizations about a population, a sample, that is meant to be representative of the population, is often studied. For each population there are many possible samples. A sample statistic gives information about a corresponding population parameter. For example, the sample mean for a set of data would give information about the overall population mean

population crash - sudden decline in the number of individuals found in a population because of a scarcity of required environmental resources

population density - the number of organisms per unit area or volume

population dynamics - the study of the factors that affect the growth, stability, and decline of populations, as well as the interactions of those factors

population explosion - sudden increase in the number of individuals found in a population because of an abundance of useable environmental resources

population genetics - the study of the allele frequency distribution and change in populations under the influence of the four evolutionary forces: (1) natural selection, (2) genetic drift, (3) mutation, and (4) gene flow

population sink - a portion of a species' geographic range where the death rate exceeds the birth rate for a local population

population viability - the probability that a population will persist for a specified period across its range despite normal fluctuations in population and environmental conditions

population viability analysis - an analysis that estimates minimum viable populations

pore water - water between the grains of a sediment; also called interstitial water

porgy - species of bony fishes in the family Sparidae. Porgies are found in temperate and tropical coastal areas of the Atlantic, Indian, and Pacific Oceans. They are especially abundant in the Mediterranean and Red Seas. Porgies have an oval-shaped, deep body with a blunt snout and small, nearly horizontal mouth. They possess strong teeth adapted for crushing their food of hard-shelled benthic invertebrates. Many species are hermaphroditic. Some are simultaneous hermaphrodites, having male and female gonads simultaneously. Others change sex as they get larger. Porgies are important food and game fishes. Other common names of fishes in the family Sparidae are sea breams and sheepsheads



A porgy photographed at Bimini (Photo: Mark Rosenstein / Active Window Productions (markrosenstein.com))

Porifera - an animal phylum that contains the sponges. They are the most primitive of the multicellular animals. Sponges assume many sessile body forms, such as finger, branching, bushy, spherical, tubular, vase and tube-like, encrusting, amorphous and massive. Some bore into coral and mollusk shells. Many of the 5,000 species are colorful and prominent inhabitants of coral reefs



A barrel sponge (Porifera).
(Photo: Dr. Anthony Picciolo)

Porites - an important and dominant genus of hermatypic coral. Porites brood or release live young rather than sperm and egg packets like most corals

porocyte - in sponges, a cell surrounding a pore (ostium)

porphyrous - purple color

port - the left side of a vessel to someone facing the bow or front

portunid crab - any member of the crab family Portunidae (order Decapoda, class Malacostraca). In these crabs, the hindmost pair of legs (5th pair) are flattened into paddles for swimming. The family includes the blue crab (*Callinectes sapidus*), an edible crab of the Atlantic coast of North America; the velvet crab, *Portunus* sp of the Atlantic and Pacific oceans and the Mediterranean Sea; and *Scylla serrata* (mangrove crab) of the Indo-Pacific region; also called swimming crab

POSIDIN (Portal for Oceanographic Services for IOOS Data and information) - an oceanographic observation web portal for the exchange of information for NOAA's Center for Operational Oceanographic Products and Services and National Data Buoy Center IOOS participants

posit - a proposition that is accepted as true in order to provide a basis for logical reasoning; take as a given; assume as a postulate or axiom

positive allometry - allometric relationship in which the slope of the line comparing two variables is greater than unity

possession - equivalent to 'territory.' Although it still appears in Federal statutes and regulations, "possession" is no longer current colloquial usage

post-emergent nest - a sea turtle nest in which the majority of hatchlings have emerged through the surface of the sand

posterior - morphologically, toward the rear or back end of an individual, or distal portion of a bodily part



The prehensile tail at the posterior end of the seahorse's body allows it to hold on to aquatic plants

posting - a single message entered into a network communications system

postlarva - in fishes, a larva following the yolk sac stage; the term is applied only when the post larva's morphology continues to be strikingly different from that of the juvenile

postulate - a statement accepted without proof; a fundamental assumption

potable water - water that is safe for drinking by humans. Specifically, freshwater that generally meets the standards in quality as established in the U.S. Environmental Protection Agency (EPA) Drinking Water Standards

potential coral reef bleaching episode - potential for coral bleaching occurs when the sea surface temperature is at least 1 degree C above the maximum expected summertime temperature

potentiation - the effect of an initial stimulus in evoking a stronger response the next time it is received; the synergistic effect of two drugs given simultaneously; the ability of one chemical to increase the effect of another chemical

PowerPoint: - a program in the Microsoft Office suite which allows users to create presentations and handouts. By creating PowerPoint "slides," users can add color, images, sounds, and movies to their text presentations

practical salinity unit (psu) - a unit of measurement of salinity similar to part per thousand (ppt)

prebiotic - a food substance intended to promote the growth of certain bacteria; also refers to the state of matter before life existed, but was conducive to the origin of life. The prebiotic 'soup' is the mixture of organic molecules in the primeval ocean that are thought to have spontaneous, self-assembly properties for the first formation of an organic complex with self-replicating qualities; Oparin's organic soup

precautionary approach - measures intended to reduce risk to a biological resource and its environment

precipitation - any form of water that falls from the atmosphere to the surface of the earth, i.e., rain, snow, sleet, and hail

precision - the ability of an instrument to measure a variable and to repeatedly obtain the same result

precocial - born or hatched in a fully-developed state; relatively mature and mobile from the moment of birth or hatching; the opposite of altricial

prehensile - capable of or adapted for grasping, such as the prehensile tail of a seahorse



This seahorse keeps its position by anchoring itself with its prehensile tail.
(Photo: Dr. Tom Doeppner, Brown University)

preprint - an article printed especially for private distribution in advance of the actual publication

pressure gradient - a graded change in the level of water or air pressure that occurs over distance

prevailing winds - winds that blow consistently from one direction; the typical winds for a particular region and time of year

prevalence - the number of disease cases within a population over a given period of time

prialt - an analgesic drug made from the venom of a species of cone shell snail, *Conus magus*. The particular analgesic substance in the venom is a conopeptide, one of the first pharmaceuticals that demonstrate the promise of "drugs from the sea"

PRIAs (Pacific Remote Island Areas) - waters of the U.S. exclusive economic zone (U.S. EEZ) around Howland Island, Baker Island, Jarvis Island, Johnston Atoll, Kingman Reef, Palmyra Atoll, Wake Island and Midway Atoll

Primary male or female - a male or female that is genetically determined at birth or hatching and is not the result of sex change

primary polyp - in colonial octocorals, e.g., sea pens, one polyp grows very large and loses its tentacles, forming the central supporting axis. This is the primary polyp. The base of this primary polyp forms a bulb, which anchors it to the substratum. Branching off this primary polyp are various secondary polyps. Some are specialized for feeding (autozooids). Others (siphonozooids) serve as intakes for water, which circulates within the colony and help keep it upright

primary production - a synonym of primary productivity

primary productivity - the rate at which new plant biomass is formed by photosynthesis. Gross primary productivity is the total rate of photosynthetic production of biomass; net primary productivity is gross primary productivity minus the respiration rate

prime meridian - an imaginary line running from north to south through Greenwich, England, used as the reference point for longitude

primer - in genomics, a short pre-existing single-stranded polynucleotide chain to which new deoxyribonucleotides can be added by DNA polymerase. It anneals to a nucleic acid template and promotes copying of the template starting from the primer site; a single-stranded nucleic acid that can "prime" replication of a template

primeval soup - Soviet biologist, Aleksandr Ivanovich Oparin, in 1924, put forward a theory of life on Earth developing in the oceans through gradual chemical evolution of carbon-based molecules in a rich organic broth or "primeval soup." He hypothesized that the early oceans were rich in organic compounds

primitive character - in evolution, an attribute of taxonomic group which all members of the group possess, i.e., the more common shared characters of a given group of organisms. Primitive characters are also called 'plesiomorphies'

prion (proteinaceous infectious particle -on) - an infectious agent composed only of protein. Prions cause a number of neurological diseases in a variety of animals, and all are currently untreatable and fatal

priority - in taxonomy, the seniority of a taxonomic name fixed by the date of publication; the earliest published name has priority

pristine - an area having its original purity, not contaminated or corrupted by human intervention; the original or pure condition or state of something; unspoiled

probability - a quantitative description of the likely occurrence of a particular event. Probability is conventionally expressed on a scale from 0 to 1; a rare event has a probability close to 0; a very common event has a probability close to 1

probe - in genetics, a DNA or RNA sequence that is labelled or marked with a radioactive isotope. It is used to detect the presence of a complementary sequence by hybridization with a nucleic acid sample

probiotic - a dietary supplement containing potentially beneficial bacteria or yeast

proboscis - an elongated tubular organ of varying use and form, usually associated with the oral region of many invertebrates

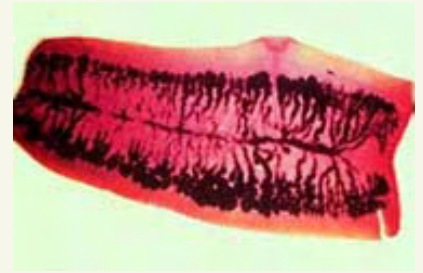
prochlorobacteria - a distinct group of Eubacteriophyta which possess both chlorophylls a and b of higher plants. The prochlorobacteria also produce oxygen like the cyanobacteria, but unlike the cyanobacteria, they do not have phycobilin accessory pigments

produced water - water associated with oil and gas reservoirs that is produced along with the oil and gas; also called "brine" (and may contain high mineral or salt content) or "formation water"

producers - the first level in a food pyramid; usually consist of photosynthetic organisms that generate the food used by all other organisms in the ecosystem

progenitor - an ancestor or precursor

proglottid - one of the segments of a tapeworm, containing both male and female reproductive organs



Gravid proglottid of the tapeworm *Taenia saginata*. The dark branched structure is the uterus. Note the mid-lateral genital pore. (Photo: U.S. Center for Disease Control)

programmed cell death (PCD) - a form of cell death in which a genetically programmed sequence of events leads to the destruction of cells without releasing harmful substances into the surrounding areas. PCD plays an important role in the health of an organism by eliminating aged cells, unnecessary cells, and unhealthy cells; also called "apoptosis" or "cell suicide"

prohibited species - with respect to a foreign (non-U.S.) fishing vessel, any species of fish that that vessel is not specifically allocated or authorized to retain, including fish caught or received in excess of any allocation or authorization (Magnuson-Stevens Fishery Conservation and Management Act)

Project Seahorse - an international team of biologists, development specialists, and other professionals committed to conserving and managing seahorses, their relatives and habitats, while respecting human needs

prokaryote - an organism whose chromosomes are not enclosed within a nuclear membrane, e.g., a bacterium or cyanobacterium

prokaryotic - descriptive of organisms with cells possessing no distinct nucleus. Prokaryotes include bacteria and cyanobacteria

proliferation - to reproduce or increase rapidly and repeatedly

promiscuous - refers to animals that copulate with several different partners within a short time span

promoter - a DNA sequence that is located in front of a gene and controls gene expression. Promoters are required for binding of RNA polymerase to initiate transcription

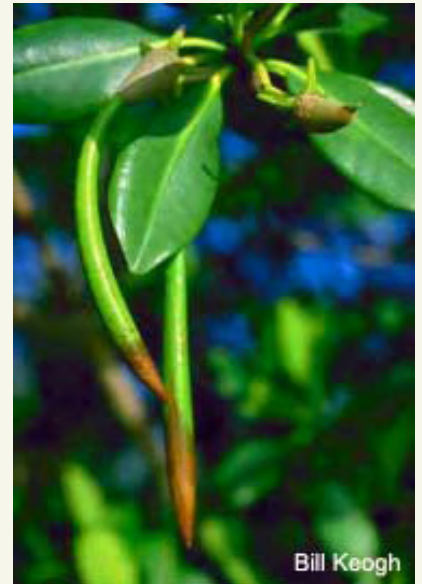
prop root - an adventitious root that grows from and supports the trunk above the ground in plants, such as mangroves



©Dr. Joseph E. Armstrong

The intertidal understory of a mangrove forest shows the muddy soil, the fairly high density of stems, and the tangle of prop and drop roots. (Photo: Copyright Dr. Joseph E. Armstrong, Illinois State University)

propagule - a structure for mangrove reproduction. After a mangrove is pollinated, it produces a propagule, which grows on a parent plant and requires carbon dioxide and water from the parent, but produces its own sugars from photosynthesis. After a while, it separates from the parent tree and falls into the water where it can be transported great distances. Propagules can resist desiccation and survive for long periods of time until they root in a suitable environment.



Bill Keogh

Cigar-shaped propagule of the red mangrove, *Rhizophora mangle*. It may reach 15 cm in length. (Photo: Bill Keogh)

proprioceptor - a specialized sensory nerve ending that monitors internal changes in the body brought about by movement and muscular activity. Proprioceptors are located in muscles, tendons, and joint capsules and when stimulated, transmit information concerning movements and position of the body; also called "propioreceptor"

prosopinacocyte - in sponges, an endopinacocyte lining an incurrent canal

prosopinacoderm - in sponges, a surface lined with prosopinacocytes

prosopyle - the opening into the excurrent canal in sponges

prostaglandin - a fatty acid compound that has many effects throughout the body, including activity in inflammation, contraction of smooth muscles, regulation of body temperature, and effects on certain hormones. Sea fans contain high concentrations of prostaglandins

prosthetic group - a specific nonpolypeptide unit in a protein determining and involved in its biological activity

prostomium - the anteriormost, presegmental region of the body of an annelid worm, sometimes bearing eyes and antennae; the portion of the head in annelids that is situated anterior to the mouth

prostrate - lying horizontally or flat on the substrate

prostrate colony - a coral colony which sprawls horizontally over the substrate

protandry - a state in hermaphroditic systems characterized by the development of male reproductive organs, or maturation of their gametes, before the appearance of the corresponding female product, thus insuring against self-fertilization

protease - an enzyme that hydrolyzes proteins, cleaving the peptide bonds that link amino acids in protein molecules

protected area - a legally established land or water area under either public or private ownership that is regulated and managed to achieve specific conservation objectives



This brilliant sea anemone is from the protected Gulf of the Farallones National Marine Sanctuary.

protected species - species which are protected by federal legislation such as the Endangered Species Act, Mammal Protection Act, and Migratory Bird Treaty Act

protein - a large complex molecule made up of one or more chains of amino acids. A typical protein contains 200-300 amino acids but some are much smaller and some much larger, e.g., titin, a protein found in skeletal muscle contains approximately 27,000 amino acids in a single chain. Proteins perform a wide variety of essential activities in cells: they largely form the physical structure of cells and cellular matrices; catalysts for all biochemical reactions are enzymes, which contain protein; the transport of materials in body fluids depends of proteins; the receptors for hormones and other signaling molecules are proteins; motion and locomotion of cells and organisms depends on contractile proteins; the transcription factors that turn genes on and off are proteins; proteins are an essential nutrient for heterotrophs; and many more - the activities of cells and organisms are largely reflections of the activities of their proteins

protein kinase C (PKC) inhibitor - an antitumor compound, isolated from marine sponges, which inhibits protein kinase C (PKC). PKC is believed to be the receptor protein of tumor-promoting phorbol esters

protein sequencing - the process of determining the amino acid sequence of a protein, or its component polypeptides

protein synthesis - the creation of proteins from their constituent amino acids, in accordance with the genetic information carried in the DNA of the chromosomes

proteinaceous - any structure composed of proteins

proteolysis - the breaking down by hydrolysis of proteins into peptides and amino acids by cleavage of their peptide bonds

proteolytic enzyme - a term referring to any enzyme which accelerates the breaking down or digestive hydrolysis of proteins into smaller proteins, polypeptides, peptides, or amino acids

proteome - all of the proteins produced from all the genes of a genome

Protista - earliest evolved eukaryotic kingdom. It includes the protozoans, the slime molds, the unicellular algae, and the multicellular algae. However, some consider the multicellular marine algae (seaweeds) as belonging to the kingdom Plantae

protocols - the selections of methods and how they are used to gain data and information at a site

protogynous - pertains to a sequential hermaphrodite in which the organism first functions as a female and later as a male

protogyny - a state in hermaphroditic systems characterized by the development of female reproductive organs, or maturation of their gametes, before the appearance of the corresponding male product, thus insuring against self-fertilization

protonephridium - a simple type of excretory organ of simple invertebrates, such as flatworms and rotifers. It is also called a 'flame bulb.' Protonephridia are primarily concerned with removing excess water from the animal

protoplasm - the complex colloidal substance which constitutes the living matter of cells and performs the life process functions. The protoplasm found between the cell (plasma) membrane and the nuclear membrane is termed the cytoplasm; the protoplasm within the nucleus and separated from the cytoplasm by the nuclear membrane is termed the nucleoplasm

protostome - an evolutionary line of coelomates that include mollusks, annelids, and arthropods. They develop their embryo by spiral cleavage, and the blastopore of the gastrula develops into the mouth. The group exhibits bilateral symmetry

prototroch - the main girdle of cilia in larvae of polychaete worms

Protozoa - heterotrophic eukaryotic unicellular organisms that belong to the kingdom Protista

protractile - capable of being protruded or thrust out

protrusible - capable of being protruded, extended or thrust out, e.g., the tongue or the jaws in some fishes



The protrusible jaw of a south Florida mojarra (family Gerreidae)

proximal - the direction towards center of the body; opposite of distal

proximate - immediate or nearest; closest in degree or order (space or time); very close in space or time

proxy - in climate research, a proxy variable is something from which a variable of interest can be obtained. For example, temperature proxies such as tree ring widths and ice core layering are used by paleoclimatologists to create a past temperature record. Tree ring widths can also be used to infer precipitation changes. Variations in Beryllium 10 can be used to infer past solar irradiance

proxy signal - paleoclimatic evidence that can be used to indirectly infer or estimate some aspect of the paleoenvironment, such as precipitation or temperature

psammon - organisms growing on, in, or moving through sand; interstitial organisms

pseudocoelom - a closed fluid-filled cavity that acts as a hydrostatic skeleton to maintain body shape, circulate nutrients, and hold the major organs in roundworms, rotifers, spiny-headed worms, and horsehair worms

pseudocoelomate - any of a group of triploblastic invertebrates that has a fluid-filled body cavity, the pseudocoelom, lying between the endoderm and the mesoderm. The pseudocoelom is contrasted with the coelom of mollusks, annelid worms, and the more complex animals, including vertebrates, by lacking an endothelial lining. Pseudocoelomates lack a circulatory system, using the pseudocoelom to transport nutrients. The hydrostatic pressure of the pseudocoelom gives the body a supportive framework that acts as a skeleton. Nematodes (roundworms), rotifers, acanthocephalans (spiny-headed worms), kinorhynchans, and nematomorphs (horsehair worms) are pseudocoelomate groups



Spiny-headed worms (Acanthocephala) attached to the intestinal lining of a fish. This parasitic pseudocoelomate uses a spiny attachment organ to secure itself to the intestine. (Photo: Maine Department of Inland Fisheries and Wildlife)

pseudopodium (pseudopod) - a protoplasmic filament or irregular process that can project from any unicellular organism. Formation of pseudopodia (or pseudopods) assist in feeding and locomotion



An amoeba thrusting out pseudopodia (false feet).

(Photo: NASA)

pseudopterosin - a compound isolated from species of Pseudopteroqorgia (soft gorgonacean corals) that may act as a marine pharmaceutical with, inter alia, anti-inflammatory and analgesic properties

psi (pounds per square inch) - a unit of air or water pressure expressed as pounds per square inch (psi)

pterygiophore - in fishes, one of several bones or cartilage with which the base of the rays of the median fins articulate

ptychocyst - a type of cnida used in tube construction by tube anemones (Ceriantharia). Tube anemones build a tube almost entirely from the everted tubules of the ptychocysts

public domain - a work is said to be in the public domain if it is not protected by copyright, or if the copyright for it has expired

published name - in taxonomy, any name which is printed and circulated, i.e., meets the criteria of publication as stated by the International Code of Zoological Nomenclature; it may be available, unavailable, valid or invalid

Puerto Rico Plateau - a shallow-water geological platform comprising the easternmost part of the Greater Antilles in the Caribbean. The emergent portion of the plateau is composed of Puerto Rico, Culebra, Vieques, St. Thomas, St. John, Tortola, Virgin Gorda, Anegada, and assorted smaller islands

puffer - any species of marine bony fishes belonging to the families Tetraodontidae (puffers, blowfishes), or Diodontidae (burrfishes, porcupinefishes, spiny puffers). These fishes are able to inflate their bodies with water or air to form a globe as a protection against predation. The flesh and organs of some blowfishes contain an extremely potent toxin which can be fatal to humans when ingested



A spotted puffer (*Arothron meleagris*) from Midway Island. When threatened, puffers can inflate their body by swallowing water to increase their body volume as a deterrent to predators. (Photo. Dr. John E. Randall)

Pulley Ridge - the deepest known reef off the continental United States, Pulley Reef is a 100+ km-long series of North-South trending, drowned, barrier islands located in the Southeastern Gulf of Mexico, near the edge of the Florida Continental Shelf. The reef is located approximately 150 miles southwest of Naples Florida and 60 miles northwest of the Dry Tortugas Ecological Reserve. It lies approximately 84 m below the ocean surface. The shallowest parts of the ridge are about 60 m deep. Even at these depths, there are many species of zooxanthellate scleractinian corals, green, red and brown macro algae, and shallow and deep water reef fishes

pulse amplitude modulation (PAM) fluorometer - a portable submersible fluorometer. Fluorometers that use the PAM technique work by rapidly sending brief pulses of light to a plant or other organism. A healthy organism responds to this light very quickly (within microseconds) by re-emitting some of the

pulse-chase isotope labeling experiment - In this protocol, a cell sample is exposed to a radio-labeled compound for only a brief period of time (the 'pulse'), then it is washed with a buffer solution to remove the isotope, and finally incubated with a non-labeled form of compound (the 'chase').

punctate - describes a surface stippled with tiny pores

punctuated equilibrium - an evolutionary model in which change occurs in relatively rapid bursts, followed by little or no discernible change in a lineage (stasis)

punctule - a minute dot, pit or aperture

pungent - sharp, biting or acrid sensation, especially in taste or smell

pure line - a genetically uniform strain in which all members have descended by self-fertilization or close inbreeding

pure tone - a sound which consists of one single frequency

purine - a nitrogen-containing, double-ring, basic compound that occurs in nucleic acids. The purines in DNA and RNA are adenine and guanine

purse seine - a fishing net used to encircle surface schooling fish. During retrieval the bottom of the net is closed or pursed by drawing a purse line through a series of rings to prevent the fish from escaping. The catch is deposited on the fishing boat. The purse seine is operated by two boats, a large boat that surrounds the catch with the net and a smaller boat which anchors the net. Purse seines may be of up to 1 km length and 300 m depth

pustule - a pimple- or wart-like projection; a bump or raised knob on the outside surface of a mollusk shell

puupehenone - a bioactive marine natural product, obtained from sponges of the genus *Hyrtilis*, which possesses antitubercular, anticancer, and antibacterial properties

pycnogonid - pycnogonids, or sea spiders, are benthic, marine arthropods, with a superficial resemblance to true spiders, to which they are probably only distantly related. They are carnivores and use a muscular pharynx to suck soft food into the gut. The mouth is at the end of a large proboscis. Digestion is intracellular and most feed on sponges, cnidarians, or bryozoans from which they suck fluids. There are no excretory organs, respiratory organs, or body cavity (coelom)



The pycnogonid *Anoplodactylus evansi* is a predator of small marine gastropods as well as other soft bodied invertebrates. (Photo: Dr. Bill Rudman)

pygmy goby - the pygmy goby, *Eviota sigillata*, has the shortest life span of any known vertebrate on Earth, with a maximum life expectancy of 59 days. *Eviota sigillata* is a small cryptic coral reef fish distributed in the Indo-West Pacific: Seychelles to the Great Barrier Reef and Micronesia, north to the Ogasawara Islands



The pygmy goby, *Eviota sigillata*, has the shortest life span of any known vertebrate on Earth, with a maximum life expectancy of 59 days. (Photo: Dr. John E. Randall)

pyknosis - degeneration of a cell in which the nucleus shrinks in size and the chromatin condenses to a solid, structureless mass

pyknotic - characterized by pyknosis

pyloric caecum - in fishes, a finger-like pouch connected with the pyloric stomach of the digestive canal. Pyloric caecae may have a digestive and/or absorptive function. They range in number from two or three in some species to thousands in others



There are 4-6 intermediate-length pyloric caecae in this specimen (Photo: John Lyons/ Wisconsin DNR, the Wisconsin Sea Grant, and the University of Wisconsin)

pyramid of biomass - in ecology, the total biomass of all organisms at each trophic level in a food chain; typically biomass declines with successively higher trophic levels

pyramid of energy - in ecology, the total energy content of all organisms at each trophic level in a food chain; the energy content declines at successively higher trophic levels

pyramid of numbers - in ecology, the number of organisms supported at each trophic level in a food chain; typically, fewer organisms are supported at successively higher trophic levels

pyranometer - an instrument that measures the amount of radiation.

pyrenoid - pyrenoids are proteinaceous centers of carbon dioxide fixation within the chloroplasts of zooxanthellae, other algae, and some bryophytes. Pyrenoids are not membrane-bound organelles, but specialized areas of the plastid that contain high levels of ribulose-1,5-bisphosphate carboxylase/oxygenase and are associated with the formation or storage of polysaccharide food reserves.

pyriform - pear-shaped

pyrimidine - a nitrogen-containing, double-ring, basic compound that occurs in nucleic acids. The pyrimidines in DNA are cytosine and thymine. The pyrimidines in RNA are cytosine and uracil

pyrolysis - the destruction of a chemical compound by heating or burning

pyrosome - a large barrel-shaped colony of colonial pelagic tunicates belonging to the genus *Pyrosoma*. The colony propels itself through the water by means of cilia that pump water through the individual tunicates. It responds to mechanical, chemical, and light stimuli by moving and by spectacular blue-green bioluminescent displays

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site
All of NOAA

Glossary of Terminology: Q

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

q. v. - which see (*quod vide*)

q.e. - which is (*quod est*)

quadrat - a square or rectangular sampling unit of known area (e.g., 1 m²) within which organisms are counted or measured. Quadrats can be used to estimate the percent cover of each species or other reef components and obtain information about density, abundance, colony size, and biodiversity



Scientist conducting a quadrat survey.

quadrate - square-shaped

qualitative analysis - the analysis of a phenomenon to determine its qualitative characteristics versus its quantitative characteristics, i.e., characteristics for which precise numerical characterization is not appropriate

quanta meter - an instrument used to measure the number of photons

quantitative analysis - the analysis of a phenomenon that uses environmental variables represented by numbers or ranges, often accomplished by numerical modelling or statistical analysis

quantitative inheritance - inheritance of measurable traits (height, weight, color intensity, etc.) that depend on the cumulative action of many genes.

quantitative polymerase chain reaction (QPCR) - real-time quantitative PCR is a highly sensitive method that utilizes small sample sizes and short experimental time frames for quantifying RNA, DNA and proteins. QPCR is especially useful for evaluating "RNA fingerprints" obtained from microarray or siRNA experiments. It allows quantification of starting amounts of DNA, cDNA, or RNA templates. QPCR is based on the detection of a fluorescent reporter molecule that increases as PCR product accumulates with each cycle of amplification. Fluorescent reporter molecules include dyes that bind double-stranded DNA (i.e. SYBR Green I) or sequence-specific probes (i.e. Molecular Beacons or TaqMan® Probes)

quantum - the smallest 'unit' of energy. The amount of energy in a quantum depends on the frequency of the radiation carrying the energy; it is equal to the frequency (in hertz) multiplied by Planck's constant, 6.626×10^{-34} joule-second. A quantum of light is called a photon

quasi - as if; seemingly; in a manner

Quaternary period - the second period of the Cenozoic era containing the Pleistocene epoch and the Holocene epoch, and dating from 1.8 million years to the present

[\(Top\)](#)



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<http://coris.noaa.gov>


[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: R

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Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

Røst Reef - the world's largest known deep-water *Lophelia* coral complex. It lies in depths between 300-400m west of Røst Island in the Lofoten archipelago, Norway. It covers an area approximately 40 km long and 3 km wide

race - a distinguishable group of organisms of a particular species that is geographically, ecologically, physiologically, physically, and/or genetically distinct from other members of the species

race - a population differing from others; refers to a unit below the subspecies level which is not given a taxonomic name

RACE (Rapid Amplification of cDNA Ends) - a technique used to obtain the 3' and 5' end of a cDNA. The technique involves three sequential enzymatic steps: reverse transcription, addition of homopolymeric tails, and polymerase chain reaction (PCR)

radial canal - a part of the water vascular system of echinoderms. Specifically, a branch off of the ring canal that leads to an arm (ray) and gives rise to the tube feet. In hydrozoan medusae, the radial canal is part of the gastrovascular cavity. it is one of four extensions leading from the mouth to the outer margin of the bell

radial cleavage - a type of cleavage characteristic of deuterostomes. When changing from a four-cell stage to an eight-cell stage embryo, the cells divide such that each cell in the top four cell plane is directly over one other cell in the bottom plane

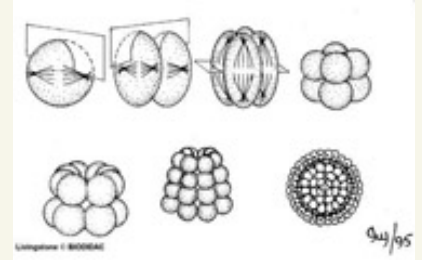


Illustration of radial cell cleavage. (Illustration: BIODIDAC)

radial corallite - a corallite on a side of a branch as opposed to an axial corallite on the tip of the branch

radial symmetry - a basic morphological plan of organisms that have their body parts arranged around a central axis. Such organisms tend to be circular or cylindrical in shape, e.g., a coral polyp, or have projections around a central disc, e.g., starfish



Radial symmetry, illustrated by this starfish (Echinodermata).

radial velocity - component of motion toward or away from a given location

radiant energy - energy traveling in the form of electromagnetic waves; energy emitted by the sun, typically in photons and waves

radiant flux - the rate of flow of radiant energy (electromagnetic waves)

radiation - energy that comes from a source and travels through some material or through space. Light, heat and sound are types of radiation

radii - inconspicuous septal elements which connect septa with the columella

radioactive decay - natural decay of the nucleus of an atom where alpha or beta and/or gamma rays are released at a fixed rate

radioactive isotope - an unstable isotope of an element that decays or disintegrates spontaneously, emitting radiation

radioactivity - the spontaneous decay of the nucleus of an element. It involves the change in the number of protons in the nucleus and therefore creates an atom of a new element

radiocarbon age - the age of plant or animal remains, determined by measuring the remaining activity of the ^{14}C atoms in the sample: $A=A_0 e^{-\lambda t}$ where A is the measured activity, A_0 is the initial activity, λ is the decay constant, and t is the sample age

radiocarbon dating - a dating method used to determine the age of samples containing carbon. The method measures the disintegration of the ^{14}C atom. ^{14}C is produced in the atmosphere by cosmic ray bombardment, and has a half-life of 5,570 years, making it useful for dating samples in the range of 0-40,000 years

radiocarbon time - regular known rates of radiocarbon decay that are used to determine the exact ages of carbon-based life

radiometer - an instrument used to measure radiant energy

radiometer - an instrument for measuring radiation energy

radiometry - the science of the measurement of radiant energy

radionuclide - any radioactive isotope

radula - a scraping organ for mastication in certain mollusks, such as snails. In many gastropods the radula consists of a variable number of chitinous teeth, of different shape and size, located in the anterior portion of the pharynx. In the cone shell family it has been reduced to a sharp and grooved tooth, fit to harpoon and inject prey with a powerful venom, which is also potentially fatal to humans



A stained section of a snail radula. The numerous chitinous teeth on this ribbon-like membrane are used to scrape, pierce, tear or cut off small pieces of food that are then directed in a continuous stream toward the digestive tract by conveyor belt like movements of the membrane. (Photo: Rick

rain shadow - an area of reduced precipitation on the wind-sheltered lee side of a mountain range caused by warming of air and dissipation of cloudiness as air descends the mountain barrier

Raita Bank - one of several submerged banks in the Northwestern Hawaiian Islands. It is a raised area of the ocean floor just 60 feet below the surface

ramifying - branching, dividing

rampart - a narrow ridge, 1-2 m high, built by waves along the seaward edge of a reef flat. It consists of boulders, shingle, gravel or reef rubble, commonly capped by dune sand

ramus - a branch

random genetic drift - changes in allele frequency that result because the genes appearing in offspring are not a perfectly representative sampling of the parental genes, i.e., changes in allelic frequency due to sampling error

random sample - a sample in which each individual in a population has the same chance of being selected as any other

random sampling - a sampling technique where a group of subjects (a sample) is selected for study from a larger group (a population). Each individual is chosen entirely by chance and each member of the population has a known, but possibly non-equal, chance of being included in the sample. By using random sampling, the likelihood of bias is reduced

range - the range of a set of numbers is the largest value in the set minus the smallest value in the set. It is a single number

range - the geographical area inhabited by a species or other group; may be continuous or discontinuous

rank - in taxonomy, the level, for nomenclatural purposes, of a taxon in a taxonomic hierarchy (e.g. all families are for nomenclatural purposes at the same rank, which lies between superfamily and subfamily)

ranked data - data for which the observations have been replaced by their numerical ranks from lowest to highest

rapacious - grasping, predatory

Rapid Ecological Assessment (REA) - a method for gathering data pertaining to ecologically significant biological components of a reef habitat over small spatial scales. Because the method provides a quick "snapshot" of major reef biota during a single dive or snorkel survey, it is particularly useful in assessing remote areas that are only rarely visited and where little time can be spent. REA is usefully employed by Coral Reef Ecosystem Division (CRED) at the NMFS Pacific Island Fisheries Science Center. During research cruises to these remote areas, teams of CRED divers survey the reef communities in a comprehensive manner, recording species abundance, diversity, and spatial distribution simultaneously for four key components of the ecosystem: fishes, corals, other invertebrates, and algae. Specific protocols are followed for field work and subsequent laboratory analyses

RARE - a U.S.-based conservation organization that works globally to equip people in the world's most threatened natural areas with the tools and motivation they need to care for their natural resources

raster - an abstraction of the real world where spatial data is expressed as a matrix of cells or pixels, with spatial position implicit in the ordering of the pixels. With the raster data model, spatial data is not continuous but divided into discrete units. This makes raster data particularly suitable for certain types of spatial operation. The term may also refer to the region of a CRT (cathode-ray tube) or LCD (liquid crystal display) monitor that is capable of rendering images

raster map - a map or chart encoded in the form of a regular array of cells

rastrate - rake-like

raw sewage - untreated domestic or commercial waste water

RDBMS (Relational database management system) - a database management system with the ability to access data organized in tabular files that can be related to each other by a common field (item). An RDBMS has the capability to recombine the data items from different files, providing powerful tools for data usage

reach - an arm of the ocean extending into the land

reaction time - the duration between the beginning of stimulation and the initiation of a response

reagent - a compound involved in a chemical or biochemical reaction, especially one used in chemical analysis to produce a characteristic reaction in order to determine the presence of another compound

real time - time in which reporting of events or recording of events is simultaneous with the event

real-time data - data collected by automated instrumentation and telemetered and analyzed quickly enough to influence a decision that affects the monitored system



Seakeys stations transmit real-time data. (Photo: NOAA)

realized niche - that portion of a fundamental niche which is actually occupied by a species

rearing habitat - an area where larval and juvenile fish find food and shelter

rebar - short for reinforcing bar. A steel bar, usually with manufactured deformations, used in concrete and masonry construction to provide additional strength. Some in the coral trade question whether rebar may contribute to nutrient loading and therefore promote algal growth as it rusts over a long time period

rebreather - an underwater breathing apparatus which is the source of breathing gas for scuba divers. A rebreather "recycles" the exhalation gasses by recovering them from the mouthpiece (and not flushing them into the surrounding water). Since not all of the oxygen in an inhalation breath is used, there is always some left in exhalation, and this gas goes through the breathing loop multiple times until it's converted into carbon dioxide. This exhalation is cycled back into the unit, where the exhaled gas is run through a scrubber, removing carbon dioxide by chemical reaction with soda lime. Oxygen is injected into the loop automatically by a computer-controlled solenoid valve in response to information received from oxygen sensors. In this way the inspiration maintains a constant partial pressure of oxygen throughout the dive. Therefore, the diver only consumes the small amount of oxygen that the body actually needs and metabolizes.. The resulting gas is analyzed by sensors to determine oxygen content and if necessary oxygen is added to the mix for the current depth from a small tank carried with the rebreather. Advantages of a rebreather are many. It allows longer bottom times. Since no bubbles are released into the water, stealth for animal behavior studies and underwater photography is easier to achieve. Another advantage of a rebreather is the much reduced risk of decompression sickness

receiving waters - water bodies that receive treated or untreated waste waters

recent - extant; still in existence

recombinant DNA - a new DNA sequence formed by the joining, usually *in vitro*, of two non-homologous (from different sources) DNA molecules, using recombinant DNA technologies

recombinant DNA technology - procedures used to join together DNA segments in a cell-free system. Under appropriate conditions, a recombinant DNA molecule can enter a cell and replicate there, either autonomously, or after it has become integrated into a cellular chromosome

recombinant line - a new combination of DNA fragments formed by cutting DNA segments from two sources with restriction enzyme fragments and then joining the fragments together with DNA ligase

recombinant organism - an organism which carries short fragments of another organism's genome (by means of recombinant DNA technology)

recombination - in genetics, the process by which offspring derive a combination of genes different from that of either parent. In higher organisms, this can occur by crossing over

recombinational speciation - the formation of new diploid species from hybrids between existing species

reconnaissance survey - a brief survey of a study area before the collection of field data

recovery plan - a plan which lists the actions that must be taken and the objectives that must be reached before an organism is no longer endangered or threatened and may be removed from the list of endangered and threatened species

recruitment - the influx of new members into a population by reproduction or immigration

rectilinear - straight-lined

red algae - red algae belong to the Division Rhodophycota. Most of the over 4000 species are marine. They range in complexity from simple unicellular organisms to unbranched and branched filaments to complex multiaxial uprights and crusts. Their pigments include chlorophyll a and the phycobiliproteins, red phycoerythrin (often the dominant pigment) and blue phycocyanin, as well as carotenes, lutein, zeaxanthin. Most red algae have a complex life history with three phases: tetrasporophyte, gametophyte and carposporophyte



Red algae. (Photo: Dept. Natural Resources and Parks, Water and Land Resources Division, Kings County, WA; from <http://dnr.metrokc.gov/wlr/waterres/marine/algae.htm>)

Red list species - a species identified as 'Extinct', 'Extinct in the wild', 'Critically endangered', 'Endangered', 'Vulnerable', 'Lower risk', 'Data deficient' or 'Not evaluated' according to criteria laid down in the IUCN Red List Categories (International Union for the Conservation of Nature and Natural Resources, 1994)



The yellow-crowned butterflyfish (*Chaetodon flavocoronatus*) is listed on the Red list as Vulnerable. This species is known only from Guam in the western Pacific Ocean (Photo: T. Allen)

red tide - discoloration of surface waters, most frequently in coastal areas, caused by large concentrations of microorganisms, such as algae or cyanobacteria



Image of red tide taken from the NOAA vessel *Ron Brown*, April 5, 2001 during the Aerosols Characterization Experiments (see <http://www.ogp.noaa.gov/ace-asia/index.htm>.) (Photo: NOAA)

red-band disease - a disease of corals manifested by a narrow band of filamentous cyanobacteria that advances slowly across the surface of a coral, killing tissue as it progresses. The band is reddish to maroon in color



Red-band disease on a sea fan. (Photo: Dr. A. Bruckner)

redox potential (Eh) - a measure of a systems capacity to oxidize material; the energy gained by transferring 1 mole of electrons from an oxidant to H₂. It is measured in volts relative to a hydrogen electrode which is at zero

reductionism - a hypothesis that all complex systems can be completely understood in terms of their components; as opposed to holism

reef - a ridge of rocks, sand, or coral that rises to or near the surface of a body of water; to partially lower a sail so that it is not as large. This helps prevent too much sail from being in use when the wind gets stronger

reef ball - an artificial reef module made from concrete poured into a fiberglass mold

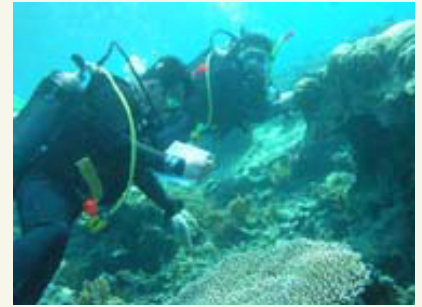


Reef balls at Royal Pahang Reef, Malaysia (Photo: Debby Ng)

reef base - the area below the consolidated slope extending up to 1 km but no deeper than 50 m. A synonym of talus slope

reef block - a large, isolated rock section that has been displaced from the reef platform, reef margin, reef front zones or the non-calcium carbonate bedrock, usually resulting from storm waves

Reef Check - a volunteer, community-based monitoring protocol designed to measure the health of coral reefs on a global scale. Reef Check is active in over 60 countries and territories throughout the tropics



Reef Check divers surveying an Indonesian coral reef. (Photo: Reef Check)

reef complex - the entire reef structure, including reef surface lagoon deposits and off-reef deposits

Reef Condition Monitoring Program (RECON) - the Ocean Conservancy's RECON Program is a low-tech, rapid monitoring protocol for assessing the health of coral reef ecosystems at selected survey sites in the tropical Western Atlantic (Wider Caribbean region). RECON trains volunteer recreational divers to observe and record valuable information about current conditions at selected coral reefs in Florida, the Bahamas, Colombia (San Andres & Old Province), Puerto Rico, and the US Virgin Islands

reef crest - the sharp break in slope at seaward margin or edge of reef flat

Reef Environmental Education Foundation (REEF) - REEF is a grass-roots, non-profit organization of recreational divers who regularly conduct fish biodiversity and abundance surveys during their dives

reef fish - a species of fish found around coral reefs and artificial reefs

reef flat - the shallow area between the shoreline intertidal zone and the reef crest of a fringing reef



Reef flat, Palau Archipelago, Micronesia, containing various species of branching coral (*Acropora*). (Photo: Jerry Wellington)

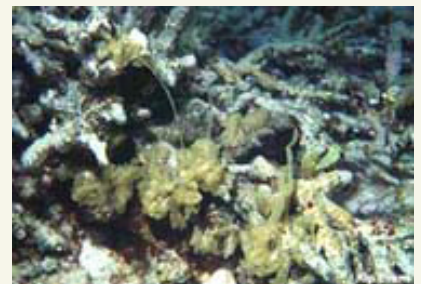
reef front - a synonym of reef slope

reef manager - an individual linked to the government, local community, non-government organizations, or universities who have formal, informal, traditional, or legislated responsibility to govern uses of a coral reef ecosystem

reef mining - the large-scale removal of living reef corals and fossilized limestone from shallow reef environments for domestic use as building materials, lime production and aggregate

reef mound - a structure that lacks reef characteristics, such as diversification and domination stages

reef rubble - dead, unstable coral pieces often colonized with macroalgae. This habitat often occurs landward of well-developed reef formations in the reef crest or back reef zone



Coral reef rubble from storm damage. (Photo: Kip Evans)

reef slope - the portion of a reef seaward of reef crest



Reef slope covered with live corals.

reef system - a cluster of reefs

reef top - the area comprising the reef flat and reef crest

ReefBase - ReefBase is a global online information system (www.reefbase.org) on coral reefs. It provides information services to coral reef professionals involved in management, research, monitoring, conservation and education. ReefBase's online geographic information system (GIS) allows the display of coral reef related data and information on interactive maps. One can zoom in to a particular area of interest, switch various data layers on and off, and save or bookmark the map for later viewing, printing or use in presentations/documents

REEFER - an apparatus used to quantify habitat heterogeneity (habitat complexity). It consists of a frame of selected area, e.g. two square meters, containing vertical, free moving PVC-poles every X-distance (e.g. every 10 cm) over its entire width. In use, a diver lowers the REEFER until all the poles touch the benthic substrate. Keeping the frame horizontal, a second diver records the height that each of the poles extends above the frame. Height differences between consecutive poles are compared to estimate the surface profile in each section of sampled reef. For vertical reef walls, a variation to the REEFER, the VEEFER may be used

referral - in taxonomy, the transfer of a subordinate taxon from one taxon to another, e.g., species removed from one genus and referred to another

reflexed - bent or turned backwards

refractometer - an instrument for measuring radiation energy

refugium - an area that remains unchanged while areas surrounding it change markedly; hence the area serves as a refuge for species requiring specific habitats

regeneration - the reproduction or reconstitution of a lost or damaged organ or part through formation of new tissues

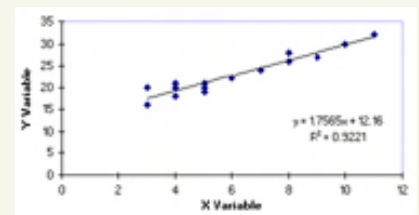
regime - a regular pattern of occurrence or action

regional continuity - in genetics, the appearance of similar traits within a geographic region that remain over a long period of time

regression - a statistical technique used to establish the relationship of a dependent variable and one or more independent variables

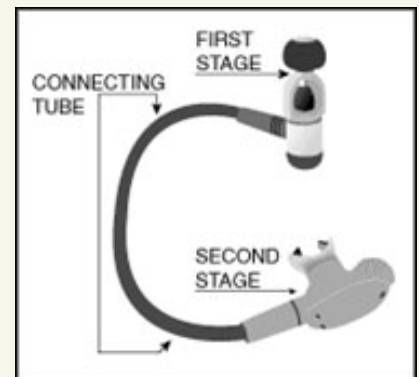
regression analysis - a statistical technique applied to data to determine the degree of correlation of a dependent variable with one or more independent variables, in other words, to see if there is a strong or weak cause and effect relationship between things; a statistical process for fitting a line through a set of data points. It gives the intercept and slope (s) of the "best fitting" line. It tells how much one variable (the dependent variable) will change when other variables (the independent variables) change

regression line - a line fit to a set of data points (scatterplot) using least-squares regression; a graph of the mathematical relationship between two variables



An example scatter plot data set with a regression line fit to the data.

regulator - a regulator is a piece of scuba equipment that reduces the high pressure of air in a scuba air tank to a pressure level that is usable by the diver. It delivers air to the diver only during inhalation. The modern scuba regulator is a very simple and reliable device with only a few moving parts. Regulators have two stages: a first stage that attaches to the scuba tank, and a second stage that has a mouthpiece. Air under high-pressure from the scuba tank is reduced sequentially in each stage. The first stage reduces the high tank pressure to an intermediate pressure of 100 to 150 psi above the surrounding water pressure. The second stage reduces the intermediate pressure to that needed for comfortable breathing



Regulators have two stages: a first stage that attaches to the scuba tank, and a second stage that has a mouthpiece.

regulatory gene - a gene that acts to control the protein-synthesizing activity of other genes; also called a 'regulator gene'

rehabilitation - the recovery of specific ecosystem components in a degraded ecosystem or habitat

reintroduction - introducing a native species back into its original habitat

reject - in taxonomy, to set aside the name of a taxon in favor of another name

rejected name - in taxonomy, a name which, under the provisions of the International Code of Zoological Nomenclature, cannot be used as a valid name and which is set aside in favor of another name

relational database - a method of structuring data as collections of tables that are logically associated to each other by shared attributes. Any data element can be found in a relation by knowing the name of the table, the attribute (column) name, and the value of the primary key

relative frequency - the number of items of a certain type divided by the number of all the numbers being considered

releaser pheromone - a chemical produced by one organism that triggers an immediate behavior in another organism

relict - a persistent remnant of an otherwise extinct taxon; a biological or geological feature that has survived in a considerably changed environment

relief - the difference in elevation between the high and low points of a land surface; changes in terrain; elevations or depressions in the land

relief map - a contour map: a map having contour lines through points of equal elevation

remote sensing - the collection of information about an object or event without being in physical contact with the object or event. Remote sensing is restricted to methods that record the electromagnetic radiation reflected or radiated from an object, which excludes magnetic and gravity surveys that record force fields



This remote sensing

(SeaWiFS) image shows sediment stirred up along the North Carolina coast by Hurricane Floyd, September 1999.

remote sensing tool - an instrument used in remote sensing often combined with a geographic information system to provide synoptic and objective views and data of the environment

renaturation - the conversion of denatured protein or DNA to its native configuration. This is rare for proteins. However, if DNA is denatured by heating, the two strands separate. If the heat-denatured DNA is then cooled slowly, the double stranded helix reforms

renewable resource - a resource or substance that can be replenished through natural or artificial means

reniform - kidney or bean-shaped

repetitive dive - any dive within a certain time frame after a previous dive. Some dive tables consider any dive within 12 hours of a previous dive as repetitive

replacement name - in taxonomy, a new taxonomic name expressly proposed for an already established one

replication - reproduction or duplication; in genetics, the synthesis of duplex (double-stranded) DNA by copying from a single-stranded template, i.e., the synthesis of an informationally identical macromolecule from a template molecule

reporter gene - a gene that researchers attach to another they wish to study

repressor - a protein that binds to an operator adjacent to a structural gene, inhibiting transcription of that gene

repressor gene - a gene that prevents a nonallele from being transcribed

reproductive guild - a group of unrelated fishes with a similar form of reproduction

reproductive isolating mechanism - a mechanism that prevents reproduction from occurring between two populations. Pre-zygotic reproductive isolating mechanisms (which take effect before fertilization) include environmental, temporal, behavioral, mechanical, and physiological barriers that prevent individuals of different populations from producing viable progeny. Post-zygotic reproductive isolating mechanisms (which take effect after fertilization) include gamete incompatibility, hybrid inviability, and hybrid sterility

reproductive isolation - a species is an interbreeding natural population that is reproductively isolated from other such groups. Species are usually separated by discontinuities, which constitute barriers that prevent, or at least inhibit, an interspecific gene flow and gene exchange. Establishment of reproductive isolation is essential for development of a new species

reproductive strategy - the way in which a species allocates or budgets energy to produce viable offspring. Energy is diverted into actual offspring and into parental care. The energy may be invested a multitude of offspring that receive little or no parental care (r-strategy), or invested in a few, large offspring that require considerable parental care (K-strategy). Although some organisms are primarily r- or K-strategists, the majority of organisms fall between these two extremes and may display traits considered characteristic of both ends of the r/K spectrum

resident - a permanent, non-migratory inhabitant

residual nitrogen time (RNT) - a theoretical mathematical representation of the amount of nitrogen absorbed in body tissues after a scuba dive. It is expressed on dive tables in minutes which are added to the no-decompression limit for a repetitive dive, i.e., the time it would take to off-gas any extra nitrogen remaining after a dive

resilience - the ability of a community or ecosystem to recover from disturbances and maintain a desired condition of diversity, integrity, and ecological processes

resiliency - the ability of a population, community or ecosystem to return to a healthy state after experiencing damaging events which do not exceed its recovery capabilities, e.g. recovery of a coral reef after a bleaching event

resilient - resumes the original shape after deformation; elastic

resolution - the ability to distinguish closely spaced objects on an image or photograph. It is commonly expressed as the spacing, in line-pairs per unit distance, of the most closely spaced lines that can be distinguished

resonance - literally means "to vibrate with". The tendency of a system to absorb more oscillatory energy when the frequency of the oscillations matches the system's natural frequency of vibration (its resonant frequency) than it does at other frequencies. In physics, resonance occurs when two systems are vibrating within the same frequency range. When resonant waves meet, they create order. In contrast, when two waves vibrating at different frequencies meet, they create chaos or dissonance; reinforcement and intensification of sound by vibrations

resonator - a structure that fills with sound and acts as a natural amplifier

resource partitioning - the dividing of scarce resources in order that species with similar requirements can use the resources in different ways, in different places, and at different times; the division of resources such that a few dominant species exploit most of the available resources while other species divide the remainder. This helps explain why a few species are abundant in a community while others are represented by only a few individuals

respiration - a biochemical process by which living organisms take up oxygen from the environment and consume organic matter, releasing both carbon dioxide and heat energy

respiratory tree - a respiratory organ of sea cucumbers (Holothuroidea-Echinodermata)

restoration - the return of an ecosystem or habitat to its original community structure, natural complement of species, and natural function



A diver prepares to reattach an elkhorn coral fragment in a Mona Island, PR, reef as part of restoration work performed after the 1997 grounding of the *Fortuna Reefer*. (Photo: Erik Zobrist, NOAA Restoration Center)

restoration ecology - activities undertaken by humans to repair ecological damage, such as establishing vegetation on degraded habitat, increasing the populations of endangered species, and decreasing the threatened area of an ecosystem

restoration monitoring - the systematic collection and analysis of data that provides information useful for measuring restoration project performance at a variety of scales (locally, regionally, and nationally), determining when modification of efforts is necessary, and building long-term public support for habitat protection and restoration

restriction endonuclease - a class of endonucleases that cleaves DNA after recognizing a specific sequence

restriction enzyme - an enzyme that cleaves double-stranded DNA; an endonuclease that recognizes specific nucleotide sequences and cleaves DNA at these highly specific locations. In genetic engineering, new genes can be inserted into these gaps

restriction fragment length polymorphism (RFLP) - variation in DNA sequence between individuals that is detectable by variation in the length of DNA fragments generated by digestion with restriction endonucleases

restriction fragment - a fragment of DNA produced by cleaving (digesting, cutting) a DNA molecule with one or more restriction endonucleases

restriction map - a genetic map of a DNA sequence showing the restriction sites (where a restriction enzyme cleaves DNA) of one or more restriction enzymes

restriction site - a sequence of DNA that is recognized by an endonuclease (a protein that cuts DNA) as a site at which the DNA is to be cut; also called "restriction enzyme cutting site"

reticulate - net-like

reticulate - resembling or forming a network

reticulate evolution - the union of different lineages of a clade by hybridization

retractable - capable of being drawn or pulled back

retractile polyp - a polyp in which the anthocodium can invert into the anthostele or into the coenenchyme

retractor - a muscle that withdraws an eversible or protrusible body part

retro- - backwards

retronym - a word or phrase created because an existing term that was once used alone needs to be distinguished from a term referring to a new development; a modification of an existing word occasioned by a discovery or a new concept; as Atlantic herring in contrast to Pacific herring, acoustic guitar in contrast to electric guitar or analog watch in contrast to digital watch

retorse - bent or turned backward or downward

retrose - turned backwards

retrovirus - a virus that contains the enzyme, reverse transcriptase. This enzyme converts the viral RNA into double-stranded DNA copies of their genome, (by using reverse transcription), which can combine with the DNA of the host cell and produce more viral particles. Many naturally occurring cancers of vertebrates are caused by retroviruses

reverse evolution - evolution which occurs when DNA returns to an ancestral form. Reverse evolution has been demonstrated in laboratory experiments at the University of Utah, in which a half billion year-old gene was reconstructed by combining key portions of two modern mouse genes that descended from the archaic gene; also called "retrograde evolution"

reverse transcriptase - an enzyme that is able to synthesize DNA from information in RNA. It requires an RNA template and a DNA or RNA primer

reverse transcription - the synthesis of DNA on a template of RNA, accomplished by the enzyme, reverse transcriptase

revision - in taxonomy, a critical re-appraisal of a taxon

rheokinesis - movement in relation to water currents

rheotaxis - orientation to water currents. An animal may face into the current (positive rheotaxis) or face downstream of the current (negative rheotaxis)

rhinophoral sheath - in sea slugs, the upstanding flange from the antero-lateral part of the mantle into which a rhinophore can be contracted

rhinophore - paired, tentacle-like chemical sensory apparatus found on the anterior end or "head" of nudibranchs. They act as olfactory/taste organs. To protect them from damage, most are able to be withdrawn into a pocket beneath the skin. Often there is a raised collar or sheath around each pocket which can be clamped shut when the sea slug is disturbed



The rhinophores on this sea slug function as chemosensory organs
(Photo: Bill Rudman)

rhizobenthos - organisms rooted in the substratum

rhizome - a horizontal stem

rho - in molecular genetics, there are a number of proteins involved in termination of transcription (the process whereby RNA is synthesized from a DNA template), particularly a protein called rho, which is involved in assisting RNA polymerase to terminate transcription at certain (rho-dependent) sites in the bacterium, *Escherichia coli*. The mechanism by which rho terminates transcription is not understood, and there are as yet no apparent sequence similarities in these rho-dependent termination regions

rho-dependent terminator - a DNA sequence signaling the termination of transcription. Termination requires the presence of the rho protein

rho-independent terminator - a DNA sequence signaling the termination of transcription. The rho protein is not required for termination

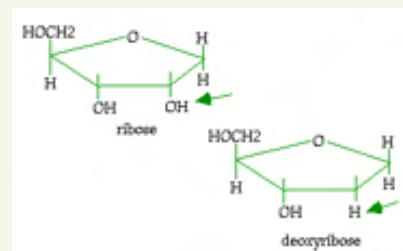
rhomboid - diamond-shaped

rhopalium - one of the sensory receptors in some jellyfish (Scyphozoa), located on the margin of the bell. Rhopalia contain statocysts for equilibrium, and ocelli, which are photosensitive cells which allow the animal to respond to light stimulation

ribbed - describes a surface with a series of ridges

ribbon reef - a large offshore linear reef, seaward of a fringing reef, which is linear but does not form a barrier to the land. A synonym of shelf-edge reef and sill reef

ribose - a monosaccharide containing five carbon atoms per sugar molecule, $C_5H_{10}O_5$. Ribose is a major component of ribonucleic acid (RNA)



A nitrogenous base is combined with a five-carbon sugar, either ribose (for RNA) or deoxyribose (for DNA). The arrows point to the single structural difference between ribose and deoxyribose. (Graphic: San Diego State University)

ribosome - a cellular organelle composed of specific ribosomal RNA (rRNA) and proteins that are responsible for the translation of messenger (mRNA) into protein synthesis

Richter scale - a logarithmic scale that measures the amount of energy released during an earthquake on the basis of the amplitude of the highest peak recorded on a seismogram. Each unit increase in the Richter scale represents a 10-fold increase in the amplitude recorded on the seismogram and a 30-fold increase in energy released by the earthquake

ridge - a long, narrow, continuous elevation of the sea floor covered with shallow water which may support unconsolidated sediments, rocks, or shallow reefs

ring canal - a part of the water vascular system of echinoderms. Specifically, a circumoral ring around the esophagus with connecting radial canals each leading to an ambulacrum. It connects to the madreporite via the stone canal; also, the part of the distributive portion of the digestive system of scyphozoan medusae that is located in the margin of the bell. The ring canal communicates with the radial and adradial canals

ring species - a gene flow situation in which two reproductively isolated populations occupying the same region are genetically connected by a geographic ring of populations that can interbreed

riparian - having to do with living or being located on the edges or banks of streams or rivers



This healthy riparian habitat includes undercut banks, woody debris in the water, and a clean stream bottom.

riprap - large pieces of rock (usually 6 to 30 inches in diameter) which have undergone only primary crushing and sizing, or larger, uncrushed pieces. Riprap is used to stabilize slopes and shorelines and construct erosion-control structures

ritualized behavior - a behavior that once served its own purpose but has come to act as a signal about that purpose. For example, agonistic behaviors that substitute for physical contact and fighting, such as the erection of fins by fishes during displays, the yawn of baboons, the baring of teeth in dogs and wolves, the raising of fur in cats, and birds raising their feathers



The yawn of the baboon is an example of ritualized behavior. (Photo: Gaping Maws (www.animalyawns.com))

riverine - associated with a river and the area adjacent to it; includes all wetlands and deepwater habitats contained within a stream channel

riverine environment - an environment created along permanent and semi-permanent streams because of the increase in soil moisture

riverine habitat - a habitat occurring along a river

rivulated - marked by irregular streaks



the rivulated parrotfish, *Scarus rivulatus*, has a pattern of irregular streaks on its head (Photo: Dr. John E. Randall)

RNA (Ribonucleic acid) - a single-stranded nucleic acid found in the nucleus and cytoplasm of a cell. It is a polymer of the sugar ribose, phosphate, purine and pyrimidine bases. RNA is very similar to DNA, but substitutes the nucleotide, uracil, for thymine. It acts as a "middle-man", converting genetic information from DNA to proteins. There are three types of RNA: mRNA (messenger RNA), which contains the specific sequence of nucleotides necessary to dictate amino acid sequence in proteins; tRNA (transfer RNA), which serves as the "adaptor" to position the appropriate amino acid next to a growing polypeptide chain during protein synthesis; and rRNA (ribosomal RNA), which is the RNA component of ribosomes. In some viruses, RNA is the genetic material

RNA polymerase - an enzyme that catalyzes the bonding reaction between nucleotides of DNA and RNA. Organisms use RNA polymerase to accelerate the process of copying DNA strands during cell reproduction

RNAi (RNA-mediated interference) - a technology based on the silencing of specific genes by double stranded RNA (dsRNA). RNAi has great potential for treating many diseases, including ocular, viral diseases and cancers by silencing RNA messages, thereby preventing the production of disease causing proteins

robust - a large or heavily built body or body part

rock - a naturally occurring aggregate of minerals and/or mineraloids. Rocks are classified by mineral and chemical composition; the texture of the constituent particles; and also by the processes that formed them. Rocks are thus separated into igneous, sedimentary, and metamorphic rocks

roe - fish eggs or egg-filled ovary; the egg mass or spawn of certain crustaceans, such as lobsters



Salmon roe marked for sale at a seafood market in Japan. (Photo: NOAA)

roentgen - unit of x-radiation or gamma radiation

rookery - a breeding ground for gregarious birds or mammals



An albatross rookery at the Midway Atoll National Wildlife Refuge. (Photo: USFWS/Susan Middleton)

Rose Atoll National Wildlife Refuge - Rose Atoll National Wildlife Refuge is located about 2,500 miles south of Hawaii, at the east end of the Samoan archipelago, 180 miles east of Pago Pago, American Samoa. It is the smallest atoll in the world with about 20 acres of land and 1,600 acres of lagoon. The square-shaped atoll protects two small, emergent islands. Rose Island, the larger of the two, is an important nesting area for the threatened green sea turtle and endangered Hawksbill sea turtle. It is within the U.S. territory of American Samoa

rosette - rose-shaped in appearance; arranged in a fashion resembling a rose flower

rostral - towards or relating to the snout or rostrum

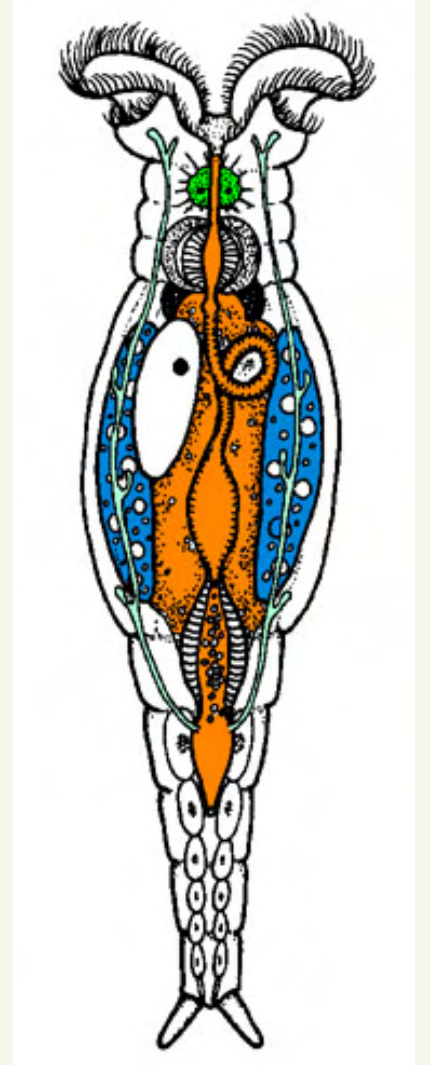
rostrum - an elongate or extended snout



Most dolphins have an elongated beak called a rostrum. (Photo: Copyright Corel Corp.)

rotenone - a very potent general use pesticide found in the roots and stems of several tropical plants. Jewel vine (*Derris* spp.), Lacepod (*Lonchocarpus* spp.), and hoary pea (*Tephrosia* spp.) are the more common plants from which rotenone is derived. It used in some countries to kill predatory fishes prior to introducing parent fish for natural spawning or newly hatched fry. As an effective fish biocide, rotenone is also used for collecting fish specimens, and in some areas for fishing, where it is added to the water and the dead and dying fishes are collected as they float to the surface. In fishes, rotenone impedes circulation to the gills, causing asphixiation

rotifer - rotifers are small invertebrates in the Phylum Rotifera. They range in size from 100 to 2500 microns, with approximately 2000 described species. Rotifers are found in aquatic and semi-aquatic habitats, but are predominantly freshwater inhabitants. Most species are free-living herbivores, bacteriovores or predators, and possess a ciliated, wheel-like organ for feeding and locomotion. Rotifers move by swimming or crawling. Some sessile species are permanently attached to freshwater plants



Internal anatomy of a rotifer. The major systems have been highlighted in color. (Graphic: Livingstone, BIODIDAC)

rRNA (ribosomal RNA) - any one of several large RNA molecules that are structural and functional components of ribosomes

rubbery - a tough, resilient mass

rubble zone - the shallowest part of a reef crest landward of the palmata zone. It consists of broken pieces of coral washed back by storms

rudimentary - a very elementary or early stage of development; not fully developed and not functional; organs in the early stage of development may be rudimentary

rugose - having a rough or ridged surface

rugose corals - an extinct group of non-scleractinian corals

rugosity - an important coral reef parameter that describes the amount of "wrinkling" or roughness of the reef profile. It is an index of substrate complexity. Areas of high complexity are likely to provide more cover for reef fishes and more places of attachment for algae, corals and various sessile invertebrates



A coral reef with a high degree of rugosity.

run aground - to take a boat into water that is too shallow for it to float in, i.e., the bottom of the boat is resting on the ground

runoff - water that has been on land and moves seaward as a result of rain, flooding, irrigation or flushing . Runoff is frequently high in nutrients and suspended sediments, as well as toxicants



Urban runoff or 'storm drain pollution' is one of the leading causes of water pollution in this country. (Photo: NOAA/NOS/Monterey Bay National Marine Sanctuary)

rural area - an area in which most residents depend on agriculture or the harvesting of natural resources for their livelihood

russet - reddish brown color

rusticle - a structure consisting of up to 35% iron compounds (iron oxides, iron carbonates, and iron hydroxides) that forms under water when wrought iron rusts. In appearance, it resembles an icicle or stalactite. The remainder of the structure is a complex community of symbiotic or mutualistic microorganisms, including bacteria and fungi, that use the rusting metal as a source of energy, collectively producing the mineral compounds as waste products and hence forming the rusticle. Structurally, the rusticle contains channels to allow water to flow through. They are very delicate, and easily disintegrate into a fine powder if disturbed. The outer surface of a rusticle is red in appearance while the core is bright orange



Rusticle hanging from the stern section of the RMS Titanic showing secondary growths during maturation. (Photo: Lori Johnston)

rutherford - unit of radioactive decay equal to 1 million disintegrations per second

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: S

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

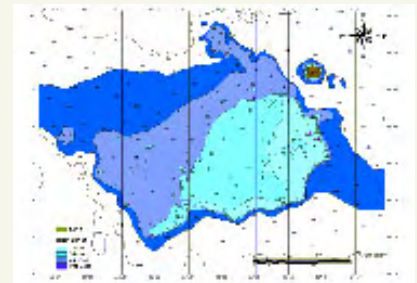
The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

S phase - the cell cycle phase during which the DNA doubles with replication of the chromosomes

Saba Bank - the Saba Bank (17°25' N, 63°30' W) is an undersea elevation with a flattened top, located 3–5 km southwest of the island of Saba. It is raised about 1000 m above the surrounding sea floor. With a length of 60 to 65 km and a width of 30 to 40 km, the total surface area is approximately 2,200 km², as measured from 11-200 meter depth. Approximately Seventy-three percent of this area is shallower than 50 m. Saba Bank is a submerged, living, atoll which ranks among the largest in the world. The total surface area of the Bank where reef structures are present is estimated at approximately 150 km², of which 20-40 km² is estimated to consist of actively growing coral reef. Because of this large expanse of reef and the prevailing westerly ocean currents, the bank likely represents an important source of eggs and larvae of corals, fishes, crustaceans, mollusks, and other kinds of marine life for the many islands lying to the west and north-west of the bank, including the Virgin Islands and Puerto Rico



Bathymetric map of the Saba Bank area with depth contours down to 1000 meters. the bank proper is bounded by the 200 meter depth contour (dark blue area is 200-500 meters). (Map: Saba Environmental Department)

sabellid worm - a marine polychaete worm in the family Sabellidae which lives in flexible tubes constructed of sand grains embedded in mucus



A sabellid worm in its parchment tube. (NOAA/ Dr J.McVey)

saccate - sac-like

safety stop - on ascending from a dive, a safety stop is a specified time spent by a scuba diver at a specific depth, for nitrogen off-gassing. While not mandatory during a no-decompression dive, it is a sound safety practice. A safety stop may be 3-5 minutes at 10-15 ft below the surface

sagittal - relating to the sagittal plane, which extends through the midline of a bilateral animal, dividing it into two equal halves

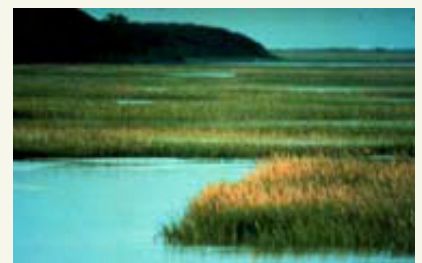
sagittiform - arrow-shaped

Saharan dust - large quantities of dust, originating in the Sahara desert of Africa, are blown across the Atlantic Ocean each summer, and may be a contributing factor for the declining health of Caribbean coral reefs. The dust may modify clouds and rainfall both in Africa and across the tropical North Atlantic as far away as Barbados. Other studies suggest that the dust may play a role in determining the frequency and intensity of hurricanes formed in the eastern Atlantic Ocean

salinity - a measure of the salt concentration of water

salt - an ionic compound composed of a positively charged cation and a negatively charged anion, so that the product is neutral and without a net charge. These ions can be inorganic (Cl-) as well as organic (CH₃-COO-)

salt marsh - a marsh periodically flooded by marine water



A salt marsh. (Photo: NOAA)

sampling - the probabilistic, systematic, or judgmental selection of a sub-element from a larger population, with the aim of approximating a representative picture of the whole

sampling bias - the tendency of a sample to exclude some members of the sampling universe and over-represent others

sampling error - the variability of a statistic from sample to sample due to chance

sampling unit - the sub-element of the total population selected for sampling

sampling universe - the largest entity to be described, of which the sample is a part

sand - coarse sediment typically found in areas exposed to currents and wave energy



Tidal current patterns in the sand and sea grass at low tide.

sand flat - sandy areas found in depressions and gullies in a coral reef, or between patch reefs, or in deeper areas below or beyond the reef. Seemingly near barren during the day, at night sand flats teem with biological activity; also a sandy tidal flat barren of vegetation. A tidal flat is an extensive, nearly horizontal, marshy or barren tract of land that is alternately covered and uncovered by the tide. It consists of unconsolidated sediment (mostly mud and sand)



A patch reef surrounded by sand flats. (Photo: <http://www.biosbcc.net>)

sandflat - a flat expanse of sand on the coast or in an estuary

sanguivore - an animal that obtains its nourishment primarily as blood

sanguivore - an organism feeding principally on blood

saprophyte - any plant that lives and feeds on dead organic matter

saprotroph - an organism which feeds on dead and decaying organisms, allowing the nutrients to be recycled into the ecosystem. Fungi and bacteria are two groups with saprophytic members

Sargasso Sea - the region of the North Atlantic Ocean to the east and south of the Gulf Stream system. This is a region of convergence of the surface waters, and is characterized by clear, warm water, a deep blue color, and large quantities of a floating brown alga called sargassum or gulf weed

sargassum - brown algae (*Sargassum muticum*) with rounded bladders that forms dense floating masses in tropical Atlantic waters, as in the Sargasso Sea

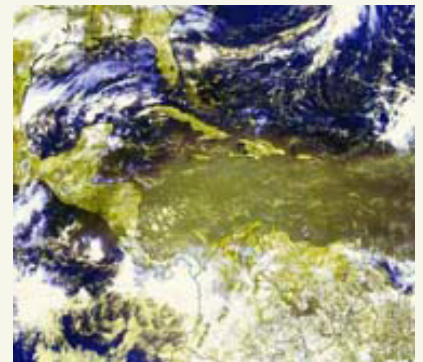
satellite - a small celestial body orbiting a larger one; a man-made object designed to orbit a celestial body; a subviral particle composed of a nucleic acid. For their multiplication, satellites depend on coinfection of a host cell with a helper (master) virus

satellite chromosome - a chromosome that is an addition to the normal genome

satellite colony - a colony that develops within the tissue of a parent colony and which has its own unattached skeleton

satellite DNA - that portion of DNA in eukaryotic cells which consists of highly repetitious sequences of bases (nucleotides) occurring tandemly (end-on-end), typically in the range from 5 to 500 bases. Satellite DNA is located at very specific spots in the genome and can be isolated from the rest of the DNA by density gradient centrifugation, forming a second or "satellite" band

satellite imagery - a representation of the measurement of energy emitted or reflected by the Earth in a variety of wavelengths. Earth observation imagery takes a number of forms, of which the most traditional are optical and near-infrared radiation, from about 0.4 (blue) to 2.0 (IR) micrometers. Apart from visual and near-infrared, other bands of the spectrum commonly used include thermal infrared (heat) and microwave (radar). Each of these has its own applications



GOES-8 (May 1999) image of airborne dust over the Caribbean Sea. This dust originated in the Sahara Desert where it was carried off the coast by strong winds.

satellite mapping - digital maps derived from satellite images

satellite virus - a satellite which encodes the coat protein in which its nucleic acid is encapsulated

saturation - in diving, the degree to which a gas is dissolved in the blood or other tissues. Full saturation occurs when the pressure of gas dissolved in the blood or tissues is the same as the ambient pressure of that gas

saturation diving - the situation where a diver is at a depth or pressure for a long enough period of time (12 hours or longer) to have the partial pressures of the dissolved gases in the body at equilibrium with the partial pressure of the gases in the surrounding environment. Scientists are able to live in and work around underwater habitats for extended periods without the risk of developing decompression sickness (the bends). Divers breathe compressed air mixed with light, inert gases, such as helium. When the diver's blood becomes saturated with helium, the time required for decompression, even if the diver returns to the surface after a period of weeks, is no greater than that required after a dive lasting just a few hours

saxitoxin - a powerful biotoxin produced by bacteria in certain marine dinoflagellates. Saxitoxin may be concentrated in the tissues of filter feeding shellfish, and results in shellfish poisoning when ingested by humans; also known as mytilotoxin

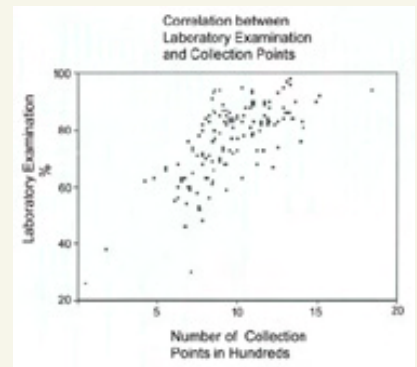
scaffold - the eukaryotic chromosome structure which remains when DNA and histones have been removed. The scaffold is made from nonhistone proteins

scalaradial - an antiinflammatory drug derived from the marine sponge *Cacospongia scalaris*

scale - the degree of resolution at which ecological processes, structures, and changes across space and time are observed and measured

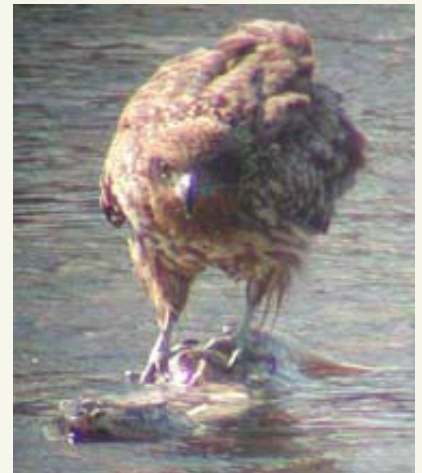
scale-like corallites - corallites that form a pattern which resembles fish scales

scatter diagram - a two-dimensional histogram showing the joint probability density of two variables within a data sample; it is used to interpret data by graphically displaying the relationship between two variables



A scatter diagram.

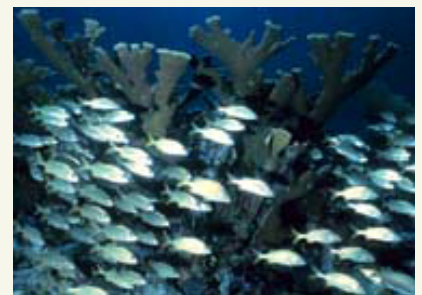
scavenger - an animal that feeds on dead or decaying organic matter



A scavenger feeding on a dead aquatic animal.

schizocoelous - the mesoderm and coelom initially develop from a solid block of mesodermal tissue in an embryo that subsequently develops a split down the middle. The cavity thus formed is the coelom. Schizocoelous development of the coelom occurs in protostomes

school - a social group of fishes (and some other aquatic animals), usually of the same species, which tends to orient and move in the same direction



A school of smallmouth grunt with elkhorn coral in the background. (Photo: Paige Gill, Florida Keys NMS)

schreckreaktion - an alarm response in some fishes as a result of an alarm substance (schreckstoff), or alarm pheromone being introduced into the water via rupture of specialized dermal club cells. Presumably a fish attacked by a predator releases schreckstoff into the water, resulting in the conspecifics making a variety of coordinated escape or fright actions

schreckstoff - a chemical alarm substance (a pheromone) produced by the skin of some groups of fishes when injured. It stimulates conspecifics and perhaps some other fishes to exhibit fright and escape movements

science - a method of learning about the physical universe by applying the principles of the scientific method, which includes making empirical observations, proposing hypotheses to explain those observations, and testing those hypotheses in valid and reliable ways; also refers to the organized body of knowledge that results from scientific study

scientific law - a statement of a scientific fact or phenomenon that is invariable under given conditions. A law may be either quantitative (including measurement) or qualitative (general characteristics). It must describe evidence that has been gathered using acceptable scientific standards of reproducibility. Examples of scientific laws: Faraday's Law of electromagnetic induction, Coulomb's Law of electrostatic attraction, Dalton's Law of partial pressures, and Boyle's Gas Law

scientific name - the Linnaean binomial. A name of a species composed of two words: the genus (or generic) name and the species (or trivial) name, e.g., *Acropora palmata*. The scientific name is always written in italics. The first letter of the generic name is always capitalized; that of the species name is never capitalized

sciophilous - thriving in conditions of low light intensity

Scleractinia - an order of Cnidaria, usually producing calcareous skeletons with hexamerl symmetry



A scleractinian - elkhorn coral (*Acropora sp.*)

sclerite - a skeletal element in octocorals. Sclerites are composed of calcite spicules; also, a hard plate or element of the exoskeleton of some arthropods

scleroblast - a cell within the mesoglea of octocorals that produces a sclerite

sclerocyte - a cell in sponges that produces spongin or spicules

sclerodermite - the basic unit of coral skeletal microstructure. A center of calcification from which bundles of acicular aragonite crystals radiate outward; the hard integument of Crustacea.

scleroseptum - one of many radiating calcareous partitions in the skeletal cup (corallite) of stony corals

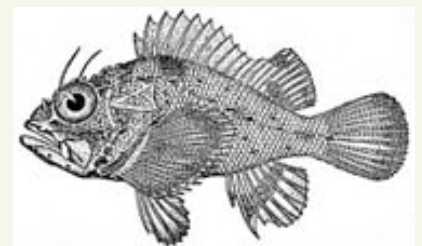
Sclerospongiae - a small class of coralline sponges (phylum Porifera) which are found inhabiting coral reefs. They possess a leuconoid grade of construction and are unique in having an internal skeleton of siliceous spicules and spongin fibers like those of the Demospongiae, together with a massive calcareous basal skeleton. They are often included in the class Demospongiae

scolex - the knoblike anterior end of a tapeworm, having suckers and/or hooklets that, in the adult stage, serve as organs of attachment to the host organism



The scolex of the tapeworm, *Taenia solium*. (Photo: Center for Disease Control)

scorpionfish - any of about nearly 400 species of bony fishes in the family Scorpaenidae. Scorpionfishes have large, heavily ridged and spined heads. They possess venomous spines on their dorsal fins, each with a groove and venom sac. Scorpionfishes are well camouflaged to blend in with their environment with fleshy projections and background coloration. Some can change their color to better match their surroundings. The most venomous fish in the world, the reef stonefish (*Synanceia verrucosa*), is disguised to look like an encrusted rock or lump of coral. This species is widely distributed throughout tropical, marine waters of the Indo-Pacific.



The coral scorpionfish, *Scorpaena albifimbria*. (Illustration: NOAA)

Most species of scorpionfishes are demersal, living on or near the bottom. They are carnivorous ambush predators feeding on crustaceans, cephalopods and fishes

scotoscope - an instrument for detecting objects in darkness

SCUBA (Self-Contained Underwater Breathing Apparatus) - a diving mode independent of surface air supply in which the diver uses open circuit self-contained underwater breathing apparatus which supplies air or breathing gases at ambient pressure



Diver training with a full face mask and underwater communications.

scute - an external horny, chitinous or bony plate or scale, such as those on the shell of a turtle

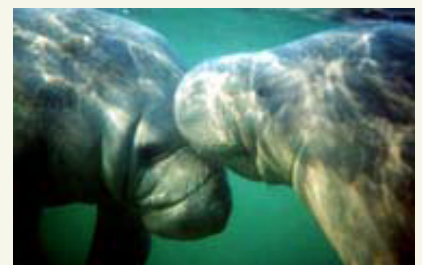


Sea turtle with shell comprised of hard, platelike scutes.

scutiform - shield-shaped

sea - a subdivision of an ocean

sea cow - a large, herbivorous aquatic mammal of the order Sirenia that contains two Recent families: Dugongidae for the genera *Dugong* (dugong, one species) and *Hydrodamalis* (Steller's sea cow, one species hunted to extinction); and Trichechidae for the single genus *Trichechus* (manatees, three species). The dugong inhabits coastal regions in the tropical parts of the Old World, and some individuals go into estuaries and rivers. Steller's sea cow inhabited the Bering Sea, and was the only Recent member of this order adapted to cold waters. Manatees live



The West Indian Manatee, *Trichechus manatus*, in Florida bay. (Photo: Copyright Laurel Canty-Ehrlich, NOAA)

along the coast and in coastal rivers in the southeastern United States, Central America, the West Indies, northern South America, and western Africa

sea cucumber - an echinoderm in the class Holothuroidea. Sea cucumbers possess a flexible, elongated body and leathery skin, and tentacles surrounding the mouth. Although they don't superficially resemble other members of the phylum Echinodermata, they retain pentamerous (five-rayed) symmetry, with five rows of tube feet running from the mouth down along the sides of the body. Sea cucumbers are an abundant and diverse group that are found in nearly every marine environment, but are most diverse on tropical, shallow-water coral reefs. They are economically important in two main ways. They produce chemical compounds that are of interest to pharmaceutical firms, and as a food item in Asia, they form the basis of a multimillion-dollar industry that processes the body wall for sale as beche-de-mer or trepang



Tentacles at the anterior end of the body of this sea cucumber secrete a substance which aids in the capture of detritus and small organisms on sand and rock bottom. The diving tool (knife) is for scale (Photo: E. Williams NURP/NOAA)

sea pansy - a soft coral in the order Pennatulacea and subclass Alcyonaria. A sea pansy is a colony of polyps having different forms and functions. A single, leaf-like, giant primary polyp up to two inches in diameter forms the anchoring stem (peduncle). This peduncle can be distended to better anchor the colony in the substrate. The primary polyp possesses secondary polyps, autozooids (feeding polyps) and siphonozooids (serve as intakes for water, which circulates within the colony and helps keep it upright) on the upper surface. The sea pansy is bioluminescent when disturbed, due to Green Fluorescent Protein.



The sea pansy, *Renilla reniformis*, is a colonial soft coral which anchors itself to the substratum, but is able to crawl about using its leaf-like primary polyp (Photo: South Carolina Department of Natural Resources Southeastern Regional Taxonomic Center)

sea pen - a soft coral in the order Pennatulacea and subclass Alcyonaria. Sea pens are colonial octocorals which exhibits polyp dimorphism. One polyp grows very large, loses its tentacles and forms a central axis. The base of this primary polyp forms a bulb which may be expanded or contracted. The bulb is used to anchor the colony. Branching off this primary polyp are various secondary polyps. Some, called autozooids, are typical feeding polyps. Others, called siphonozooids, serve as intakes for water, which circulates within the colony and helps keep it upright. Calcareous spicules and frequently a central axial rod of calcium carbonate also provide support. One group of sea pens have secondary polyps grouped into "polyp leaves," giving these species a feather-like appearance, from which we get the common name as they look something like old-fashioned quill pens. Most species, however, do not have polyp leaves, and look more like clubs, umbrellas, or pinwheels



One group of sea pens have secondary polyps grouped into "polyp leaves," giving these species a feather-like appearance, from which we get the common name as they look something like old-fashioned quill pens. (Photo: Kåre Telnes (www.seawater.no))

sea snake - a member of the family Hydrophiidae. Sea snakes are common in the Indo-Pacific. Related to cobras, these live-bearing reptiles are highly venomous but not aggressive by nature



This sea snake was photographed and released during a 1998 cruise of the NOAA ship *McARTHUR* to South America.

sea star - an echinoderm characterized by radial symmetry, and usually with five arms (rays) radiating from a central body. Minute pincer-like structures on the arms, called pedicellaria, ensure that the surface of the arms stay free from algae. There are a few sea stars that have 6 or 7 arms, and some with even more. Injuries will also cause more arms to grow. The majority of sea stars are carnivorous and feed on sponges, bryozoans, ascidians and mollusks. Other are detritus feeders or scavengers. Some sea stars, for example the crown-of-thorns that feeds on coral polyps, are specialized feeders; also called "starfish"



The horned sea star (*Protoreaster nodosus*) inhabits shallow water in the lagoon or back reef of Indo-Pacific coral reefs. (Photo: Teresa (Zubi) Zuberbühler) (www.starfish.ch)

sea state - a description of the sea surface with regard to wave action



Fishing vessel battles through rough conditions (sea state). (Photo: NOAA/ National Weather Service/ Ocean Prediction Center)

sea time - logged time spent at sea

sea urchin - sea urchins are echinoderms in the class Echinoidea, that possess a hard calcareous shell (test) armed with spines, which may be long and pointed, or short and pointed, or dull. The spines are used for locomotion (along with tube feet), protection, and for trapping drifting food particulates, such as algae. Most sea urchins are algal grazers but some feed on sponges, ectoprocts and ascidians, and others on detritus. Sea urchins help to keep corals free of overgrowing algae



The rock boring sea urchin, *Echinometra mathaei*, lives in holes and depressions on rock in shallow areas. (Photo: Teresa (Zubi) Zuberbühler) (www.starfish.ch)

SeaBat - a multibeam sonar system that provides high-resolution bathymetry and imagery data in real time for extremely detailed 3-D representation of underwater features and seabed conditions

seagrass - a flowering plant, complete with leaves, a rhizome (an underground, usually horizontally-oriented stem) and a root system. They are found in marine or estuarine waters. Most seagrass species are located in soft sediments. However, some species are attached directly to rocks with root hair adhesion. Seagrasses tend to develop extensive underwater meadows



Seagrass bed.

SEAKEYS - NOAA and the Florida Institute of Oceanography (FIO) supply daily and historical enhanced Coastal-Marine Automated Network (C-MAN) data via the SEAKEYS program. Since 1992, SEAKEYS has provided hourly data from up to seven meteorological and oceanographic monitoring stations situated throughout the Florida Keys National Marine Sanctuary and Florida Bay. These stations measure the usual C-MAN meteorological parameters, such as wind speed, gusts and barometric pressure, but are enhanced with oceanographic instruments measuring salinity, sea temperature, fluorometry and turbidity. These data are collected and presented via email and the Web daily, and are supplied through a historical database on the Web. Unique software developed for SEAKEYS data operates in near real-time and provides alerts as to conditions conducive to natural events such as coral bleaching (Coral Reef Early Warning System [CREWS]), larval conch survival, and in the future, harmful algal blooms



Coastal-Marine Automated Network (C-MAN) Station.

seamount - a submarine mountain, usually conical in shape and volcanic in origin, that rises 1000 meters or more above the sea floor. Some definitions of seamounts do not include the height criterion

Seascape - a large, multiple-use marine area, defined scientifically and strategically, in which government authorities, private organizations, and other stakeholders cooperate to conserve the diversity and abundance of marine life and to promote human well-being. Seascapes typically have high biological diversity, ecological and economic connectivity, and aesthetic and cultural value. Seascapes may include government-authorized protected areas for addressing special management needs and provide an opportunity for government agencies to coordinate their efforts voluntarily to secure more effective regional management programs. Seascapes define places where conservation goals and human well-being can be secured through partnerships between governments, local communities, and non-government and private organizations

seawall - a massive structure built along the shore to prevent erosion and damage by wave action

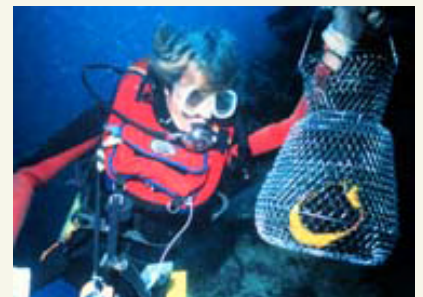
seaward slope - the area of a barrier reef or atoll from the reef crest. It includes spurs, grooves, terraces, reef walls, etc.

SeaWiFS - Sea-viewing Wide Field-of-view Sensor carried on the SeaStar satellite

Secchi depth - the depth at which a Secchi disk disappears from view as it is lowered in water. Secchi disk a white disk 20-30 cm in diameter, used as a qualitative way of measuring water clarity. It is lowered from a vessel and viewed from above the surface in full solar illumination to estimate the light attenuation in the water column. This is done empirically by relating the depth at which the disk disappears to the attenuation of light

Second Law of Thermodynamics - each time energy is converted from one form to another, some of the energy is always degraded to a lower-quality, more dispersed, less useful form; no system can convert energy from one form to another useful form with 100 percent efficiency; energy cannot be transferred spontaneously from a cold body to a hot body. As a result of this fact, natural processes that involve energy transfer must have one direction, and all natural processes are irreversible. This law also predicts that the entropy of an isolated system always increases with time

second stage regulator - in scuba breathing equipment, the second stage regulator, which is attached to the mouthpiece, reduces the intermediate pressure from the first stage regulator (attached to the air tank) to that needed for comfortable breathing at depth



The second stage regulator is contained in this NOAA diver's mouthpiece. (Photo: NOAA/National Undersea Research Program)

secondary male or female - a male or female that is the result of sex change. A secondary male would be derived from a protogynous female, in which there is a regression of the ovaries and a proliferation of testicular tissues. A secondary female would be derived from a protandrous male in which the female primary sex organs replace the testes



Secondary male stoplight parrotfish. Parrotfish can undergo sex reversals during their life history. (Photo: George Ryschkewitsch)

secondary polyp - polymorphic polyps which grow as branches from the supporting primary polyp in colonial octocorals. These secondary polyps are specialized for feeding or water circulation within the colony

secondary production - the production of living material per unit area (or volume) per unit time by herbivores. It is usually expressed as grams carbon per meter square per year

secretion - the passage of a molecule from the inside of a cell through the cell membrane into the periplasmic or interstitial space, or the extracellular medium; the organic process of synthesizing and releasing some substance from the body of an organism

secretory product - a functionally specialized substance, not a waste product, released from a gland or cell. Hormones, for example, are secretory products

section - a thin slice of some biological material for examination under a microscope

section, cross - sliced at right angles to the longitudinal axis of an organism or part

section, oblique - sliced as a section that is neither parallel to the longitudinal axis nor at right angles to this axis of an organism or part

section, saggital or longitudinal - sliced along or parallel to the longitudinal axis of an organism or part

sedentary - not moving. Many organisms, both plants and animals, spend the majority of their lives in one place

sedimentary rock - rock formed from sediments in ancient oceans, e.g., sandstone, limestone, and chalk. Sedimentary rocks can be changed by heat and pressure into metamorphic rocks; any rock resulting from the consolidation of sediment

sediments - soil, sand, and minerals washed from land into water, usually after rain. They pile up in reservoirs, rivers, harbors, and coastal areas destroying habitats, and clouding the water so that sunlight cannot reach aquatic plants. Careless farming, mining, and building activities expose sediment materials, allowing them to wash off the land after rainfall

seep - a small area where water that may be of a different temperature and density flows from below the seafloor and rises slowly into the ocean; a spot where water that is flowing below the earth's surface slowly oozes out to form a small pool or a spring above



Methane bubbles that rise through the seabed sediments may escape gently at the seabed through discrete migration pathways and form seabed seeps (Project CRIMEA)

seepage - the movement of water through a porous medium

segmentation - in many animals, the body is divided into repeated subunits called segments, such as those in centipedes, insects, and annelid worms. Segmentation is the state of having or developing this type of body plan

seine - a fish net that hangs vertically, with floats at the top and weights at the bottom

Sekisei Lagoon - the largest coral reef in Japan, located almost at the southernmost end of the Ryukyu archipelago and designated as a part of Iriomote National Park. The Lagoon has a rich ecosystem and is a major source of coral larvae for distant reefs in the Ryukyu and Honshu Islands

selective pressure - forces acting on populations that determine that some individuals are more reproductively successful or genetically fit than others, and contribute more descendants (or genes) to subsequent generations

self-fertilization - when a sperm cell and ovum from the same organism fuse and form a zygote

semelparity - the reproductive condition where individuals reproduce only once during their lifetime

seminal receptacle - a sac that stores spermatozoa (sperm cells) prior to fertilization of an egg

semipermeable membrane - a thin membranous barrier that permits passage of particles up to a certain size or of a special nature; also referred to as a 'differentially permeable membrane'

semispecies - populations of a species that are completely isolated from one another but have not yet evolved into truly different species

senescence - the aging process in mature individuals; the period near the end of an organism's life cycle

senior homonym - in taxonomy, the older, or earliest established taxonomic name

senior synonym - in taxonomy, the older name of two synonyms

sens. lat. - in the broad sense (*sensu lato*)

sensor - a device that receives electromagnetic radiation and converts it into a signal that can be recorded and displayed as numerical data or as an image

sensory receptor - a neurological structure specialized to respond to stimuli and changes in the internal or external environment of an organism. Sensory receptors consist of neuron endings and specialized cells in close contact with neurons

septate shell - a shell divided into smaller chambers, as in the chambered nautilus (Cephalopoda-Mollusca)

septum - a thin partition

septum (pl. septa) - the skeletal plate that projects into the calyx from the theca. Septa may be subdivided into primary, secondary, and tertiary structures



Skeleton of a coral polyp. Notice the septa radially arranged around a central axis.

septum, primary - in corallites, full partitions that separate two sets of mesenterial pairs

septum, secondary - in corallites, partial partitions that separate mesenteries within a mesenterial pair

sequence - the order of neighboring amino acids in a protein or the purine and pyrimidine bases in DNA or RNA

sequencing - analytical procedures for the determination of the sequential order of amino acids in a polypeptide chain or nucleotides in a DNA or RNA molecule

sequential hermaphrodite - a form of hermaphroditism where individuals can change sex, but the sexes are separate

serotonin receptor - a receptor for the neurotransmitter serotonin (5-hydroxytryptamine or 5-HT). The receptors are located on the cell membrane of nerve cells (neurons) and other cell types, such as smooth muscle cells

sere - the series of communities that follow one another in a natural succession, as in the change from a bare field to a mature forest

serehd - the serehd or Pohnpei Lory (*Trichoglossus rubiginosus*) is a small, brightly colored parrot indigenous to Pohnpei Island in the Federated States of Micronesia. It is the state bird of Pohnpei

serial homology - representative or repetitive relation in the segments of the same organism, as in the lobster, where the parts follow each other in a linear series; repeated structures within an organism that have similar developmental origins

serial spawning - spawning more than once in a season

series - in taxonomy, the sample available for study

serosa - a serous membrane

serotonergic - a term that means "related to the neurotransmitter serotonin". A synapse is serotonergic if it uses serotonin as its neurotransmitter. A substance is serotonergic if it is capable of producing, altering, or releasing serotonin

serotonin - a neurotransmitter (5-hydroxytryptamine, 5-HT) necessary for communication between nerve cells

serotonin receptor agonist - a compound that activates serotonin receptors, mimicking the effect of the neurotransmitter serotonin

serotonin receptor antagonist - a chemical that acts to inhibit serotonin receptors

serous membrane - an epithelial and connective tissue membrane that lines body cavities and covers visceral organs within these cavities. Epithelial cells constituting this membrane secrete a fluid (serous fluid) to the membrane's surface, which keeps the membrane moistened; also called "serosa"

serpulid worm - a marine polychaete worm in the family Serpulidae which secretes and lives in a rigid calcareous tube



Tiny tubes of a tube-building serpulid worm.
(Photo: NOAA)

serrate - saw-like; notched

server - a computer which is designed to be accessed by many other computers. Servers can be attached to local area networks and/or be hooked up to the internet. With the proper software and connections, servers can control the distribution of email, store World Wide Web documents, and provide access to files that are shared by many users

sesquiterpene isocyanides - a class of toxic chemicals which act as defensive chemical secretions in some sea slugs

sessile - describes an immobile organism because of its attachment to a substrate. The term has also been applied to organisms, such as anemones, that move very slowly



A sessile colonial anemone (*Epizoanthus americanus*) living in Gray's Reef off Sapelo Island, GA.

seston - minute particulate material moving in water that is composed of both living organisms, such as plankton, and non-living matter such as plant debris and suspended soil particles

set - in mathematics, a collection of things without regard to their order

seta - a cuticular hair arising from the outside of the exoskeleton of an invertebrate

setiform - bristle-like; brush-like

setose - bearing setae

sewage - the total of organic waste and waste water generated by residential and commercial establishments

sex chromosome - a heteromorphic chromosome that plays a role in sex determination, such as the X and Y chromosomes, whose distribution in a zygote determines the sex of the organism; a chromosome whose DNA determines sexual characteristics in females (X)-and males (Y)

sex inversion - change of sex naturally or after steroid hormone application; also called "sex reversal"

sex ratio - the relative number of males and females in a population.

sex-linked gene - a gene coded on a sex chromosome, such as the X-chromosome-linked genes

sexual dichromatism - pertaining to differences in color and color pattern between the sexes of a particular species



Sexual dichromatism in the freshwater southeast Asian dwarf gourami, *Colisa lalia*. The male is to the left of the female.

sexual dimorphism - pertains to systematic differences between males and females. The two sexes are markedly dissimilar in appearance



Female (above) and male (below) sockeye salmon (*Oncorhynchus nerka*) show extreme sexual dimorphism (color, male hump).

shakedown dive - a practice scuba dive to make sure that the equipment works and the divers understand procedures

shape file - a set of files that contain a set of points, arcs, or polygons (or features) that hold tabular data and a spatial location. This file format is used in ArcView software

shearwater - any of about 25 species of medium-sized, long-winged seabirds in the family Procellariidae. Those in the genus *Procellaria* are usually called 'petrel'



The pink-footed shearwater (*Puffinus creatopus*) occurs primarily in the eastern

shelf break - nearshore bathymetry characterized by rapid and substantial increases in depth that are continuous with the deeper parts of the ocean

shelf escarpment - the edge of the bank/shelf where depth increases rapidly into deep oceanic water

shelf reef - a reef that forms on the continental shelf of large land masses

shelf-edge reef - a synonym of ribbon reef

shellfish - a term that includes both molluscs, such as clams and oysters, and crustaceans, such as lobsters and shrimp



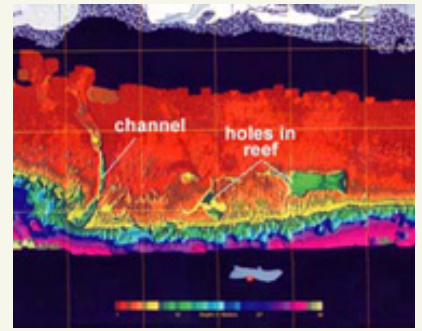
Edible crabs, shrimp, lobsters, crayfish, clams, mussels, scallops, and oysters are considered shellfish.

shifting baseline - refers to the incremental lowering of environmental standards, in which each new generation lacks knowledge of how the environment used to be, redefines what is "natural," according to personal experience, and sets the stage for the next generation's shifting baseline

shoal - a submerged expanse of coral reef, surrounded by deep water, which does not form a part of a barrier or fringing reef

shoal (biol.) - a social group of fishes of the same species that are not always similar in size or equal in social status. The shoal does not usually move in a highly coordinated fashion, as does a school. Shoals are typically found in shallow water or at the surface. Some consider shoals to be schools in shallow water

SHOALS (Scanning Hydrographic Operational Airborne Lidar Survey) - SHOALS is a laser-based scanning LIDAR bathymeter which collects high-resolution bathymetric data in shallow, offshore areas. Map products provide a view of sea-floor topography. In areas with coral reefs, this includes not only the top surface of the reef but also associated channels and sand flats



SHOALS imagery of the South Moloka'i reef tract shows the position of a distinctive channel that crosses the reef and a large hole in the reef. The large hole is shown below in oblique view. The origin of features such as this one is being investigated by USGS scientists. (Photo: U.S. Geological Survey)

shore bird - any of various species of bird, such as the sandpiper, plover, or snipe, that frequents the shores of coastal or inland waters



This sand piper is foraging for food on a beach. (Photo: Mary Hollinger/NOAA)

shore reef - a synonym of fringing reef

shore species - marine fishes that are always found near the shore

shoreline - the line separating land and water. It fluctuates as water rises and falls



Shoreline of Fanning Island in the South Pacific.

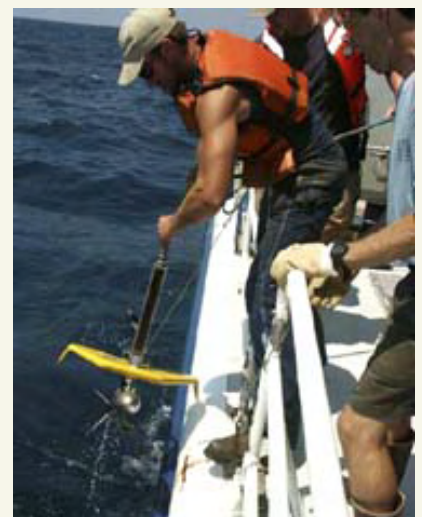
shoreline - the intersection of the land, including man-made waterfront structures, with the water surface. The shoreline depicted on NOS maps and charts represents the line of contact between the land and a selected water elevation. In areas affected by tidal fluctuations, the shoreline is the interpreted mean high water line. In confined coastal water of diminished tidal influence, the mean water level line may be used. In non-tidal waters, the line represents the land/water interface at the time of survey. In areas where the land is obscured by marsh grass, cypress or similar marine vegetation, the actual shoreline can not be accurately represented. Instead, the outer limit line of the vegetation area is delineated (where it would appear to the mariner as the shoreline) and is referred to as the apparent shoreline

shower - precipitation that is intermittent in time, space or intensity

sibling species - closely-related species that are nearly morphologically indistinguishable

sic - thus

side scan sonar - sonar designed to look sideways and at a downward angle from both sides of a towed unit, called a towfish. The bottom and any objects in the water above the bottom reflect sound waves back to the towed array. An image is produced from this information



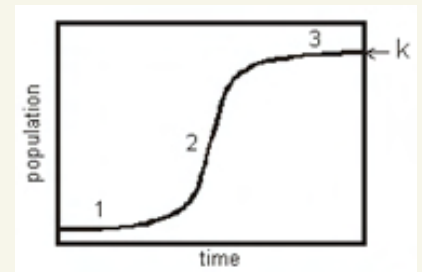
Deployment of the side scan sonar tow vehicle,

also called a 'fish'. (Photo: NOAA)

sieve plate - a structure in echinoderms through which water can flow in either direction between the water vascular system and the surrounding ocean; also known as the madreporite

sigma - an informal name for the standard deviation. The lower case Greek letter sigma (σ) is the usual symbol for the standard deviation

sigmoid growth - a growth rate trend characterized by an elongated S-shaped, or sigmoid curve. It is typical of population growth rate trends which begin rapidly at an exponential rate but slow as limiting factors are encountered until a limit is approached asymptotically



This sigmoid (or s-shaped) curve is characteristic of many growth situations.

sign - evidence as is perceptible to the examiner, as opposed to the subjective sensations of the patient (symptom). Sign, not symptom should be used to describe lesions or conditions observed in coral, as the ability to convey sensations is not a characteristic of coral

sign stimulus - the effective part of an action or object that triggers a highly stereotyped innate behavior (or fixed action pattern) in an animal by means of a hypothetical neural pathway called the innate releasing mechanism (IRM)



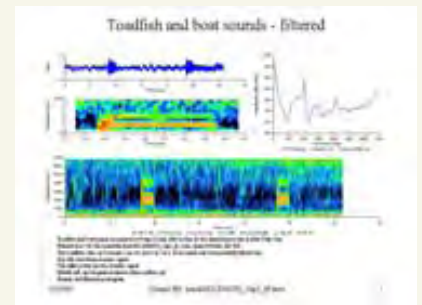
The red belly of the male three-spined stickleback (*Gasterosteus aculeatus*) acts as a sign stimulus to "release" aggressive behavior in a rival male or courtship behavior in a female. (Photo: Mid Northants Trout Association/Kevin Rowley)

signal transduction pathway - a series of sequential events by which a signal outside of a cell causes a functional change inside the cell. Signal transduction pathways transfer the signal through a series of intermediate molecules until final regulatory molecules are modified in response to the signal. Signal transduction pathways are important means of regulating numerous cellular functions in response to changes in the cell's chemical or physical environment

signal-to-noise ratio - the difference between the source level of a sound signal from a source and the source level of the background noise

signalment - in pathology, a detailed description of an organism whose health is being examined. It includes physical characteristics, taxonomic identification, and specimen collection information

signature sound - a unique sound that is associated with a specific sound source



The signature sound of a toadfish.

significance level (level of significance) - in statistics, the probability of a false rejection of the null hypothesis in a statistical test

Sikes Act - passed in 1960, and amended several times, the Sikes Act authorizes the Secretary of Defense to develop cooperative plans for conservation and rehabilitation programs on military reservations and to establish outdoor recreation facilities. The Act also provides for the Secretaries of Agriculture and the Interior to develop cooperative plans for conservation and rehabilitation programs on public lands under their jurisdiction. Some coral reefs are affected by this Act

siliceous - composed of silicon or primarily of silicon

sill - the lowest point on a submarine ridge or saddle at a relatively shallow depth, separating a basin from an adjacent sea or another basin

sill reef - a synonym of ribbon reef

silt curtain - a temporary impenetrable barrier of flexible geotextile material used to contain sediments within a defined zone in the aquatic environment. This curtain is weighted at the bottom to achieve closure while supported at the top through a flotation system; also called a "turbidity curtain"

simple - not divided or branched

simultaneous hermaphrodite - a form of hermaphroditism where individuals simultaneously possess functional testes and ovaries, and can release either male or female gametes during spawning

sine - without

single nucleotide polymorphism (SNP) - a SNP (pronounced "snip") is a small genetic change, or variation, that can occur within an organism's DNA sequence. The genetic code is specified by the four nucleotides: adenine, cytosine, thymine, and guanine. SNP variation occurs when a single nucleotide, such as adenine, replaces one of the other three nucleotides. SNPs found within a coding sequence are of particular interest to researchers because they are more likely to alter the biological function of a protein. Because of the recent advances in technology, coupled with the unique ability of these genetic variations to facilitate gene identification, there has been a heightened activities of SNP discovery and detection

single-stranded - a term used to describe nucleic acid molecules consisting of only one polynucleotide chain. The genomes of certain phages are single-stranded DNA molecules; rRNA, mRNA and tRNA are all single-stranded nucleic acids

single-stranded DNA - a single chain of deoxyribonucleotides that occurs in some bacteria and viruses. It usually exists as a covalently closed circle

sinistral - left, as opposed to dextral, or right

sink - a process or place that acts to absorb or remove energy or a substance from a system. The ocean, for example, is a sink for carbon dioxide



The marine environment is a sink for many nutrients. (Photo: copyright Digital Vision Ltd.)

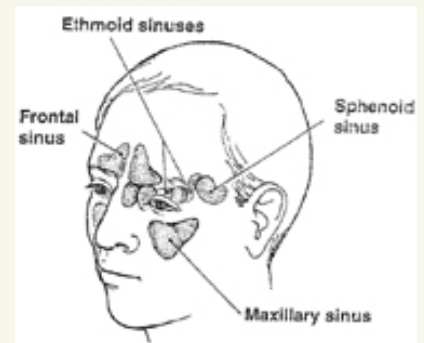
sink habitat - a habitat in which reproduction is insufficient to balance mortality. The population can persist in the habitat only by being a net importer of individuals

sink population - a population that occupies habitat types in which reproductive output is inadequate to maintain local population levels. The population may be replenished by emigrants from source populations

sink population or species - a population or species that cannot reproduce fast enough to replace themselves. Sink populations or species are present only because immigrants compensate for excess deaths in the area. Eventually, sink species will disappear from isolated areas

sinkhole - a depression formed in an area either by dissolving of the surface limestone or by collapse of underlying cavities

sinus - one of several air spaces within the skull that are in contact with ambient pressure through nasal passage openings in the posterior pharynx; a sac-like space



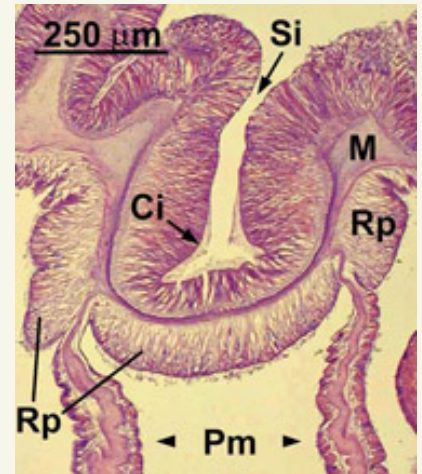
The sinuses are a group of 4 pairs of air filled spaces in the head. They are called the ethmoid, maxillary, sphenoid, and frontal sinuses. They warm and humidify the air as one breathes. They also trap and filter organic and non-organic particles from the air, such as bacteria, spores, and dust. (Graphic: Cystic Fibrosis Center at Stanford University)

siphon - an opening in molluscs or in urochordates (tunicates) which draws water into the body cavity. In many molluscs, such as octopods and squids, the siphon may be used to forcibly expel water, providing a means of propulsion



An octopus rapidly swimming by forcibly expelling water through the tubular siphon projecting from the head. (Photo: Jeff Jeffords)

siphonoglyph - a groove in the pharynx of some cnidarians that is lined with cilia which pump water into the animal's gastrovascular cavity. This water current inflates the body, circulates fluids, and provides a volume of water to act as a hydrostatic skeleton



A microscopic section showing the siphonoglyph of a sea anemone from Chile, *Anemonia alicemartinae* (Siphonoglyph (Si) with "reticulated pads" (Rp); Ci: cilia; M: mesoglea; Pm: pair of perfect mesenteries). (Photo: V. Häussermann & G. Försterra/U. Frankfort)

siphonophore - siphonophores are "colonial jellyfish" which have swimming bells at the top, and tentacles with stinging cells below that help them to catch their prey. Each individual of the colony is specialized for a different function, such as swimming, feeding and reproduction. Some siphonophores can be more than 10 meters long. They are in the phylum Cnidaria, class Hydrozoa and order Siphonophora



Siphonophores are actually colonies of individuals, each specialized for different functions such as swimming, feeding and reproduction. (Photo courtesy of Marsh Youngbluth and NOAA Ocean Explorer)

siphonozoid - a specialized polyp found in colonial soft corals, such as sea pens and sea pansies, which functions as an intake for water, which circulates within the colony and helps keep it upright

siphosome - in hydrozoans, the region of the siphonophore colony that bears all zooids except the nectophores

siphuncle - a tubelike structure in the body of a shelled cephalopod, such as the chambered nautilus, extending through the partitions of each chamber of the septate shell; the term is also used to describe tubular structures that direct water flow, or as a feeding siphon of several different kinds of invertebrates

Sipuncula - an animal phylum that contains the peanut or starworms. They are small, non-segmented benthic animals (they are not worms), some of which live in coral crevices, empty mollusk shells or marine worm tubes. Several species bore into coralline rock

siRNA (short interfering RNA) - a 21-23 nucleotide-long RNA that mediates messenger RNA (mRNA) catalysis; used in gene suppression

sister group - a taxon thought to be the closest relative of a given taxon, exclusive of the ancestral species of both taxa

sister taxa - two taxa that are more closely related to each other than either is to a third taxon; monophyletic taxa that are each other's closest relatives, i.e., they share an immediate common ancestral species

site fidelity - the behavior of certain animals whereby they return, reproductive season after reproductive season, to the same breeding site

sixteen S RNA gene (16S rRNA gene or 16S ribosomal RNA gene) - a particular kind of RNA used as a molecular tool to extract and compare bits of a particular kind of RNA from samples in order to determine if previously known or new microorganisms are present in a particular environment. This technique is widely used as a biomarker and for microbial ecology studies. The 16S rRNA gene is very short, just 1,542 nucleotide bases, and can be quickly and cheaply copied and sequenced

skeletal density - certain massive coral species (e.g. *Porites*) exhibit annual variations in the density of their calcium carbonate (CaCO_3)

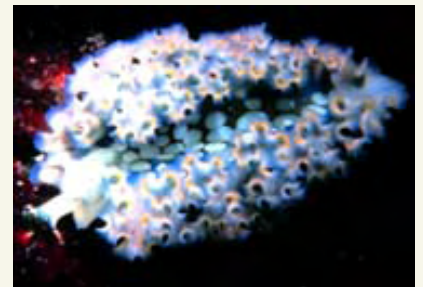
skeleton, similar to tree rings. The annual density bands are revealed when slices of coral skeleton are X-rayed

skeleton - a supportive or protective structure or framework of an animal, a plant, or part of an animal or plant. In animals it is an external (exoskeleton) or internal (endoskeleton) support structure, against which the force of muscles acts. Vertebrates have a skeleton of bone or cartilage; arthropods have one made of chitin; corals have one of calcium carbonate; sponges have a mass of spicules; many other invertebrates use a hydrostatic skeleton, which is an incompressible fluid-filled region of their body. In plants, the skeleton may be a rigid protective covering, as in the shell of a diatom, or the vascular system of a vascular plant

skerry - a low-lying rocky island or reef, often without terrestrial vegetation, and frequently swept by waves

skewness - A measure of the degree to which a distribution is asymmetrical

slug - a pulmonate or opisthobranch gastropod in which the shell is absent, or reduced and buried within the mantle



Lettuce sea slug (*Tridachia crispata*) from the Florida Keys National Marine Sanctuary.

slurp gun - a tube-shaped fish collecting device that operates somewhat like a syringe by sucking up fish or other specimens

smooth - describes a surface without projections; glabrous

snapper - any species of bony fishes in the family Lutjanidae. Snappers are found in the tropical and subtropical regions of the Atlantic, Pacific, and Indian oceans. A few are estuarine to entirely freshwater. Many species are popular food and game fishes. Some ha



Large aggregations of gray snapper, *Lutjanus griseus*, are frequently observed among coral reefs, rocky areas, estuaries, and mangrove habitats. (Illustration: FAO Species Catalogue)

sneaky male - a small, non-dominant male fish which attempts to fertilize eggs by darting suddenly onto the nest site; also called "sneaker"

snorkel - a breathing device that allows a swimmer to breathe while face down in the water. It consists of a bent plastic or rubber tube fitting into a swimmer's mouth and extending above the surface



This swimmer is breathing through a snorkel. (Photo: Courtesy of Cayman Islands Department of Tourism)

snout - the portion of the head that is just anterior to the eyes



Measuring the snout length of a fish.

social behavior - any kind of interaction between two or more animals, usually between animals of the same species

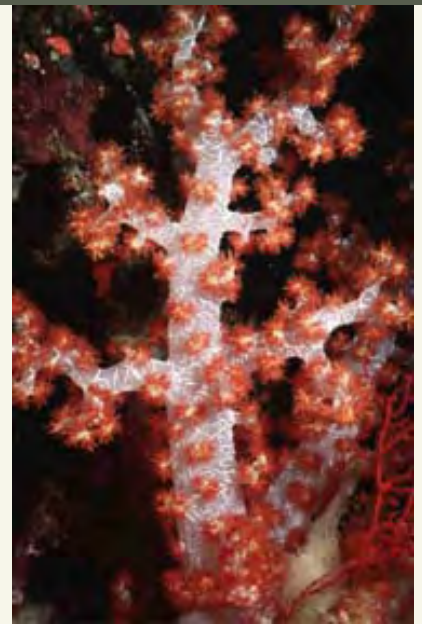
social group - a small population in which the individuals are bound together in relatively stable patterns of interaction and in some ways depend upon each other for its survival

social rank - in animal behavior, the position an animal holds in a social group of the same species

sociobiology - the systematic study of the biological basis of all social behavior. Sociobiology works entirely within the neo-Darwinist evolutionary paradigm in which "each phenomenon is weighed for its adaptive significance and then related to the basic principles of population genetics

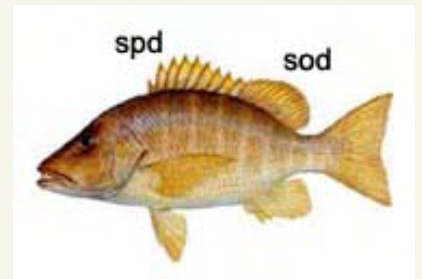
SocMon Guidelines - SocMon is a set of guidelines for establishing a socioeconomic monitoring program at a coastal management site. The guidelines provide a prioritized list of socioeconomic variables useful to coastal managers as well as the questions for data collection and the tables for data analysis. It is expected that the guidelines will be tailored to each site's needs. SocMon is a companion to the GCRMN Socioeconomic Manual for Coral Reef Management (GCRMN Manual)

soft coral - common name for species of the anthozoan order Alcyonacea of the subclass Octocorallia. In contrast to the hard or stony corals, most soft corals do not possess a massive external skeleton



Beautiful specimen of soft coral

soft dorsal - a dorsal fin containing only soft rays, or the soft-rayed hind part of the dorsal fin, if both spines and soft rays are present (as in squirrelfish)



The spiny dorsal (spd) and soft dorsal (sod) fin of a schoolmaster snapper. (Photo: Fishing-Florida.com)

sol - a liquid colloidal dispersion; a cytoplasmic phase (the other phase is a gel)

solar energy - electromagnetic energy from the Sun

solar radiation - the amount of radiation or energy received from the sun at any given point

solar year - the time it takes the Earth to make one orbit around the Sun; approximately 365.2422 days

soleiform - slipper-shaped

solenium - in octocorals, a small gastrodermis-lined canal which penetrates the coenenchyme to join a network of other solenia which fuse with the larger gastrovascular canals to connect the gastrovascular cavities of the polyps

solitary coral - coral polyps can be solitary or colonial. Solitary forms remain as a single individual polyp and one corallite

solstice - either of the two times of the year when the sun is the greatest distance from the celestial equator, occurring about June 22 and December 22

solute - the chemical substances dissolved in a solution, such as salts in seawater

solution - a liquid mixture in which the minor component, the solute, is uniformly distributed within the major component, the solvent

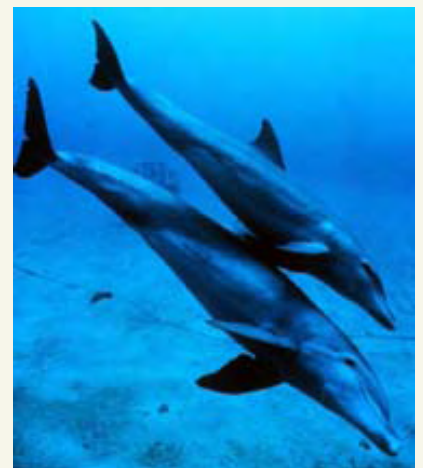
solvent - the liquid in which a solute is dissolved to form a solution

solvolysis - a reaction with a solvent involving the rupture of one or more bonds in the reacting solute

somatic mutation - a change in the genetic structure that can occur in any of the cells of the body except the reproductive cells, and therefore is neither inherited nor passed to offspring. Also called an 'acquired mutation'

somite - a segmental mass of mesoderm in the vertebrate embryo, occurring in pairs along the notochord, and developing into skeletal muscles and vertebrae; in some invertebrates, the term "somite" refers to a metamere

sonar - SONAR is an acronym for "sound navigation and ranging." Active sonar describes an apparatus that transmits high frequency sound waves in water and registers the vibrations reflected back from an object. Passive sonars listen without transmitting. They are usually military (although a few are scientific). Some marine animals, such as whales and dolphins, use echolocation systems similar to active sonar to locate predators and prey

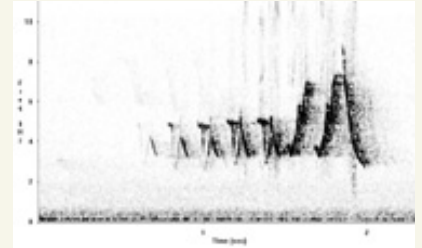


Mother and juvenile bottlenose dolphins (*Tursiops truncatus*). Dolphins and whales can use echolocation to help navigate.

sonic muscle - in fishes, a muscle(s) associated with the swimbladder, which when contracted against the swimbladder wall, produces sounds associated with territorial and reproductive behavior

soniferous - sound producing

sonograph - a hard copy display of sound data generated either in real time or from recorded data. Also known as a sonogram



Sonograph of a crested warbler. Time is on the x-axis and frequency (pitch) is on the y-axis. The sonograph shows discrete pulses of sound over time. Loudness (amplitude) is indicated by the darkness of the pulse.

sorus - a group or cluster of sporangia

sound - a longitudinal pressure wave produced by the vibration of molecules in an elastic medium, which can be a liquid, solid, or gas. As the molecules are set in motion, they radiate outwards, colliding into other molecules (compression), then move apart farther than their equilibrium distance (rarefaction), travelling in this manner until they stimulate a sound receptor organ, such as an ear or tactile organ. The receptor translates the mechanical energy of the pressure wave to electrochemical energy of a nervous system, which stimulates a hearing or tactile sensation in the receiving organism

source DNA - the DNA from an organism that contains a target gene. This DNA is used as starting material in a cloning experiment

source habitat - a habitat that is a net exporter of individuals

source population - a population that occupies a habitat suitable for reproduction, in which the quantity of offspring results in a population that exceeds the carrying capacity of the local habitat, thereby promoting dispersal

source species - a species whose births exceed deaths in an area. Source species can provide individuals to populate other areas

Southern Cross - a small conspicuous constellation in the southern hemisphere in the Milky Way near Centaurus

Southern Oscillation - a large-scale atmospheric and hydrospheric fluctuation centered in the equatorial Pacific Ocean. It exhibits a nearly annual pressure anomaly, alternatively high over the Indian Ocean and high over the South Pacific. Its period is slightly variable, averaging 2.33 years. The variation in pressure is accompanied by variations in wind strengths, ocean currents, sea-surface temperatures, and precipitation in the surrounding areas. El Niño occurrences are associated with the phenomenon

sovereign - an independent or non-independent jurisdiction which itself possesses or whose people possess in their own right the jurisdiction's supreme authority, regardless of the jurisdiction's or people's current ability to exercise that authority

sp(p) - abbreviation for species, singular and plural

spacer region - a sequence of nucleotides in a DNA molecule between coding genes

spat - tiny single corallites that form immediately after the metamorphosis of planula larvae

spathiform - resembling a rounded pole in form

spatial data - information about the location and shape of, and relationships among, geographic features, usually stored as coordinates and topology

spatial index - the ratio of reef surface contour to linear distance. As part of a monitoring program employing a chain transect protocol, the spatial index provides a way to quantify changes in the topographical complexity of the reef

spatial index - as pertaining to coral reef ecosystems, the ratio of reef surface contour distance to linear distance. A high index indicates a surface of high rugosity

spatulate - spoon or broadly blade-shaped

spawn - to produce or deposit eggs; the eggs of aquatic animals; the mass of eggs deposited by fishes, amphibians or mollusks; offspring in great numbers or masses; to give forth young in large numbers



Fish spawn (egg mass)
deposited on a coral.
(Photo: Kev Jacklin)

spawning - in corals, the release of gametes into the water

specialist - an organism which has adopted a lifestyle or niche specific to a particular set of conditions

specialist species - species that have a relatively narrow ecological niche

speciation - the evolutionary process that gives rise to a new species

species - in sexually reproducing organisms, a species is a group of genetically related organisms, usually similar in physical appearance, that actually or potentially interbreed and are reproductively isolated from other groups

species aggregate - a group of species that are morphologically similar and therefore difficult to identify

species at risk - an extirpated, endangered or threatened species or a species of special concern (formerly called "vulnerable")

species diversity - the number of different species in an area and their relative abundance

species group - a group of species considered together, often because they are difficult to differentiate without detailed examination, e.g., very similar species; a group of closely related species; a superspecies

species of concern - species about which NOAA's National Marine Fisheries Service (NMFS) has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the Endangered Species Act

species of special concern - species which are particularly sensitive to human activities or natural events but not endangered or threatened. Special concern was formally referred to as "vulnerable"

species recovery plan - a plan for restoration of an endangered species through protection, habitat management, captive breeding, disease control, or other techniques that increase populations and encourage survival

species richness - the number of species in an area or biological collection

specific action potential - instinctive behavior, triggered by internal chemico-physiological factors that builds to a certain level, and allows the behavior to take place. This build up is called the specific action potential. It is responsible for an animal performing one behavior in preference to other behaviors

specific name - the second name in a binomen and in a trinomen

speciose - having many species

spectrometer - an instrument for measuring wavelengths of light of a spectrum

spectrophotometer - an instrument for measuring speed of different parts of light spectrum

spectroradiometer - a radiometer that measures radiant energy as a function of wavelength

spermary - an organ in which male gametes (sperm cells) are produced. The term is usually used in reference to invertebrate animals

spermatangium - the male gamete-producing reproductive organ in certain algae

spermatium - a non-motile male gamete produced by a spermatangium in red algae

spermatocyte - a male gametocyte, which in the meiotic process, develops into four haploid spermatids, each of which develop into a spermatozoan

spermatogenesis - the process of sperm cell (spermatozoa) development in male animals, in which the diploid number of chromosomes is reduced by half to the haploid number in the spermatozoa

spermatophore - a packet containing sperm cells which is produced by the male genital system for transfer to the female. This method of sperm transfer is found in some vertebrates (salamanders) as well as invertebrates

spermatozoan - a sperm cell; the male reproductive cell; the male gamete

spicule - one of the numerous small to minute calcareous or siliceous bodies occurring in and serving to stiffen and support the tissues of various invertebrates, as in the majority of sponges, alyconarians, and many radiolarians, holothurians and compound ascidians

spicule - minute, hard, needle-like or sharp-pointed processes or projections

spinate - spine-like or composed of spines

spine - a sharp hard bony structure on the skeleton or skin. Body spines serve as predator deterrents; a usually stiff, sharp, dermal rod which supports a fin in fishes

spiniform - spine-shaped

spiny lobster - a crustacean of the Family Palinuridae; it lacks large claws and has a flexible, leathery tail fan



Spiny lobsters in a seagrass bed.

spiracle - one of the external openings communicating with the air tubes (tracheae) or book lungs of certain arthropods; a tubular opening, formed from the modified first gill cleft, communicating with the gill cavity of certain ganoid (e.g., gar pike, bowfin) and all elasmobranch fishes

spiral cleavage - a developing embryo has spiral cleavage if, as it undergoes cleavage and changes from a four-cell embryo to an eight-cell embryo, the cells divide at slight angles to one another, so that the none of the four cells in one plane of the eight-cell stage is directly over a cell in the other plane. Spiral cleavage is characteristic of protostomes

spirocyst - an anthozoan cnida structured as a thin, single walled capsule containing a long, sticky, spirally coiled, unarmed tubule of uniform diameter

spirocyte - a cell in anthozoans that produces a spirocyst

spirotele - a type of nematocyst

spit - a stretch of sand, attached to the land at one end, and extending out into the sea

splicing - the removal of introns and joining of exons to form a continuous coding sequence in RNA

split spawning - spawning occurring over consecutive nights or consecutive lunar cycles within a reef

splitter - refers to a taxonomist who focuses more on small differences among taxa, emphasizing minor variation among individuals, and who tends to recognize more taxa

sponge - a multicellular animal (metazoa) below the tissue grade of construction. Sponges belong to the phylum Porifera. There are approximately 5,000 living species classified in three distinct groups, the Hexactinellida (glass sponges), the Demospongia, and the Calcarea (calcareous sponges). They are important components of a coral reef ecosystem



Tube sponges (Phylum Porifera) with sea fans (gorgonia) in background.

sponge (2) - the egg mass of a female crab, which she carries attached to long "hairs" on her pleopods



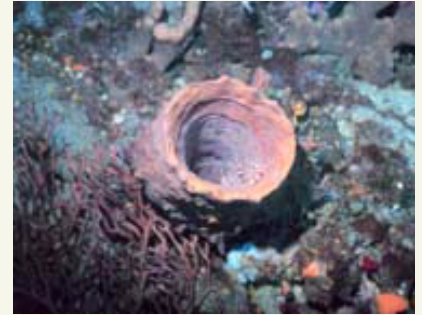
Depending on the size of the female, female blue crabs carry and release 800,000 to 8,000,000 eggs (Photo: Smithsonian Environmental Research Center)

spongidines A-D - an antiinflammatory drug derived from marine sponges in the genus *Spongia*

spongin - a fibrous horny protein that forms the skeletal framework of some sponges

spongistatin - a marine pharmaceutical, extracted from the marine sponge *Hyrtios erecta*, which has broad-spectrum antifungal activity. It interferes with microtubule activity, hence the disruption of the cell division process (mitosis)

spongocoel - the central body cavity of sponges, which opens to the outside by way of the osculum.



The central cavity of this sponge is the spongocoel. Note the banded shrimp in the spongocoel. (Photo: Dr. Anthony Picciolo)

spongocyte - a cell that secretes spongin fibers in sponges

spontaneous process - a process which requires no influence from outside the system to proceed; a process which can proceed in an isolated system; in chemistry, a spontaneous process is one which occurs with the system releasing free energy in some form (often, but not always, heat) and moving to a lower energy (hence more thermodynamically stable) state

sporangium - an organ containing or producing spores in some algae and fungi

spore - a small reproductive cell produced by certain bacteria, algae, fungi and nonflowering plants. Spores contain at least one genome and are highly resistant to heat excess and dehydration

sporophyll - a fertile blade in attached brown algae

sporosac - a reduced gonophore of a hydromedusan that does not develop into free medusae, but remains attached and produces the gametes

spot - a circular area of pigment



This female three-spotted gourami, *Trichogaster trichopterus*, gets its common name from the conspicuous spots on its flank and caudal peduncle. The third "spot" is the eye. (Photo: Miguel Pais)

spur and groove - a system of shallow ridges (spurs) separated by deep channels (grooves) oriented perpendicular to the reef crest and extending down the upper seaward slope

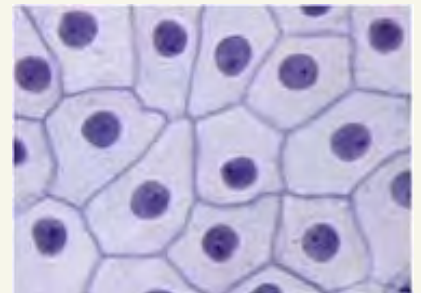
spyhopping - behavior of a whale when raising the head vertically out of the water, usually while stationary, then sinking below the surface without much splash

SQL (Structured Query Language) - a specialized language for sending queries to databases

squall - a brief sudden and violent wind storm, often accompanied by rain or snow

squall line - any nonfrontal line or band of active thunderstorms

squamous epithelium - an epithelium consisting of one or more cell layers, the most superficial of which is composed of flat, scalelike or platelike cells



simple squamous epithelium, only one cell layer thick, under high power (Photo: K. Wynne/Tyler Junior College)

squeeze - pain or discomfort in an enclosed space (sinuses, middle ears, inside a face mask) experienced by scuba divers on descent and ascent, caused by barotrauma to the affected area

squirrelfish - a bony fish in the family Holocentridae. Squirrelfishes are small, brightly colored spiny-finned fishes, commonly found living on coral reefs. Most squirrelfishes are reddish in color mixed with silver and white. All species have large eyes. During the day they are usually found hiding in crevices or beneath ledges. They are crepuscular species, most active at low light levels and at night



The squirrelfish, *Holocentrus adscensionis*, on a reef at Little Cayman Island (Photo: Mary Lou Frost)

SST (Sea Surface Temperature) - the temperature of the layer of seawater (approximately 0.5 m deep) nearest the atmosphere

stability - in ecological terms, a dynamic equilibrium among the physical and biological factors in an ecosystem or a community; relative homeostasis; unchanging with time. This can be a static state, where nothing changes or a steady state where resource flows occur

stable isotope - an isotope of a chemical element which is not spontaneously radioactive. Elements can exist in both stable and unstable (radioactive) forms. Most elements of biological interest (including C, H, O, N, and S) have two or more stable isotopes, with the lightest of these present in much greater abundance than the others. Among stable isotopes the most useful as biological tracers are the heavy isotopes of carbon and nitrogen. These two elements are found in the earth, the atmosphere, and all organisms

stakeholder - an individual or group with an interest in the success of an organization in delivering intended results and maintaining the viability of the organization's products and services. Stakeholders influence programs, products, and services

stalked eye - an eye carried on the end of a stalk or peduncle



A red and white hermit crab (*Dardanus venosus*) illustrates stalked eyes in some crustaceans (Photo: Mary Lou Frost)

standard deviation - a measure of the spread or dispersion of a set of data. It is calculated by taking the square root of the variance

standard error of the mean - the standard deviation divided by the square root of the sample size. It is the standard deviation of a sample of means

standing stock - the total mass of organisms comprising all or part of a population or other specified group or within a given area; measured as volume, mass, or energy; biomass

starboard - the right side of a vessel to someone facing the bow or front

start codon - the set of three nucleotides in an mRNA molecule with which the ribosome starts the process of translation. The start codon sets the reading frame for translation. The most commonly used start codon is AUG, which is decoded as methionine in eukaryotes, and as *N*-formylmethionine in prokaryotes; also called 'initiator codon'

stasipatric speciation - instantaneous speciation caused by polyploidy

statistic - an estimate based on a sample or samples of a population, providing an indication of the true population parameter

statistical analysis - the application of probability theory to quantified descriptive data

statistical bias - in statistics, a difference between the expected value of an estimator and the population parameter being estimated

statocyst - a sensory organ possessed by many invertebrates for the perception of gravity, thus body orientation and balance. Statocysts are found in many invertebrates. Each one has a cavity lined with sensory cells and contains a statolith

statolith - a sand grain or a calcium carbonate granule or other hard secreted substance, found in the cavity of a statocyst. Under the influence of gravity, a statolith makes contact with the lining of the cavity, thereby stimulating sensory cells that line it

status and trends analysis - a monitoring program designed to evaluate the current condition of physical and biological features found in an ecosystem and to detect changes that may occur over time.

stellate - star-shaped



The diver is holding a stellate-shaped starfish. (Photo: Copyright Corel Corp.)

stem cell - a precursor cell whose daughter cells may differentiate into other cell types

stenohaline - pertaining to an aquatic organism that can withstand a narrow salinity range

stenoky, stenokous - adapted for only a few specific ecological niches

stenotele - a stinging nematocyst which contains a spirally coiled thread armed with spiral rows of projections. The triggered capsule, which is ejected from the cell, discharges its tubular content (shaft, stylets and tubule) by a process of evagination. In doing so, the three joined stylets punch a hole into the prey, through which the long evaginating tubule penetrates into the interior

stenothermal - pertaining to an aquatic organism that can withstand a narrow temperature range

stenotopic - found in only one or a relatively small number of habitats

stereoblastula - a solid blastula, lacking a blastocoel

stereocilium - a specialized microvillus that superficially resembles a cilium and projects from the surface of certain cells, such as the auditory hair cells

stereogastrula - a solid gastrula, lacking a gastrocoel

stereotypical behavior - in animal behavior, any behavior that an animal repeats in the same way

stern - the rear (back) end of a vessel

sternite - the ventral plate (or sclerite) of each segment of the body of an arthropod

Stetson Reef - a deep water coral site along the eastern Blake Plateau offshore South Carolina. This site is characterized by hundreds of pinnacles, including a 152 m-tall pinnacle in 822 m of water which supports live bushes of *Lophelia* coral, sponges, gorgonians, and black coral bushes. This represents one of the tallest *Lophelia* lithoherms known

stevensine - a bioactive alkaloid isolated from a number of marine sponges

stewardship - related to the environment, the concept of responsible caretaking, based on the premise that we do not own resources, but are managers and are responsible to future generations for their condition; the science, art and skill of responsible and accountable management of resources

stipe - stalk or erect portion, as in some brown algae

stipitate - body mass supported by a long stalk or stipe

stochastic - random; exhibiting variability due to random events

stolon - a type of stalk that lies in contact with the substrate; in corals, a horizontal polyp outgrowth from which daughter polyps are budded

stoloniferous - a type of colony formation in which the zooids are connected by a common stolon which is in contact with the substrate, as found in ectoproctans (moss animals)

stoma - any of various small openings or pores in an animal body, especially an opening resembling a mouth in many invertebrates; also a minute pore in the epidermis of the leaf or stem of a plant; plural is 'stomata'

stomadaeum - the pharynx in anthozoans; foregut of higher animals; the anterior or oral portion of the alimentary canal of an embryo

stone canal - the section of the water vascular system in echinoderms that connects the ring canal to the madreporite

stonefish - species of carnivorous bony fishes in the scorpionfish family, Scorpaenidae. Stonefishes are usually found resting on the bottom, practically invisible because of their resemblance to the coral or rocky substrate. Its mottled color pattern and fleshy projections make a nearly perfect camouflage. They are distributed in the shallow tropical marine waters of the Indopacific, feeding mostly upon small fishes and crustaceans. Its dorsal fin possesses spines that release a highly venomous toxin, making it the most dangerous of known venomous fish. On occasion, stonefish stings have proved fatal to humans



This extremely venomous reef stonefish blends into its environment. (Photo: Dr John E. Randall)

stony coral - a synonym of hard coral

stop codon - a codon in mRNA for which there is no corresponding tRNA molecule to insert an amino acid into the polypeptide chain. Protein synthesis is terminated and the completed polypeptide is released from the ribosome. Three stop codons are known: UAA, UAG, and UGA. Mutations which generate any of these three codons in a position which normally contains a codon specifying an amino acid are known as 'nonsense mutations'; also called 'nonsense codons.' A stop codon signals the end of the amino acid chain in protein synthesis

storm surge - a rise above normal water level on the open coast due to the action of wind stress on the water surface



Storm surge swamps a house. (Photo: NOAA)

str (short tandem repeats) - repetitive segments of DNA of a pattern of length from 2 to 10 bp, scattered throughout the genome in the non-coding regions between genes or within genes (introns), often used as markers for linkage analysis because of high variability in repeat number between individuals. These regions are inherently unstable and susceptible to mutations

strain - a group of individuals within a species having a common origin; a specific genetic variant of an organism; a pure-breeding lineage, usually of haploid organisms, bacteria or viruses; the descendants of a single isolation in pure culture

strategic plan - a document used by an organization to align its organization and budget structure with organizational priorities, missions, and objectives. A strategic plan should include a mission statement, a description of the agency's long-term goals and objectives, and strategies or means the agency plans to use to achieve these general goals and objectives

stratified sampling protocol - multiple transects for sampling a large site at different depth to avoid double counting or missing organisms

stratigraphy - the branch of geology that deals with the origin, composition, distribution and succession of strata

stream bed - the stream bottom or surface over which a stream flows

stressor - a physical, chemical or biological factor that adversely affects organisms; an agent, condition or similar stimulus that causes stress to an organism

striae - a thin, narrow groove or channel, or a thin line or band especially if several of them are parallel or close together

striated - marked with lines or grooves

stridulation - the process in which a biological sound is produced when one body part rubs against another

stridulation - to produce a sound by rubbing two body parts together. Some fishes make sounds by rubbing together bodily structures, especially skeletal parts

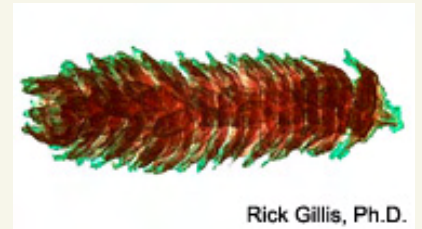
stripe - a straight line of pigment that can vary in width, and which can be oriented vertically, horizontally, or obliquely on the head, body, or fins of an organism



Distinctive striping of the Moorish Idol (*Zanclus canescens*). (Photo: Dr. James P. McVey, NOAA)

strobe - pertaining to underwater photography, an artificial light device or flash device used to restore wavelengths of light filtered out by water

strobila - a stage in the jellyfish life cycle. Free-swimming scyphozoan (true jellyfishes) medusae produce gametes which give rise to small polyps called scyphistomae. After a period of growth, a scyphistoma divides transversely to become a strobila that resembles a stack of discs. Each of the "discs" becomes an ephyra larva, detaches from the strobila and swims freely in the plankton. The ephyra larva will eventually grow into an adult medusa



Rick Gillis, Ph.D.

The late strobila stage of the jellyfish *Aurelia*. This sessile stage contains numerous discs stacked on top of one another. Eventually, each of these discs will break free from the stack as free-swimming ephyra larvae. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

stromatolite - a layered, fossilized deposit, mainly of limestone, formed by photosynthesizing colonial cyanobacteria and other microbes. They are the oldest known fossils, dating back more than 3 billion years. Stromatolites are prokaryotes that thrived in warm aquatic environments and built reefs much the same way as coral does today. They were common in Precambrian time (i.e., more than 540 million years ago). Although stromatolites continue to form in certain areas of the world today, they grow in greatest abundance in Shark Bay in western Australia

stromatoporoid - a fossil calcareous sponge

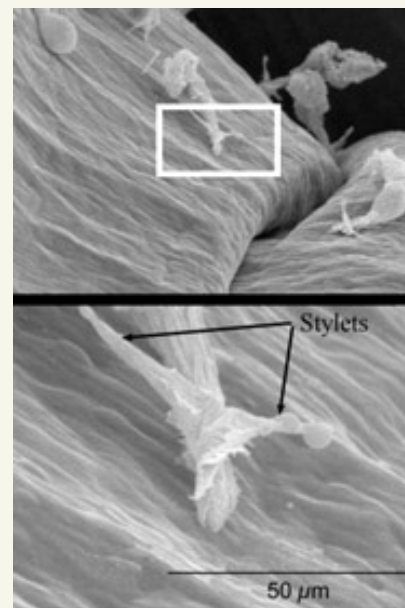
structural complexity - as pertaining to coral reef ecosystems, a measure of the amount of coral surface area in relation to linear area. For example, branching coral reef habitats will have a higher structural complexity than encrusting coral reef habitats

structural gene - a DNA sequence that forms the blueprint for the synthesis of a polypeptide, such as an enzyme

structure-forming deep corals - any colonial, azooxanthellate corals generally occurring at depths below 50 meters that provide vertical structure above the seafloor that can be utilized by other species. It includes both branching stony corals that form a structural framework (e. g., reefs) as well as individual branching coral colonies, such as gorgonians and other octocorals, black corals, gold corals, and lace corals. These structure-forming deep corals include a number of very different species that contribute to three-dimensionally complex habitats in deeper waters. Structure-forming deep corals are defined as those coral species with complex branching morphology and sufficient size to provide substrate or refuge for associated fishes and invertebrates

stygobite - a species generally restricted to subterranean groundwater

stylet - a needle-like structure; in cnidarians, when a cnidocyte is fired, it is inverted and a stylet pierces the skin of the prey allowing toxins to be injected; a piercing structure in in some invertebrate mouthparts; also called "lancet"



When a cnidocyte is fired, it is turned inside out and a stylet punctures the prey, injecting toxins which may cause paralysis. (Photo: Doug Bray, William Nalder/ University of Alberta)

styliform - having the shape of a pointed rod

subadult - an individual similar to the adult in appearance but not yet capable of reproducing

subclass - a taxonomic group that is below a class and above an order

subduction - the process in which one lithospheric plate collides with, and is forced down under another plate

Subersic acid - an antiinflammatory agent derived from marine sponges in the genus Suberea

subfamily - a taxonomic group that is below a family but above a genus

subgenus - a taxonomic group that is between a genus and a species

subgular - below the throat

subkingdom - a taxonomic group comprising a major division of a kingdom

submarine canyon - a long, narrow, steep-walled undersea valley

submarine groove - a troughlike depression with vertical to overhanging walls which cut across the reef front at right angles

submerged bank - a large, relatively flat shoal or other expansive submerged feature that is markedly shallower than the surrounding ocean bottom

submerged cultural resource - an historical ship, aircraft, or other cultural artifact that has come to rest on the ocean bottom

submersible - a small underwater vessel (submarine) which requires a support ship to transport it to and from the diving area. It is used primarily for oceanographic research. There are also some commercial submersibles that carry tourists below scuba diving depths to view coral reef walls



The three-person submersible Alvin could dive to just under 15,000 feet, enabling it to reach 86 percent of the world's

suborbicular - nearly circular

suborbital - an area below the eye

suborder - a taxonomic group that is a subdivision of an order

subordinate - in taxonomy, belonging to a lower or inferior taxonomic rank. For example, a genus is subordinate to the family to which it belongs

subordinate taxon - in taxonomy, a taxon at a lower rank than the taxon of the same coordinate group with which it is compared

subphylum - a taxonomic group ranking that is between a phylum and a class

subplocoid form - a coral growth form in which the corallites are sometimes separated by coenosteum

subpopulation - a well-defined set of interacting individuals that compose a proportion of a larger, interbreeding population

subradular organ - a sensory organ in chitons (Polyplacophora-Mollusca) which can be protruded and pressed against the substrate in the search for food

subset - in mathematics, a subset of a given set is a collection of things that belong to the original set

subsidence - a gradual sinking of land with respect to its previous level; the slow sinking of air, usually associated with high-pressure areas

subspecies - a taxonomic group that is a division of a species. It usually evolves as a consequence of reproductive isolation of one or more populations within a species

subspecific name - the third term of the trinomen, a subspecies

substrate - the material making up the base upon which an organism lives or to which it is attached

subterminal - located some distance away from the end

subtidal - permanently below the level of low tide; a continually underwater environment

subumbrella - the lower or oral surface of a medusa or jellyfish

subunit - in protein chemistry, an individual polypeptide chain in a protein which contains more than one polypeptide chain

sucker - a structure, such as those at the end of tube feet of echinoderms, or on the tentacles of octopods and squids, that can produce a small vacuum and enable the animal to stick to many surfaces



Suckers on an octopus tentacle allow the animal to adhere to almost any surface. (Photo: J'nie Woosley/National Zoological Park)

sucker - any organ which has an adhesive action

sucking disk - a disk-like structure used by some fishes to attach itself to rocks or vegetation

Sula Reef - a deep water *Lophelia* reef located on the Sula Ridge on the Mid-Norwegian shelf at depths of 200 - 300 m. A very large deep water coral reef, it is about 13 km long, 700 m wide, and up to 35 m high

Sulu-Sulawesi Seascape - an area of approximately 900,000 square kilometers (about 347,492 square miles) that includes the Sulu and Sulawesi Seas, in the national waters of three independent nations of the Southeast Asian Region: Indonesia, Malaysia, and the Philippines

summit - the highest part or point; the top

Sundarbans - the world's largest mangrove forest located in Bangladesh at the edge of the delta where the Ganges, Brahmaputra and Meghna Rivers come together

superclass - a taxonomic group that is below a phylum and above a class

superfamily - a taxonomic group that is below an order but above a family

superficial cleavage - a type of cleavage, typical of centrolecithal eggs found in most arthropods, in which karyokinesis (nuclear division) occurs without cytokinesis (cytoplasmic division), resulting in a syncytium. Cleavage furrows form to separate the nuclei

Superfund - money collected from a special tax on chemical feedstocks and raw petroleum. When a responsible party can not pay, Superfund money can be used by the US Environmental Protection Agency (USEPA) to investigate, evaluate, and clean up the hazardous waste sites identified on the National Priorities List (NPL); Superfund is also used to refer to USEPA's program for investigation and cleanup of hazardous waste sites

supergene - a group of neighboring genes on a chromosome that tend to be inherited together and sometimes are functionally related

superior - the anatomical term for "above" (e.g., the head is superior to the shoulder)

supermale - a male which does not change sex and is the principal spawner

supernatant - the soluble liquid fraction of a sample after centrifugation or precipitation of insoluble solids

supernumerary - superfluous or extra

superorder - a taxonomic group that is above an order and below a class or subclass

superorganism - an "organism" which consists of many organisms, such as coral or the Portuguese man-of-war (a superorganism appears to be one organism, but in fact is a number of colonial animals joined together); a social unit of animals where division of labor is highly specialized and where individuals are not able to survive by themselves for extended periods of time. An ant or bee colony is another example of a superorganism. The concept of superorganism is controversial among some scientists

supporting cell - in cnidarians, a columnar cell of the epidermis or gastrodermis whose apical end may bear microvilli, cilia, or flagella

suppressor gene - a gene that can reverse the effect of a mutation in other genes, i.e., a gene that suppresses the phenotypic expression of another gene, especially of a mutant gene

supraesophageal ganglia - a nerve plexus above the esophagus in the head of malacostracan crustaceans

supraesophageal ganglion - in arthropods, worms, and other invertebrates, the supraesophageal ganglion forms the brain, which typically contains integrative centers for the major senses

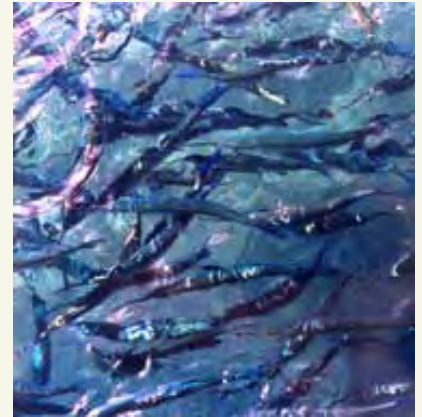
supraorbital - an area above the eye

suprasammon - organisms which swim just above sand and are dependent upon it as a food source

supratidal - above the level of high tide; a terrestrial environment that is influenced by proximity to the sea. Such influences include sea spray, sea breezes and aeolian processes, and geological and biological "spillover" such as dune development

surf - a collective term for "breakers"; the wave activity in the area between the shore line and the outermost limit of breakers. In literature, surf usually refers to the breaking waves on shore and on reefs

surface feeder - an organism, usually a fish, that takes its food from the air/water interface, or feeds just below the water surface, e.g., a needlefish



Needlefish feeding at the surface in Oahu (Photo: Mary B. Hollinger/NOAA)

surface interval - the length of time that a scuba diver spends on the surface between two consecutive dives

surface water - an open body of water, such as a stream, lake, reservoir or wetland

surge channel - a deep channel in the windward side of a coral reef through which water moves in and out of the reef

surgeonfish - any species of brightly colored reef-dwelling bony fishes in the family Acanthuridae which have laterally compressed bodies and possess one or more sharp erectile spines near the base of the tail; also called "tang" and "doctorfish"



A school of surgeonfish (blue tang) in the Florida Keys (Photo: Florida Keys National Marine Sanctuary)

surrogate species - small number of species whose distributions and abundances are well known; used in conservation planning; assumed to reflect the distribution and abundance of the regional biota; subsumes indicators and umbrella species; also called "focal species"

survey (biology) - the systematic and usually standardized collection or inventorying, processing, and analysis of representative portions of a biological community or defined site with its habitats, to determine the community structure and function

suspension feeder - an organism that feeds by capturing particles suspended in the water column. A synonym of filter feeder



Suspension-feeding sponge among corals.

sustainability science - a multi-disciplinary approach to science that recognizes the limitations of traditional scientific inquiry in dealing with the complex reality of social institutions interacting with natural phenomena. Sustainability science seeks to improve on the substantial but limited understanding of nature-society interactions gained in recent decades. This has been achieved through work in the environmental sciences estimating and evaluating human impacts, and evidence from social and development studies that takes into account environmental influences on human well-being. Urgently needed is a better understanding of the complex dynamic interactions between society and nature so that the trend towards increasing vulnerability is reversed

sustainable development - those efforts to guide economic growth in an environmentally sound manner with an emphasis on natural resource conservation

sustainable yield - the number or weight of organisms in a population that can be harvested without reducing the population biomass from year to year, assuming that environmental conditions remain the same

suture - the line of union of two bones or plates

swamp - a type of wetland that is dominated by woody vegetation. When it does not, it is usually termed a marsh. Swamps may be fresh or salt water and tidal or non-tidal

swath - the area of Earth's surface or atmosphere measured by an instrument during a single satellite overpass; a path or strip

sweeper - any of about 25 species of bony fishes in the family Pempheridae. Sweepers may be found around coral reefs in the Atlantic, Pacific, and Indian Oceans. They have deep, laterally compressed bodies and a single, short dorsal fin. During the day, schools of sweepers may hover in caves, and come out at night to feed on plankton



A glassy sweeper
(*Pempheris schomburgki*)
photographed at Bimini
(Photo: Mark Rosenstein/
Active Window Productions
(markrosenstein.com))

sweeper polyp - a polyp that acts in an aggressive manner by stinging neighboring corals and sessile invertebrates

sweeper tentacle - A coral polyp tentacle that has an increased number of nematocysts and elongates in order to 'sting' neighboring corals and sessile invertebrates. A tool in the competition for space and resources



A hammer coral (right) thrusts out a sweeper tentacle towards a mushroom anemone (left). (Photo: Scott Brooks)

swell - the persistence of a wind-formed wave after the wind ceases



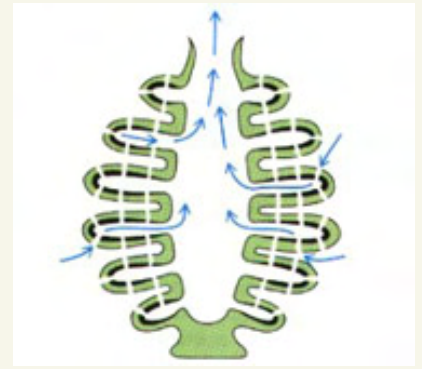
An ocean swell

swimmeret - one of several flat, fringed, and usually bilobed, paired appendages on the ventral surface of the abdominal somites of decapod crustaceans, used for swimming and reproduction



The arrow points to a swimmeret of a juvenile lobster. (Graphic: NOAA)

syconoid - a body form of medium complexity in sponges where the body wall has become folded and the choanocytes (flagellated collar cells) are not located along the spongocoel, but along radial canals. Water enters the sponge through a series of incurrent canals and passes through internal pores called prosopyles into the radial canals, which are lined with flagellated choanocytes. - It is the action of these choanocytes that keeps water moving through the sponge. From the radial canals, water then enters the central spongocoel through pores called apopyles, to exit to the environment through a single opening, the osculum.



Anterior end of a syconoid sponge in which the body wall has been folded into a series of internal and external canals. - 1= osculum; 2= spongocoel; 3= ostium; 4= radial canal; 5= incurrent canal; 6= apopyle. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

Symbiodinium microadriaticum - a dinoflagellate symbiont (zooxanthellae) in marine cnidarians

symbiont - a symbiotic organism; either of two organisms participating in a symbiotic relationship



These clownfish exist in a symbiotic relationship with the sea anemone; the anemone provides protection and the clownfish feed and clean the anemone. Different clownfish species choose particular anemone species for their hosts. (Photo: Copyright Corel Corp.)

symbiosis - a relationship between two species of organisms in which both members benefit from the association (mutualism), or where only one member benefits but the other is not harmed (commensalism), or where one member benefits at the expense of the well-being of the other (parasitism)



A clownfish has a symbiotic relationship with a sea anemone, finding protection within the clump of stinging cell-bearing tentacles.

sympatric species - different species that live in the same area but are prevented from successfully reproducing by a reproductive isolating mechanism

symplesiomorphy - in evolution, a shared primitive character

sympodial growth - growth of a coral colony in which the colony does not produce a trunk. New polyps offshoot along the edges of adult polyps. The youngest polyps are always on top of colony

synapomorphy - in evolution, a shared derived character

synapse - the site where neurons communicate with each other. A synapse is a small gap that physically separates neurons. Axon terminals of a neuron sending a nervous impulse (the presynaptic neuron) release neurotransmitters into the synapse. The neurotransmitters diffuse to the other side (the postsynaptic side) where they bind to receptors on the postsynaptic neurons, thereby relaying the nervous impulse

synapticulum - a conical or cylindrical supporting process, as those extending between septa in some corals

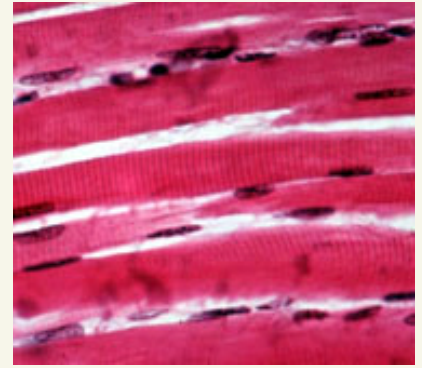
synbiotic - an appropriate synergistic combination of pre- and probiotics

synchronous - occurring at the same time

synchronous breeding - a breeding system in which all members of the population tend to breed at the same time

synchrony - the relation that exists when things occur at the same time

syncytium - a mass of cytoplasm containing several nuclei and enclosed in a membrane, but having no internal cell boundaries, e.g., skeletal muscle cells



Skeletal muscle cells are a multinucleate syncytium. The dark stained bodies are nuclei. (Photo: General College, University of Minnesota)

syndrome - a set of signs occurring together; the sum of signs of any diseased state

synecology - the branch of ecology that deals with whole communities and the interactions of the organisms within them

synergism - an interaction between agents (eg, drugs) that produces an effect greater than the combined effects of the same agents used separately

syngameon - a group of discrete morphological units (semispecies) that are interfertile; a cluster which comprises several morphospecies, i.e., "all of species or semispecies linked by frequent or occasional hybridization in nature

syngamy - the process of union of two gametes, also called fertilization. It encompasses both plasmogamy and karyogamy.

synomone - a chemical substance produced by one organism that is beneficial to both itself and a member of another species

synonym - in taxonomy, one of two or more scientific names that are spelled differently, but refer to the same organism

synonymous substitution - in molecular biology, a nucleotide substitution that does not result in an amino acid replacement

synonymy - in taxonomy, the relationships between different names applied to the same taxon; a chronological list of taxonomic names which have been applied to a single taxon, including authors and dates

synopsis - in taxonomy, a brief description of the main characters of a taxon

syntopic - relating to or displaying conditions as they exist simultaneously over a broad area; pertaining to populations or species that occupy the same macrohabitat

syntype - in taxonomy, each specimen of a type series from which neither a holotype nor a lectotype has been designated. The syntypes collectively constitute the name-bearing type

systemic - a condition or process that affects the body as a whole, not localized to one area or system

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site
All of NOAA

Glossary of Terminology: T

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

T cell - one type of white blood cell that attacks virus-infected cells, foreign cells, and cancer cells. T cells also produce a number of substances that regulate the immune response; also called "T lymphocyte." T stands for the thymus gland, where T lymphocytes mature

T cell receptor - an antigen-binding protein, located on the surfaces of CTLs (cytotoxic or killer T cells); a transmembrane protein on the surface of T cells that recognizes antigens associated with MHC proteins on the surface of phagocytes

t-test - a statistical procedure for testing the difference between two or more means. It is used for estimating the probability that the means have been drawn from the same or different populations

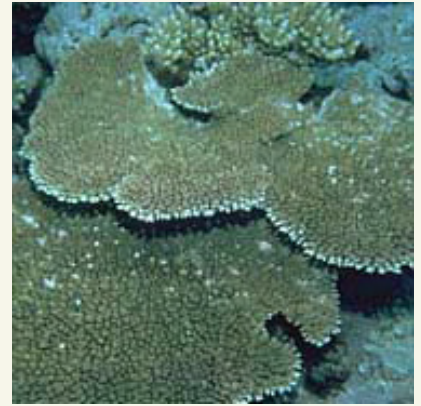
t. - according to; on the evidence of (*teste*)

t. c. - in the volume cited (*tomus citate*)

table reef - an isolated flat-topped coral reef which reaches the surface but lacks a lagoon

tabula - a horizontal partition (or floor) dividing the corallite skeleton; one in a series of horizontal plates traversing a coral with a massive calcareous skeleton. The polyps extend only down to topmost tabula

tabulate - having a flat surface



Coral (*Acropora*) having a tabulate shape.

tachyauxisis - rapid growth; a part or structure that grows at a quicker rate than the organism as a whole

tactile - pertaining to information, interpretations, and behavior derived from the sense of touch

tactile comb - a sensory projection on the umbrella margin of a medusa. It bears long, stiff hairs

taeniform - ribbon-like; elongate, compressed and deep-bodied

tagging - an identification system involving various methods (fin clipping, coloring, biotelemetry, radioactive markers, tattooing, branding, tagging, etc.), used for individual identification and for studies on movement, growth and other biological activities; also called "marking"

Taino - Pre-Columbian indigenous inhabitants of the Bahamas, Greater Antilles and the northern Lesser Antilles

talus slope - a synonym of reef base

Tanaidacea - a minor order of small (1 mm–2 cm in length) crustaceans in the class Malacostraca. Of the approximately 1000 species, most are marine, but some are found in coastal freshwater and estuarine habitats. They are among the most diverse and abundant animals in some marine environments. Most species are benthic, although some species may be planktonic. They are found at a wide variety of depths, from the littoral zone to deep waters, in all oceans of the world, from tropical to temperate, and even in polar regions

tank - a hollow steel or aluminum cylinder, used to contain compressed air or other breathing gas mixtures used by scuba divers for an air supply; also called a cylinder or bottle



A NOAA diver breathing compressed air from the steel scuba tank (or cylinder) attached to his BCD (buoyancy control device). The diver is entering the water using the giant step technique. (Photo: NOAA National Undersea Research Program)

taphonomy - the study of everything that happens to an organism's body after it dies; includes probable cause and manner of death, movement of the body, chemical and physical alteration, burial, decomposition, diagenesis and fossilization

target - in genomics, the DNA or RNA being hybridized to a microarray; for diagnostic tests, the molecule or nucleic acid sequence that is being sought in a sample

tau - the third charged lepton (in order of increasing mass), with electric charge -1

tautonymy - in taxonomy, the use of the same word for the name of a genus-group taxon and for one of its included species or subspecies

Tautra reef - one of the world's shallowest deep-water coral reefs, located in Norwegian waters at only 39 meters water depth

tawny - brownish yellow color

taxis - an innate behavioral response to a directional stimulus (a stimulus from a particular direction) whereby the organism either moves toward (positive taxis) or away (negative taxis) from the stimulus

taxocene - a taxonomically related set of species within a community that have similar ecological functions

taxol - a pharmaceutical, derived from the yew tree, which is a potent anti-tumor drug

taxon - a taxonomic group or entity

taxonomic group - a taxon with all its subordinate taxa and their individuals; e.g. the taxonomic group Crustacea consists of all crustaceans and their taxa

taxonomic group - a taxon with all its subordinate taxa and their individuals; e.g., the taxonomic group Crustacea consists of all crustaceans and their taxa

taxonomic key - a tabulation of diagnostic characters of taxa in dichotomous couplets to facilitate rapid identification

taxonomy - the science and methodology of classifying organisms based on physical and other similarities. Taxonomists classify all organisms into a hierarchy, and give them standardized Latin or Latinized names. There are seven main levels of classification in the hierarchy. They are, from most to least inclusive: Kingdom; Phylum (or Division for algae, fungi, and plants); Class; Order; Family; Genus; and Species. Taxonomists describe new species, classify organisms, and study speciation, the evolution of new species

teal - greenish blue color

technology - the creation of products and processes for the purpose of improving human chances for survival, comfort level, and quality of life

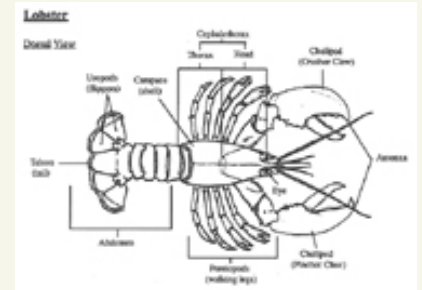
tectal - pertaining to the roof of a structure, e.g. the top of the head or brain

teleost - a large group of fishes (infraclass Teleostei) which contains most of the bony fishes

telolecithal - an egg cell in which the yolk is not evenly distributed throughout the cytoplasm, but is concentrated in one location, and cleavage is incomplete, e.g., a bird egg

telomere - the terminal part of a eukaryotic chromosome. These specialised structures are involved in the replication and stability of linear DNA molecules. In vertebrate cells, each telomere consists of thousands of repetitive copies of the same DNA sequence. Telomeres shorten each time a cell divides; when one or more telomeres reaches a minimum critical length, cell division stops, signaling cell senescence. This mechanism limits the number of times a cell can divide

telson - the terminal joint or movable piece at the end of the abdomen of crustaceans; middle piece of the tail fan



The telson, flanked by uropods, is the central part of the tail fan.
(Graphic: Maine Department of Marine Resources)

temperate - region in which the climate undergoes seasonal change in temperature and moisture. Temperate regions of the earth lie primarily between 30 and 60 degrees latitude in both hemispheres

template - a molecule that serves as the pattern for synthesizing another molecule ; in the process of replication or transcription, the strand of DNA that serves as the source of information

temporal niche - the functional position of an organism in its environment as determined by the periods of time during which it occurs and is active there

temporary threshold shift - in mammals, a temporary increase in the threshold of hearing (minimum intensity need to hear a sound) at a specific frequency that returns to its pre-exposure level over time

tendrill - a slender elongated thread-like organ which may cling to objects for support

tendrilliform - having the form or shape of a tendrill

tentacle - a finger-like evagination of the body wall. Tentacles surround the mouths of coral polyps, anemones and other invertebrates. They are used for capturing prey, defense, reproduction, gas exchange, and light absorption



Tentacles of a sea anemone. Each tentacle contains stinging cells (nematocysts) used for defense and food capture. (Photo: Dr. Anthony Picciolo)

tentacle-tube-foot suspension feeder - a suspension feeder that traps particles on distinct tentacles or tube feet (in echinoderms)

tentacular bulb - the expanded base of a medusa's tentacle. It functions in digestion and nematocyst formation; also called " ocellar bulb"

tentacular lobe - a lobe at the point of insertion (beginning) of a septum

tentacular sheath - one of the two cavities in the sides of the body of ctenophores (comb jellies) into which the tentacles can be withdrawn

tentaculozoid - a dactylozoid (a colonial hydrozoan polyp that possesses a large, nematocyst-bearing fishing tentacle, and functions in defense and in food capture)

tera - a metric prefix meaning 10 to the 12th power, or one trillion

terabyte - a measure of data size. A terabyte of data is equivalent to 1,000 gigabytes of data or 1,000,000 megabytes of data. One petabyte equals 1,000 terabytes

teratogen - a chemical or other factor that specifically causes abnormalities during embryonic growth and development

terete - round in cross-section and tapering

tergite - a hard plate (sclerite) forming one of the constituents of the dorsal exoskeleton (tergum) of an animal, such as an arthropod

tergum - the back of an animal

terminal - at the end position

terminal male - in fishes, a supermale; the dominant male

terminal taxon - one of the units of a phylogenetic tree whose collective phylogeny is reconstructed, i.e., the undivided tips of a tree (usually contemporary taxa). Terminals may be higher taxa, species, populations, individuals, fossils or even genes

terminator - a sequence of DNA bases that stops RNA polymerase from synthesizing RNA

terminus - the end

ternary name - in taxonomy, the trinomen

terpenoid - a class of organic compound produced by soft corals for defense and for aggressive colonization of new substrates

terri - a prefix meaning "earth"

territoriality - the defense of a given area

territory - an area over which an animal establishes jurisdiction. The area is defended and no other individuals of the same species, and often of other species, are allowed inside, except for prospective breeding partners during a reproductive bout

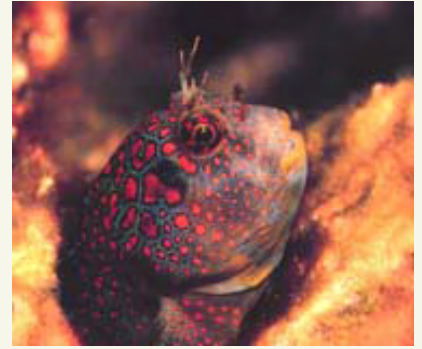
Territory (Office of Insular Affairs) - an incorporated United States insular area, of which only one exists currently, Palmyra Atoll. With an area of 1.56 square miles, Palmyra consists of about fifty small islands and lies approximately one thousand miles south of Honolulu, HI

territory (OIA) - an unincorporated United States insular area, of which there are currently thirteen, three in the Caribbean (Navassa Island, Puerto Rico and the United States Virgin Islands) and ten in the Pacific (American Samoa, Baker Island, Guam, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Atoll, the Northern Mariana Islands and Wake Atoll)

tertiary consumer - a carnivore which eats other carnivores

TESS (Threatened and Endangered Species System) - the USFWS Threatened and Endangered Species System (TESS) is a list of threatened and endangered animals and plants native to the United States, and the outlying Areas of the United States, the Freely Associated States, and Trust Territory

tessellated - a checkered appearance



A tessellated blenny.
(Photo: NOAA)

test - shell or hard outer covering of echinoderms and ascidians



Dorsal view of sea urchin
test.

test animal - an individual used for experimental research purposes

tetraspore - a haploid spore in the red algae life cycle which is the meiotic product of the tetrasporangium of a diploid tetrasporophyte. The tetraspores are released, settle, and grow into gametophytes

tetrasporophyte - diploid phase in the life cycle of red algae which produces haploid tetraspores. The tetrasporophyte is the site of meiosis, more specifically, the tetrasporangia where haploid tetraspores are produced. These tetraspores are released, settle, and grow into the gametophyte, completing the basic red algal life history

tetraxon - in sponges, a spicule with four rays

tetrodotoxin (TTX) - tetrodotoxin (TTX) is an especially potent marine neurotoxin, named after the order of fish from which it is most commonly associated, the Tetraodontiformes (includes the puffers, porcupine fish, blowfish, cowfish, boxfish). The toxin appears in high concentrations in the gonads, liver, intestines and skin of pufferfish. The fatality rate when injected may be as high as 60 percent. Tetrodotoxin is more than 10,000 times deadlier than cyanide. Other marine and terrestrial organisms have been found to store TTX, for example, the Australian blue-ringed octopus, parrotfish, triggerfish, gobies, angelfish, ocean sunfish, globefish, seastars, starfish, xanthid and other crabs, a horseshoe crab, a number of marine snails, flatworms, tunicates, ribbonworms, mollusks and marine algae (*Jania spp.*) Terrestrial organisms include the Harlequin frogs (*Atelopus spp.*), three species of California newt and other eastern salamanders



A specially licensed Japanese chef prepares fugu, the ever-so-slightly tainted fillet of the extremely poisonous blowfish, whose internal organs contain tetrodotoxin.

Texas Automated Buoy System (TABS) - Texas A & M University's Geochemical and Environmental Research Group (GERG) operates two data buoys near the Flower Garden Banks National Marine Sanctuary at Sites N and V. The buoys measure winds, air temperature and humidity, atmospheric pressure, conductivity, and surface currents and report the data in near real time through the Texas Automated Buoy System

thallus - the vegetative body of a plant or alga that is not differentiated into organs, such as roots, stems and leaves

thamnasteroid form - a coral growth form in which the septa of adjacent corallites are confluent, often sinuous and twisted

thanatocoenosis - an assemblage of organisms or their parts brought together after their deaths, as for example, by flowing water; 'death assemblage'

the destruction resuspension - the process in which sediment particles on the substrate are brought back into water column suspension by waves, tides, or wind

theca - the calcareous wall of the corallite

thelytoky, thelytokous - parthenogenetic production of females from unfertilized eggs; reproduction that is exclusively female with no male contribution to the young

theoretical probability - the chances of events happening as determined by calculating results that would occur under ideal circumstances

theory - a comprehensive explanation of a given set of data that has been repeatedly confirmed by observation and experimentation and has gained general acceptance within the scientific community

thermal stress anomaly (TSA) - an area of the ocean surface which is experiencing warmer sea surface temperatures (SSTs) than the typical maximum temperature reached at that location. The typical maximum temperature, which generally occurs in late summer, is important because this is the highest temperature to which corals in a particular location are accustomed. So, when the SST exceeds this by some threshold (typically one degree C) corals are in danger of bleaching. Many factors such as salinity, insolation, winds, and local currents play a role in coral reef bleaching, but clearly extreme SSTs are a critical factor; also called "hotspots"

thermocline - the region below the surface layer of the ocean or lake, where the temperature gradient increases abruptly (i.e. where temperature decreases rapidly with increasing depth). A thermocline may reach the surface and become a front. It is usually an ecological barrier and its oscillations have significant consequences on population distribution and ocean productivity

thermohaline circulation - the density-driven convective circulation system of the world's oceans. Warm Atlantic water moves northward along the axis of the Gulf Stream, and evaporation increases water density while releasing heat to the colder atmosphere in the North Atlantic. Once significantly dense, the water sinks into the deep ocean, forming a downward limb of a giant conveyor-like circulation that extends around the world's oceans

thermoreceptor - a neurological receptor that detects changes in temperature

thigmotactic - responding to touch or outer surface contact

thoracic - pertaining to the chest area

thorax - the central region of a crustacean body

thrombosis - the development of a blood clot in the circulatory system. Compounds derived from marine sponges are potential drugs for the treatment of thrombosis

thylakoid - a phospholipid bilayer membrane within a chloroplast that is folded repeatedly into a stack of disks called grana. The molecules that perform the light reactions of photosynthesis are all embedded within the membranes of the thylakoids

thymine - one of the four bases in DNA that make up the letters ATGC, thymine is the "T". The others are adenine, guanine, and cytosine. Thymine always pairs with adenine

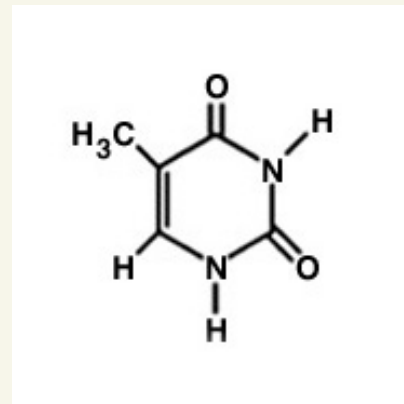


Diagram of the chemical structure of thymine, one of the four nitrogenous bases in DNA.

tidal channel - a channel that dissects the tidal flat surface. It is formed and maintained by tidal currents

tidal current - a horizontal movement of the water caused by gravitational interactions between the Sun, Moon, and Earth

tidal delta - a delta formed at both sides of a tidal inlet

tidal flat - a marsh or sandy or muddy coastal flatland which is covered and uncovered by the rise and fall of the tide

tidal inlet - a waterway from the open ocean into a lagoon

tidal pool - an area in the littoral zone that retains sea water at a low tide because of a depression or arrangement of rocky substrate



A tidal pool. The seawater is replenished with each incoming tide. Tidal pools provide a unique habitat for some fishes and invertebrates (Photo: Albert E. Theberge, NOAA)

tidal range - the difference in water level between successive high and low tides

tide - the periodic rising and falling of the water that results from the gravitational attraction of the moon and sun acting on the rotating earth



High tide combined with a storm threaten a pier.
(Photo: Mary Hollinger)

tide gauge - a device for measuring the height (rise and fall) of the tide; especially an instrument for automatically making a continuous graphic record of tide height versus time

tide tables - tables which give daily predictions of the times and heights of high and low waters. These predictions are usually supplemented by tidal differences and constants through which predictions can be obtained for numerous other locations

tidelands - the zone between the mean high water and mean low water lines. It is identical with intertidal zone (technical definition) when the type of tide is semi-diurnal or diurnal

TIFF (Tag Image File Format) - a common format for exchanging raster graphics (bitmap) images between application programs, including those used for scanner images

time lapse photography - a photographic process in which a series of photographs are taken of the same basic scene at regular, timed intervals from the same viewpoint

time zone - a region of the Earth that has adopted the same standard time, usually referred to as the local time. Most adjacent time zones are exactly one hour apart, and by convention compute their local time as an offset from Greenwich Mean Time (GMT)

tinctorial - relating to staining or coloring

Tisler Reef - a deep water *Lophelia* reef located in the Skagerrak, the submarine border between Norway and Sweden, at depths of 74 to 155 m. It has the world's only known yellow *Lophelia pertusa* corals

tissue - a group of cells with a specific function in the body of an organism. Tissues are composed of nearly identical cells and their products, and are organized into larger units called organs

TOAD (Towed Optical Assessment Device) - a device employing videography used chiefly at night on the NOWRAMP cruises to the Northwestern Hawaiian Islands. TOAD consists of a video camera and lights on a frame designed to be towed just above the substrate. The video is used to certify or ground truth acoustic habitat sensing. Specifically, the TOAD videos show the composition of the bottom in a few locations, such as sand, rubble, sea grass, coral, etc. It allows interpretation of broad area acoustic data by comparing it to the video information



A towed optical assessment (TOAD) device is used to record bottom characteristics (Photo: NOAA)

tom. - volume (*tomus*)

tombolo - a land form such as a spit or bar which forms an isthmus between an island and a mainland shore, or between two islands



a tombolo connects the small island with the mainland of a larger island, Dominica, in the West Indies. The Atlantic ocean is to the right of the tombolo, and the Caribbean Sea is to the left.

topodeme - a deme (a local interbreeding population) occupying any specified geographical area

topographic map - a map containing contours indicating lines of equal surface elevation (relief)

topography - the set of natural or man-made physical features found on a map or chart of a region, such as mountains, valleys, bridges, and the shapes of landforms. A topographic map is a two-dimensional map portraying three-dimensional landforms; the relief features or surface configuration of an area

topology - the branching sequence of a phylogenetic tree

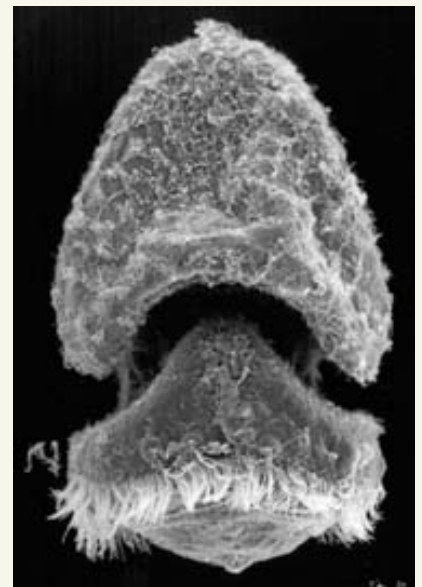
toponym - a place name

topotype - in taxonomy, a specimen collected at the type locality

topotypical population - in taxonomy, a population occurring at the type locality

topsentin - a marine pharmaceutical extracted from the sponges *Topsentia genitrix*, *Hexadella* sp., and *Spongosorites* sp. The topsentin family of compounds possesses potent anti-inflammatory properties

tornaria larva - a ciliated, free-swimming pelagic larva of a hemichordate



Young tornaria of
Balanoglossus biminiensis.
(Photo: University of
Saskatchewan Archives)

torpor - a dormant state

torsion - twisting of the body during development so that the posterior of the body takes an anterior position over the head

totipotent - the state of a cell that has the potential to develop into any and all adult cell types as compared with a differentiated cell whose fate is determined

towfish - an instrument, e.g., a side scan sonar, towed behind a ship

toxicant - any substance which is potentially toxic

toxicity - the action of poisons, including xenobiotics, on biochemical reactions or processes in living organisms or ecological systems

toxicology - the scientific discipline involving the study of the actual or potential danger presented by the harmful effects of substances (poisons) on living organisms and ecosystems, of the relationship of such harmful effects to exposure, and of the mechanisms of action, diagnosis, prevention and treatment of intoxications

trabeculum - in corallites, one of many rods or axial structures composed of fibrous tufts (sclerodermites), which form teeth along the upper septal margin

trace - in biology or ichnology, a visible mark (as a track, trail, burrow) left by the passage of an animal; in chemistry, an unmeasurable or insignificant quantity

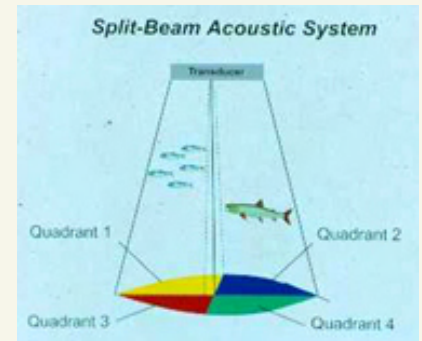
trace fossil - a sedimentary structure consisting of a fossilized track, trail, burrow, tube, or other impressions or depressions left from the life activities of an animal, plant, insect, or natural force that has been preserved in soft sediment and lithified to solid rock; Any indication of prehistoric organic activity, such as tracks, trails, burrows, or nests; also called ichnite or ichnofossil

trace fossil classification - a classification system that parallels the Linnaean taxonomic classification of organisms. In trace fossil nomenclature, a binomial is used, with a genus and specific epithet. With trace fossils, the genus is called an ichnogenus, and the species is an ichnospecies. The name is similarly italicized, and in full reference to the author plus the year of publication should be cited. "Ichnogenus" and "ichnospecies" are commonly abbreviated as "igen." and "isp.", respectively

trade winds - a system of relatively constant low level winds that occur in the tropics. The trade winds blow from the northeast to the equator in the Northern Hemisphere and from the southeast to the equator in the Southern Hemisphere

transcription - the process by which the genetic information encoded in a linear sequence of nucleotides in one strand of DNA is copied into an exactly complementary sequence of mRNA (messenger RNA). The mRNA then carries this information to the cytoplasm of the cell, where it serves as the blueprint for the manufacture of a specific protein

transducer - the electromechanical component of a sonar system that is mounted underwater and converts electrical energy to sound energy and vice versa



Split beam transducer receives echoes with four different quadrants (Graphic: American Fisheries Society)

transduction - transfer of genetic material from one cell to another by means of a virus or phage vector

transect - a line used to survey the distribution of organisms or substrate across a given area. Sample plots or points are established along the transect for collecting data



NOAA divers collect data along a transect line.

transfection - infection of a cell with nucleic acid from a virus, resulting in replication of the complete virus; gene transfer into eukaryotic cells

transforming gene - a gene that causes normal cells to change into cancerous tumor cells; also called an 'oncogene'

transgenic - having genetic material (DNA) from another species. This term can be applied to an organism that has genes from another organism

transient - species or population that migrates through a given area, but does not breed or "winter" there

transient aggregation - an aggregation characterized by individuals that migrate over long distances and over a short reproductive season

transition - in molecular biology, a nucleotide substitution from one purine to another purine, or from one pyrimidine to another pyrimidine

translation - in genetics, the process whereby genetic information coded in mRNA (messenger RNA) directs the formation of a specific protein at a ribosome in the cytoplasm

transmissometer - an instrument for measuring transmission of light through a fluid

transpiration - the loss of water vapor from a plant to the outside atmosphere, mainly through the stomata of leaves and the lenticels of stems

transport - an exchange of molecules (and their kinetic energy and momentum) across the boundary between adjacent layers of a fluid or across cell membranes

transposon - a short DNA sequence that has the ability to move from one chromosomal position to another one in the genome, a process called transposition ; also known as "jumping gene"

transverse - crosswise

transversion - in molecular biology, a nucleotide substitution from a purine to a pyrimidine, or vice versa

trap - a portable, enclosed device with one or more gates or entrances and one or more lines attached to surface floats; also called a pot

trauma - any sudden physical injury or damage to an organism caused by an external force or violence. Trauma is also used to describe severe emotional or psychological shock or distress

traumagenic device - any part of an organism which is concerned with the causation of physical injury to another, such as teeth, spines, darts, rasping organs, beak bites, etc

trawler - a fishing vessel that tows an open-mouthed fishing net drawn along the sea bottom or in the water column

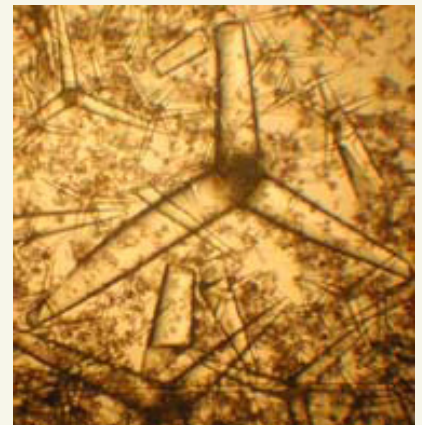


a double-rigged shrimp trawler with bag of one net on board (Photo: NOAA)

trench - a deep steep-sided depression in the ocean floor caused by the subduction of oceanic crust beneath either other oceanic crust or continental crust

trial and error learning - a form of associative learning. Trial and error learning occurs when an animal connects its own behavior with a particular environmental response. If the response has a positive reinforcement, or it is favorable to the animal, the animal will repeat the behavior in order to receive the same response again, possibly to receive a reward. If the response is unfavorable, such as causing pain, the animal will avoid the behavior

triaxon - in sponges, a spicule with three rays



Microscopic triaxon spicules in a sponge. (Photo: NOAA)

tribe - a taxonomic group that is between a genus and a subfamily

trichocyst - a stinging or grasping organelle in the outer cytoplasm of protists, especially ciliates. It consisting of a hair-like filament that can be discharged suddenly from a minute capsule

trichogyne - receptive elongation of the carpogonium (female reproductive structure) in red algae where male gametes become attached

trifurcate - dividing into three parts

triggerfish - any of several species of tropical coral reef fishes in the order Tetraodontiformes, family Balistidae, with laterally compressed bodies, heavy scales, and tough skins. Triggerfishes are named for the mechanism of the three spines of their first dorsal fin. When the fish is alarmed the first of these spines is locked upright by the second and drops only when the latter is pressed like a trigger. The function of this reaction is to lock the fish firmly in a mass of coral when attacked. Triggerfishes have powerful, chisel-like teeth adapted for cracking the coral and mollusks upon which they feed



The blue triggerfish (*Pseudobalistes fuscus*) in Hurghada, Red Sea. (Photo: Thomas Jundt)

triglyceride - a complex molecule which is the main component of dietary and body fat. It is made up of a combination of glycerol and three fatty acids

trihedral - with three surfaces, e.g. the body of a trunkfish



The trihedral shape of a trunkfish as it swims directly toward the viewer (Illustration: NOAA)

trimix - a breathing gas mixture of helium, oxygen, and nitrogen. By using trimix, it is possible for divers to descend to hundreds of feet without suffering from toxic partial pressures of oxygen (which increases with depth), and also reduces the effect of nitrogen narcosis



Marine scientists breathing trimix working on a transect line in order to collect sponge and water samples at a depth of approximately 60 m (200 ft). (Photo: NOAA National Undersea Research Program)

trinomen - in taxonomy, the combination of a generic name, a specific name, and a subspecific name, that together constitute a scientific name subspecies

triplet - in genetics, a sequence of three nucleotides of DNA which specifies an amino acid.

triploid - a polyploid having three sets of homologous chromosomes

tripton - the nonliving particulate matter in bodies of water

tritoniid - a member of a family of nudibranchs (Tritoniidae) which feed on soft corals, gorgonians, and other anthozoans. A characteristic common to the tritoniids are the dorsilateral branched cerata, used as gills and located in the edges of the dorsal surface



This relatively small Caribbean tritoniid (*Tritonia hamnerorum*) feeds exclusively on gorgonian sea fans and is sometimes found in large numbers. (Photo: Bill Rudman)

triturate - to grind or masticate

tRNA (transfer RNA) - short-chain RNA molecules present in the cell, in at least 20 varieties. Each variety is capable of combining with a specific amino acid, and attaches the correct amino acid to the protein chain that is being synthesized at the ribosome of the cell, according to instructions coded in the mRNA

trochophore larva - the ciliated planktonic larva of many invertebrates, including polychaete worms, mollusks, and rotifers



The trochophore larva of a marine worm. (Photo: University of Saskatchewan Archives)

troglobite - an obligate cave dweller

trolling - a fishing method where lures or baits attached to lines are towed behind a slowly moving boat



Fishing vessel trolling for tuna. (Graphic: NOAA)

trophic - related to or functioning in nutrition

trophic dynamics - the complex biological processes whereby energy and matter are passed up to successive levels of food webs

trophic group - a group of organisms consuming resources from a similar level in the energy cycle

trophic level - a classification system of organisms according to their means of obtaining nutrition. A segment of the food chain in which all organisms obtain food and energy in basically the same manner (e.g., photosynthesis, herbivory, or carnivory) and in which all organisms are the same number of links from the photosynthetic segment

trophosome - a collective term for all nonreproductive structures of colonial hydrozoans; a structure in beard worms (Polychaeta-Siboglinidae) that harbors commensalistic chemosynthetic bacteria in cells called bacteriocytes

tropical - region in which the climate undergoes little seasonal change in either temperature or rainfall. Tropical regions of the earth lie primarily between 30 degrees north and south of the equator

tropical depression - a mass of thunderstorms and clouds generally with a cyclonic wind circulation of between 20 and 34 knots

tropical disturbance - an organized mass of thunderstorms with a slight cyclonic wind circulation of less than 20 knots

Tropical Ocean Coral Bleaching Indices - indices of selected coral reef sites/regions (maintained by NOAA/NESDIS) that present satellite-obtained measurements of relevance to coral reef ecosystems

tropical storm - a tropical cyclone with maximum winds less than 34 m/sec (75 mile per hour)

trumpetfish - any of a family of tropical reef fishes (Aulostomidae), recognised by its long body, tubular snout with minute teeth, its chin barbel, and a series of short dorsal spines. A carnivore, It often approaches its prey vertically, darting down from above and sucking the prey into its long snout



The trumpetfish is a common reef fish. It feeds on other reef fishes.
(Photo: Keoki and Yuko Stender)

truncate - having the end squared off

trunkfish - any fish species in the family Ostraciidae (order Tetraodontiformes). Trunkfishes are encased in an triangular inflexible bony carapace which protects them from predators. Only the jaw, eyes, the bases of the fins, and the caudal fin protrude from this carapace. They are slow swimmers that move primarily by sculling with their dorsal and anal fins and use their caudal fin for sudden bursts of speed. They are also known as boxfishes or cowfishes.



The spotted trunkfish, *Lactophrys bicaudalis*. (Illustration: NOAA)

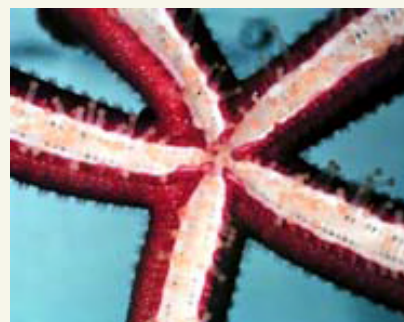
trust territory - a colony or territory placed under the administration of one or more countries by commission of the United Nations

tsunami - a long-period gravity wave generated by a submarine earthquake or volcanic event



Tsunami damage at Seward, Alaska, following 1964 Good Friday Earthquake. (Photo: NOAA)

tube feet - extensions of the water-vascular system of echinoderms, protruding from the body and often ending in suckers. They may be used for locomotion and/or for maintaining a tight grip on prey or on the substrate



The ventral side of a Pacific starfish shows its tube feet.

tube worm - a marine worm in the phylum Annelida, class Polychaeta, that lives within tubular cases made of mineral or chitinous secretions or of aggregated grit. Other worm-like invertebrates in the phyla Pogonophora and Phoronida have also been referred to as tubeworms



The Christmas tree worm, *Spirobranchus giganteus*, is a tube worm that inhabits coral reefs (Photo: Keoki and Yuko Stender)

tubercle - any small, usually hard, knobby excrescence or lump. In pycnogonids and some cheliceramorph arthropods, the central eyes are carried on a tubercle

tubicolous - inhabiting a tube or tubular structure; tube dwelling, such as some marine polychaete worms



a sabellid tube worm lives its life in a parchment tube (Photo: Dr James McVey/ NOAA)

tubiform - a shape resembling a tube



The trumpetfish has a snout which is tubiform or tubular in shape. (Photo: Copyright Digital Stock Corp.)

tubules of Cuvier - eversible toxic or sticky tubules associated with the bases of the respiratory trees of some sea cucumbers (Holothuroidea-Echinodermata)

tumid - swollen, inflated.

tumor - a mass of new tissue, with no useful physiological function, growing independently of its surroundings



A coral (*Porites lutea*) with a tumor (Photo: CNMI/ Coastal Resources management)

tumorigenesis - the production or formation of tumors

tunic - the outer covering of a tunicate (Urochordata). The tunic is mostly composed of a protein and carbohydrates



Orange colonial tunicate at Gray's Reef National Marine Sanctuary. Each of the individual tunicate's body is covered by the tunic. (Photo: NOAA)

Turbellaria - a class of generally small and free-living members of the flatworm phylum Platyhelminthes. Classification within the Turbellaria is in a state of flux as it is unclear whether the class is truly monophyletic. Most are marine and benthic, but some also inhabit fresh water and moist temperate and tropical terrestrial habitats. Most members of class are predatory on small invertebrates; the rest are herbivores, ectoparasites, or scavengers. Many coral reef-inhabiting turbellarians in the order Polycladida are very colorful

turbidimeter - an instrument for measuring turbidity of liquids

turbidity - cloudy water, usually caused by the suspension of fine particles in the water column. The particles may be inorganic, such as silt, or organic, such as high densities of single-celled organisms

turbidity current - a current of rapidly moving, sediment-laden water moving down a slope through air, water, or another fluid. The current moves because it has a higher density and turbidity than the fluid through which it flows

turbidity flow - a flow of dense, muddy water moving down a slope due to a turbidity current

turbinate - resembling an inverted cone

turquoise - blue green color

turriform - tower-shaped

tusk - an enlarged tooth

twilight - the time immediately before sunrise and after sunset when the sky remains illuminated

twilight zone - the term, "twilight zone" represents a transition from a region that receives sunlight during the daylight hours, to a region that remains in perpetual darkness. The coral-reef twilight zone is roughly defined as coral-reef habitat at depths between about 200 feet (60 meters) and 500 feet (150 meters). The upper limit represents the approximate maximum depth to which stony corals tend to dominate the reef structure, and the lower limit represents the maximum depth at which significant photosynthesis occurs (the maximum depth to which the living coral reef extends)

tympaniform - drum-shaped

type - in taxonomy, the standard of reference for determining the precise application of a name. Each taxon has, actually or potentially, a type: type of a nominal species is a specimen (type specimen or holotype); type of a nominal genus is the nominal species (type species); type of a nominal family is the nominal genus (type genus)

type collection - in taxonomy, a collection of type specimens

Type I error - the error of rejecting the null hypothesis when it is true

Type II error - the error of not rejecting the null hypothesis when it is false

type locality - in taxonomy, the geographical (and, where relevant, stratigraphical) location of the occurrence of the population from which the type specimen (i.e. holotype, lectotype or neotype) was taken

type material - in taxonomy, a collective term for all type specimens

type series - in taxonomy, the series of specimens which either constitutes the name-bearing type (syntypes) of a nominal species or subspecies or from which the name-bearing type has been or may be designated

type species - in taxonomy, the nominal species that is the name-bearing type of a nominal genus or subgenus

type specimen - in taxonomy, any specimen of the type series

typhoon - a hurricane that forms in the western Pacific Ocean



A satellite view of a typhoon in the western Pacific ocean (Image: NOAA)

typological species - a species defined on the characters of the type specimen; a group of organisms in which individuals are members of the species if they conform to certain fixed properties

[\(Top\)](#)



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<http://coris.noaa.gov>


[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: U

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

u - a common replacement for the Greek letter μ as a symbol for the micron or micrometer. The correct symbol for this unit is μm

U.S. Coral Reef Task Force (USCRTF) - established by President Clinton in June, 1998, through Executive Order 13089 on Coral Reef Protection, to lead the U.S. response to this growing global environmental crisis. Chaired by the Secretary of the Interior and the Secretary of Commerce, the USCRTF is composed of the heads of 11 federal agencies and the Governors of 7 states, territories or commonwealths with responsibilities for coral reefs. The USCRTF is responsible for overseeing implementation of the Executive Order, and developing and implementing coordinated efforts to: map and monitor U.S. coral reefs; research the causes and solutions to coral reef degradation; reduce and mitigate coral reef degradation from pollution, overfishing and other causes; and implement strategies to promote conservation and sustainable use of coral reefs internationally

U.S. Pacific Remote Insular Area (PRIAs) - PRIAs consist of the following islands and coral reefs appurtenant to such island, reef or atoll, as applicable: Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Wake Island, and Palmyra Atoll

ubiquitous - having a worldwide distribution; common to abundant in a given area

ultimate - last or farthest

ultramarine - deep blue color

ultrasonic - sound waves that have frequencies higher than what humans can hear, usually greater than 20,000 Hz. Some animals such as bats, a species of cave bird, and cetaceans use these high frequency ultrasonic sounds for communication and navigation

Ultraviolet-A (UV-A) - UV with wavelengths 315 - 400 nm

Ultraviolet-B (UV-B) - UV with wavelengths 280 - 315 nm

Ultraviolet-C (UV-C) - UV with wavelengths less than 280 nm

umbo - the earliest part of a bivalve or brachiopod shell; in bivalves, it is the most dorsal section of the shell, while in brachiopods, it is the most posterior



A bivalve shell: 1 = umbo; 2 = periostracum (the pigmented outermost layer of the shell). (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

umbraculiform - umbrella-shaped

umbrella - describes the body of a jellyfish or medusa



The transparent umbrella of this jellyfish makes it less obvious to predators.

umbrella species - in conservation biology, species with large area requirements. Conservation of these species should automatically conserve a host of other species

unaltered fossil - a fossil which retains much or all of its original chemical and structural composition

unavailable name - in taxonomy, a name which does not meet all mandatory provisions of the International Code of Zoological Nomenclature and thus has no status in nomenclature. Unavailable names include: *nomen oblitum*, *nomen negatum*, *nomen nudum*, *nomen nullum*, *nomen vetitum*

uncinate - hooked at the tip

undercurrent - a current below another current, or beneath the surface

underwater dB - the unit used to measure the intensity of an underwater sound. Underwater dB refers to "decibels referenced to 1 microPascal," which is abbreviated as "dB re 1 μ Pa." Sound intensity given in underwater dB is not directly comparable to sound intensity given

undulating - moving in waves

unincorporated territory - a United States insular area in which the United States Congress has determined that only selected parts of the United States Constitution apply

uniplanar - occurring in one plane

uniramous appendage - a type of appendage that is characteristic of insects and other members of the arthropod subphylum Uniramia. It consists of an unbranched series of segments

unite - in taxonomy, to combine or join two or more taxa

United States Insular Area - United States territory that is neither a part of one of the fifty states or the District of Columbia. Insular area is the current generic term used by the U.S. State department to refer to any commonwealth, freely associated state, possession or territory controlled by the US government. Several islands in the Pacific Ocean and Caribbean Sea are considered insular areas of the United States. Palmyra Atoll is an incorporated, uninhabited island, owned by the Nature Conservancy but administered by the Office of Insular Affairs. Unincorporated and inhabited U.S. possessions are Puerto Rico, U.S. Virgin Islands, American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands. Uninhabited areas are the United States Minor Outlying Islands, which are: Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Islands, Wake Island, Palmyra Atoll, and Navassa Island (disputed with Haiti)

United States territory - any extent of region under the jurisdiction of the federal government of the United States, including all waters (around islands or continental tracts). The United States has traditionally proclaimed the sovereign rights for exploring, exploiting, conserving, and managing its territory

Universal Time (UT or Z) - the correct name for the time system previously called Greenwich Mean Time (GMT). The symbol Z is often pronounced "Zulu," the name of the letter Z in the international radio alphabet

unorganized territory - an unincorporated United States insular area for which the United States Congress has not enacted an organic act

unpublished name - in taxonomy, any name which has not been printed and circulated to meet the criteria of publication as stated by the International Code of Zoological Nomenclature

unused name - in taxonomy, an available senior synonym that is not known to have been used as a valid name in the past 50 years

unzip - a method for uncompressing files on a PC after downloading them from the Internet. Many files are stored on servers in a compressed format, making them take up less disk space, and reducing the time it takes to download them. These files must be decompressed to make them usable by your computer. WinZip and pkunzip are popular free software programs that will uncompress files

upload - transferring data (usually a file) from the computer you are using to another computer. The opposite of "download"

upstream - toward the source or upper part of a stream or current; against the current

uptake - the entry of a substance into the body, into an organ, into a tissue, into a cell, or an organism's body fluids by passage through a membrane or by other means

upwelling - the process by which warm, less-dense surface water is drawn away from a shore by offshore currents and replaced by cold, denser water brought up from the subsurface

uracil - one of the four bases in RNA. The others are adenine, guanine, and cytosine. Uracil replaces thymine, which is the fourth base in DNA. Like thymine, uracil always pairs with adenine

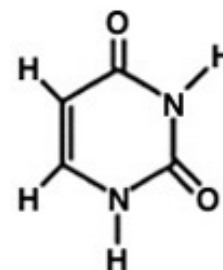


Diagram of the chemical structure of uracil, one of the four nitrogenous bases in RNA.

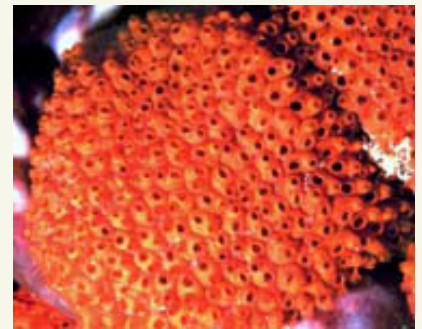
urban area - an area in which a majority of the people are not directly dependent on natural resource-based occupations

urea - a waste product of metabolism eliminated via the kidneys. In elasmobranchs (sharks, rays, skates), urea is found in the blood where it helps to maintain osmotic balance

uridine - the nucleoside having uracil as its base. Uracil is attached to a ribose ring

URL (Universal Resource Locator) - a website address, such as: www.coris.noaa.gov

Urochordata (Tunicata) - a subphylum of the animal phylum Chordata that contains the ascideans (sea squirts). Most adults are sessile and bear little resemblance to the other chordates. They are common inhabitants of coral reefs and mangrove roots



Orange colonial tunicates (Urochordata) at Gray's Reef National Marine Sanctuary.

uropod - fan-shaped, paired posterior abdominal appendage in certain crustaceans, e.g., lobsters or shrimp, that are used for swimming



Ventral view of crayfish. (Photo: Copyright LTTM 2003)

UV (ultraviolet) radiation - the region of the electromagnetic spectrum consisting of wavelengths from 1 to 400 nm

uvelloid - resembling a small cluster of grapes

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site
All of NOAA

Glossary of Terminology: V

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Glossary Pages

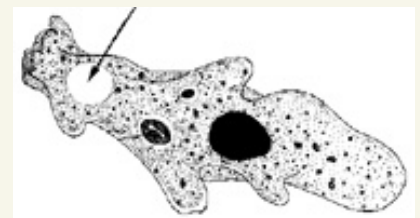
[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

v. et. - see also (*vide etiam*)

vaccine - a preparation that contains an antigen, consisting of dead or weakened whole or parts of disease-causing organisms, that is used to confer immunity against the disease that the organisms cause. Vaccine preparations can be natural, synthetic or derived by recombinant DNA technology

vacuolated - possessing vacuoles

vacuole - a membrane-bounded vesicle in eukaryotic cells that has a secretory, endocytotic, phagocytotic or storage function



A water vacuole in an amoeba. (Graphic: Wappingers Schools)

vacuolization - the formation or multiplication of vacuoles

vagile - freely motile; wandering; mobile

vagility - the capacity of an organism or population to change its location or distribution with time; ability to migrate

vaginate - enclosed by a sheath

vagrant - a species that has strayed beyond its natural range but has not established reproducing populations

valence - the chemical combining capacity of an element or ion; the number of electrons that are used by an atom to form a compound. A valence electron is in the outer or next outer shell of an atom

valid name - in taxonomy, the correct name for a given taxon, which may have several available names, one of which (usually the oldest) is chosen as the valid name. The valid name is always an available name, but an available name is not always a valid name

validated name - in taxonomy, a formerly invalid or unavailable name that has been made valid or available by the International Code of Zoological Nomenclature, e.g. by annulment or suppression of senior homonyms or synonyms

valve - the shell or shells of certain organisms, such as clams, oysters, and snails



A giant *Tridacna* clam with its two valves open.

variance - the population variance of a random variable is a non-negative number which gives an idea of how widely spread the values of the random variable are likely to be; the larger the variance, the more scattered the observations on average. It is a measure of the 'spread' of a distribution about its average value

variant - any individual or group that deviates from the typical anatomy or behavior; in genetics, an organism that is genetically different from the wild type organism

variegated color pattern - an irregular pattern of small, dark and light markings, with many of the dark marks connected

vas deferens - a duct that carries spermatozoa away from a testis

vascular plant - any plant containing a system of vessels which transport water and nutrients between different parts of the plant (e.g., from the roots to the leaves)

vasculature - the network of blood vessels in an organ or body part; tissue consisting of cells joined to form tubes for transporting fluids through a body

vasiform - vessel-shaped

vector - an abstraction of the real world where positional data is represented in the form of coordinates. In vector data, the basic units of spatial information are points, lines and polygons. Each of these units is composed simply as a series of one or more coordinate points. For example, a line is a collection of related points, and a polygon is a collection of related lines. Vector images are defined mathematically as a series of points joined by lines. Vector-based drawings are resolution independent. This means that they appear at the maximum resolution of the output device, such as a printer or monitor. Each object is self-contained, with properties such as color, shape, outline, size, and position on the screen

vector - an organism which carries or transmits a pathogen; a vehicle that transfers genetic material into a host cell or organism. Typically, vectors are of two types: viral- or DNA-based. DNA vectors are autonomously replicating, circular macromolecules that can be easily manipulated to carry genetic information and are transferred into cells by standard laboratory techniques. These vectors include plasmids, cosmids, and yeast artificial chromosomes (YACs). Recombinant viruses that have been bioengineered to be harmless can also carry new genetic information for transfer into cells, or into an entire host organism (an example of gene therapy)

VEEFER - see "REEFER"

vegetal coloration - a resemblance to vegetation which allows organisms to conceal themselves from predators or prey

vegetal hemisphere - the half of an oocyte or egg with more yolk, or the corresponding half of an early embryo with the slower dividing yolk-laden cells

vegetal pole - the portion of an oocyte or egg that is opposite the animal pole and contains most of the yolk granules. See "**animal pole**"

vegetative reproduction - a reproductive process that is asexual and so does not involve a recombination of genetic material. It involves unspecialized plant parts which may become reproductive structures (such as roots, stems, or leaves); also called "vegetative propagation"

velarium - a structure that resembles a hydrozoan velum. In scyphozoan medusae, but has a different embryonic origin

veliger - a molluscan larva in which the foot, mantle and shell first make their appearance

velocity - the rate of change of position over time, calculated by dividing distance by time

velum - a circular shelf of tissue attached to the underside of the umbrella in a hydrozoan mesusa. It functions in locomotion

vener reef - a reef with very little calcium carbonate accretion. A non-reef coral community

venomous - pertaining to an organism that has a venom, usually secreted by a gland, that is injected through hollow spines or teeth



A venomous cone shell. When close to its prey, usually another gastropod mollusk, it expands its long proboscis exploring for soft parts. A radular dart, bearing venom, is injected into the prey; death quickly results. (Photo: Dr. James P. McVey, NOAA Sea Grant Program)

vent - the posterior opening of the intestine, gonads, and kidney ducts. The vent is located just anterior to the anal fin in fishes

ventral - pertaining to, or situated near, the belly, or underside, of an animal

ventral disk - a "sucking disc " formed by the uniting of the pelvic fins in some fishes; for example, clingfishes



A clingfish's ventral disc allows it to hold onto rocks in strong currents or when waves crash over tide pools.

ventral fin - a synonym for pelvic fin

Verhulst's Law - although individuals may benefit from the presence of conspecifics, population growth cannot go on forever without negative consequences. Eventually, an upper boundary is reached beyond which population density cannot increase

vermetid reef - a reef composed of vermetid gastropods (a family of marine snails) built on some substrate such as coralline algae or bivalve shells. These filter-feeding shelled snails, called worm-shells, are gregarious colonial animals which develop massive structures. A vermetid reef may be seen in southwestern Florida, south of Fort Meyers in the Ten Thousand Islands area

vermetid tube - the "tube" of the worm-shell snail



A vermetid tube among coral branches. The snail's operculum covering the shell's opening is visible. (Photo: Ron Shimek)

vermiculation - a worm-like marking

vermiform - worm-shaped

vermillion - bright red color

vermivore - an animal which feeds upon worms and worm-like animals

vernacular name - the colloquial or common name of a taxon, i.e., in any language or form other than that of biological nomenclature. Vernacular names have no status in nomenclature

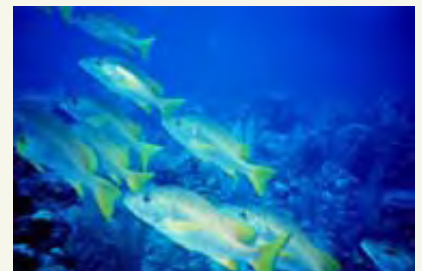
verruca - a wart-like projection; a small cylindrical projection arising from the corallum that contain calices

verrucose - having a warty appearance

versus - against; in contrast to

vertebra - one of the bony segments of the vertebral column of vertebrate animals; in brittlestars (Echinodermata-Ophiuroidea), a vertebra is one of the many articulated ossicles that join together along the length of the arms. They occupy most of the interior of each arm, and have sockets by which they connect to each other

vertebrate - an animal that possesses a vertebral column (back bone), such as fishes, amphibians, reptiles, birds and mammals



Vertebrate animals of the fish class Osteichthyes.
(Photo: Dr. Anthony Picciolo)

vertical classification - classification which stresses common descent and tends to unite ancestral and descendant groups of a phyletic line in a single higher taxon, separating them from contemporaneous taxa having reached a similar grade of evolutionary change

vertical fin - the unpaired dorsal, caudal and anal fins. Vertical fins are also called median fins

vertical migration - the diel behavior of zooplankton and some nekton to descend from surface waters during the daytime and ascend to the surface during nighttime hours

vertical zonation - horizontal banding of communities of organisms in response to a vertical environment gradient

vesiculate - thin and bladder-like

vestigial structure - an incompletely or ineffectively developed structure which is greatly reduced from the original ancestral form and is no longer functional

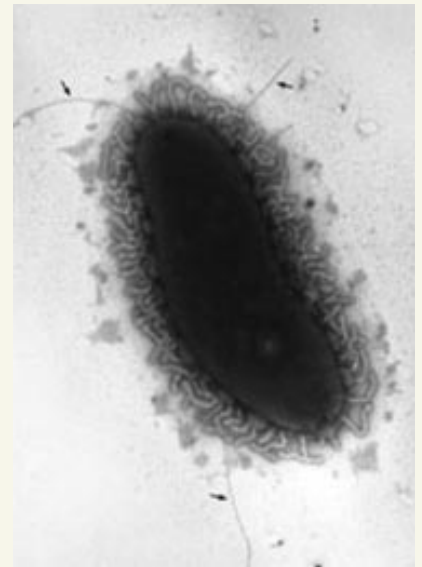
Vestimentifera - a former phylum of benthic marine tube worms, now considered by many to belong to the family Siboglinidae of the phylum Polychaeta. Vestimentiferans live close to hydrothermal vents on mid-ocean ridges and around cold sulphidic or hydrocarbon seeps on continental slopes. They feed primarily on symbiotic (mutualistic) hydrogen sulfide- or methane-oxidizing bacteria living in an internal organ, the trophosome

vestmentum - a short region immediately behind the head of a vestimentiferan tube worm. The front part of the vestimentum forms a collar. This region may secrete the tube

viable - having the capacity to live, grow, germinate or develop; capable of life or normal growth and development

vibraculum - a bryozoan heterozoid that possesses long setae, or bristles, and may function in cleaning the colony

Vibrio - a genus of motile, gram-negative, rod-shaped bacteria characterized by short, slightly sinuous filaments and an undulatory motion. Some species in this genus cause cholera in humans and other diseases in other animals, including corals



Vibrio vulnificus pili, a bacterium normally found in temperate estuarine waters, and as a colonizer of molluscan shellfish, such as oysters. (Photo: NOAA Northwest Fisheries Science Center)

vibrotaxis - an organism's response to mechanical vibrations

vicariant event - an unexpected or abnormal event

vicariant speciation - speciation when a single, widespread population is divided by (1) the emergence of an extrinsic barrier, (2) extinction of intervening populations, or (3) migration of some individuals into a separate region

vice - in place of; rather than

video transect - a nondestructive, repeatable procedure for assessing and monitoring diurnally active fishes and other macroscopic marine organisms. Videotaping along a linear transect reduces the variance in error inherent with visual observations made by a diver or snorkeler, and allows virtually unlimited time for study of the images by many individuals

villiform - taking the form of villi (finger-like projections); in fishes, pertains to teeth which are slender and crowded closely together in bands

villus - a small, fingerlike or hairlike projection of the small intestinal wall that contains connective tissue, blood vessels, and a lymphatic vessel, and which functions in the absorption of nutrients

violaceous - violet color

violet - bluish purple color

viral DNA - DNA (deoxyribonucleic acid) that makes up the genetic material of viruses

virion - a complete infectious viral particle, existing outside of a host cell, with nucleic acid and capsid, and in some types, an outer lipid envelope

viroid - an infectious particle similar to a virus, but smaller. It consists only of a strand of nucleic acid without the protein coat (capsid) characteristic of a virus

virology - the study of viruses

virtual library - virtual libraries provide online access to specialized collections of information resources. Normally they include bibliographic citations with links to full text documents and other online resources such as video or photos. Virtual Libraries can also serve as gateways to information and resources on science, management, and policy for researchers, scientists, resource managers, policymakers, stakeholders, and the general public. Restoration, Marine Protected Areas, and Coral Reefs are examples of three NOAA virtual libraries in such areas

virulence - the ability to infect or cause disease

virulence - the disease-producing ability of a microorganism

virus - a sub-microscopic, obligate intracellular parasite that replicates itself only within cells of living hosts; many are pathogenic; the structure of a virus is basically a strand of nucleic acid (DNA or RNA) wrapped in a thin protein shell. A virus is not a cell, and is "lifelike" only when replicating itself at the expense of the host cell

viscera - the internal organs, collectively, of an coelomate organism, especially those located within the abdominal cavity, but also to the organs within the thoracic and mediastinal cavities

visceral hump - the main body of a mollusk, which contains most of the organs, including a complete digestive and excretory tract as well as the reproductive organs. The visceral hump also includes the mantle, which consists of two external flaps of tissue that secretes the material that forms the shell on some species, and it protects the mantle cavity. The mantle cavity contains the gills, which excrete waste and circulate oxygen. Most mollusks have a shell, which sits on the visceral hump and a protects the main body from predators

viscid egg - an adhesive egg that is deposited on sand, gravel, plants, etc. to which it sticks by means of the egg's sticky surface

viscosity - a measure of resistance to flow in a liquid

visible radiation - energy at wavelengths from 400 - 700 nm that is detectable by the human eye

visible wavelengths - wavelengths approximately 400 to 700 nm

visualization tool - a method of visually displaying data, such as a visualization theater, computer display, and map and chart

vitamin - a chemical substance, required in trace concentrations, which acts as a cofactor with an enzyme in catalyzing a biochemical reaction

vitamin B complex - a large group of water soluble vitamins that function as co-enzymes

Vitareef program - a program that was established in order to provide a standardized method of characterizing the conditions of reef corals. It can and has been used by both researchers and non-scientists to document observations of reefs at specific points in time, which can be followed up in subsequent observations to assess changes in the state of individual coral colonies, selected coral species, or a reef as a whole

vitellaria larva - a ciliated larva of echinoderms, such as sea lillies (Crinoidea), some sea cucumbers (Holothuroidea), and brittle stars (Ophiuroidea)

viviparity - a form of reproduction where the offspring are nourished in the reproductive tract of the female (other than by a yolk sac) and then expelled from the mother as free-swimming young. Mangrove reproduction by means of propagules is also a form of viviparity in plants

vocalization - a sound intentionally produced by an animal

volant - flying or capable of flying

volcanism - the set of geological processes that result in the expulsion of lava, pyroclastics, and gases at the Earth's surface

voucher specimen - any specimen that serves as a basis of study and is retained as a reference. It should be in a publicly accessible scientific reference collection. A type specimen is a particular voucher specimen which serves as a basis for the taxonomic description of a species

vulnerable species - a species that is particularly at risk because of low or declining numbers, a small range, or for some other reason, but is not threatened or endangered

[\(Top\)](#)



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[Main Page](#)
[References](#)

This Site
All of NOAA

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Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

Wahlund effect - a subdivided population contains fewer heterozygotes than predicted despite the fact that all subdivisions are in Hardy-Weinberg equilibrium, i.e., internally subdivided species have more homozygosity than an equivalent fused population would, creating more phenotypically expressed variation

wake - waves generated in the water by a moving vessel

walking shark - a small, slender-bodied, bottom-dwelling epaulette shark (*Hemiscyllium* sp), one of the carpet sharks, that uses its pectoral fins to "walk" across the seafloor

wall - the reef slope, which may suddenly drop off into deeper water, forming a nearly vertical wall

Wallace's Line - a hypothetical line which separates the zoogeographical regions of Asia and Australasia. It is named after Alfred Russel Wallace who noticed the apparent boundary during his travels through the East Indies in the 19th Century. The line runs through the Malay Archipelago, between Borneo and the Celebes and Bali and Lombok. West of the line are found mostly species that are related to Asiatic species, to the east mostly species that are related to Australian species

warning signal - in animal behavior, any visual, acoustic, or chemical signal (stimulus) broadcast by an organism to warn others of its presence; also includes threat signals directed toward an opponent of the same or different species

wash zone - the depth zone in which sediments are disturbed by wave action near the shoreline

wastewater - water that is a mixture of water and dissolved or suspended solids carrying wastes from homes, businesses and industries

wastewater treatment plant - a facility containing a series of tanks, screens, filters and other processes by which pollutants are removed from water

water - pure water consists of hydrogen and oxygen, H₂O. It is a binary compound that occurs at room temperature as a colorless, odorless, tasteless, transparent liquid which is very slightly compressible. It freezes at 0 degrees C and boils at 100 degrees C. It is the most important natural solvent, and frequently contains impurities, which are mostly removed by distillation



Wave sweeps toward a coastline. (Photo: Copyright Digital Vision Ltd.)

water column - the water mass between the surface and the bottom

water mass - a large body of water whose density characteristics are distinct from the surrounding aquatic environment because of inherent temperature or salinity differences

water pik method - a laboratory technique which uses a water pik to separate tissues from the skeletons of hard corals or remove zooxanthellae from coral polyp tissues

water pressure - the force per unit area exerted by the weight of water. Each 33 feet of sea water exerts a pressure equivalent to one atmosphere, or 14.7 psi

water strider - an insect (a bug) in the order Hemiptera. Some species, mostly in the genera *Hemmatobates* and *Halobates*, are marine inhabitants of mangroves, intertidal coral reef flats, and the water surface near coral and rocky reefs in the Indo-Pacific region; marine species also called "sea skaters"

water table - the level or depth below the ground that is saturated with water

water table - the level below the earth's surface at which the ground becomes saturated with water. The water table is set where hydrostatic pressure equals atmospheric pressure; the surface between phreatic water which completely fills voids in the rock and ground air which partially fills higher voids

water vascular system - in echinoderms, a system of internal canals and appendages that are water-filled and functions as a means of locomotion

watercourse - a natural channel for water

watershed - an area of land that drains downslope to the lowest point. The water moves through a network of subterranean and surface drainage pathways which converge into streams and rivers, eventually reaching an estuary and finally the ocean. Because water moves downstream, any activity that affects the water quality, quantity, or rate of movement at one location can affect locations downstream to the ocean and out to coral reefs



Angel Falls, Venezuela. This great waterfall contributes to the Orinoco River watershed. Nutrients and minerals from the rainforests and savannas of the Orinoco River basin are transported with the Orinoco current and may effect coral reefs in the southeastern Caribbean. (Photo: Copyright Dr. Anthony R. Picciolo, NOAA)

wave crest - the top of a wave

wave height - the vertical distance between the crest and adjacent trough of a wave

wave length - the distance between two successive wave crests or troughs

wave trough - the low spot between two successive waves

WCMC Global Coral Disease Database - the World Conservation Monitoring Centre (WCMC) and NOAA maintain the Global Coral Disease Database which is populated with over 2000 records of coral diseases from approximately 155 sources. The occurrence of a disease on a coral species (or genus) was recorded for each location and date on which it was observed. A unique combination of coral species, disease, date, and location therefore constitutes a single record

weather - temperature, precipitation, and wind speed and direction that occur on a daily basis

Web Reef Advisory System (WRAS) - the Web Reef Advisory System (WRAS) was developed by ReefBase and Reef Check, in collaboration with the Coastal Resources Center at the University of Rhode Island and the Department of Biological Sciences at the University of Southern California, as "an online application to input, view, and analyze Reef Check survey data. It calculates indicators of how good or bad a shape a particular reef is in, and what the underlying causes may be, based on Reef Check surveys." WRAS allows users to view, analyze, and add data. The file location is: www.reefcheck.org/datamanagement/

Weberian apparatus - the four anterior vertebrae and associated tissues in some fishes (catfishes, loaches, minnows, suckers) that connect the gas bladder to the inner ear, conveying pressure changes and sound

wedge shaped - a form that is thick at one edge and tapered to a thin edge at the other

weight belt - a belt worn during scuba diving that contains lead weights, either solid masses or as shot in pouches. The weight belt allows a diver to descend in the water column against the forces buoying the diver upwards

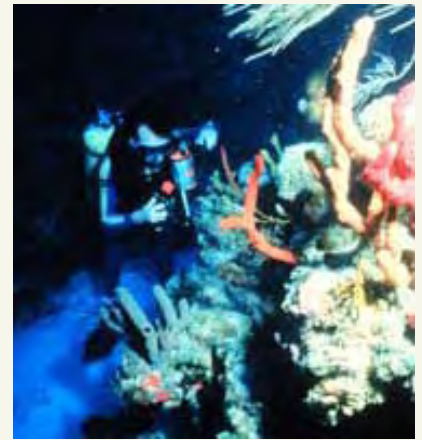
wet collection - a museum collection of specimens that are stored in ethanol, isopropanol, formalin or other liquid preservatives

wetland - an area that, at least periodically, has waterlogged soils or is covered with a relatively shallow layer of water. Bogs, freshwater and saltwater marshes, and freshwater and saltwater swamps are examples of wetlands



Wetlands provide for valuable nursery areas for many organisms.

white hole - an area along the spur and groove system (zone) where the sand channel widens considerably



A scientist stands in a sand channel within a reef spur-and-groove zone.

white pox disease - a coral disease characterized by circular lesions with coral tissue degradation on the Caribbean elkhorn coral, *Acropora palmata*. The pathogen is a bacterium, *Serratia marcescens*.



White pox disease is characterized by white circular lesions on the surface of infected colonies (Photo: Dr. A. Bruckner, NOAA)

white skeleton - the exposed white calcium carbonate skeleton of a coral colony

white-band disease - a coral disease characterized by complete coral tissue degradation of Caribbean acroporid corals.- Two species of Acroporidae are affected, the elkhorn coral, *Acropora palmata*, and the staghorn coral, *A. cervicornis*. The disease exhibits a sharp demarcation between apparently healthy coral tissue and exposed coral skeleton.- These signs are identical to plague, except that white band is acroporid specific (and plague has not been found on acroporids).- Tissue loss usually proceeds- from the base of the colony branch to the tip, although it can



Elkhorn coral populations have suffered widespread declines from white-band disease (Photo: Dr. A. Bruckner, NOAA)

begin in the middle of a branch in *A. cervicornis*. White band disease affects acroporid corals throughout the Caribbean and has decimated populations at a regional scale. The infective agent has not yet been isolated. For more information and illustrations, see: http://www.coral.noaa.gov/coral_disease/white_band.shtml

whorl - a ring; one turn of a spiral

wild - living in a natural state; living in nature

wild type - the form of an organism that occurs most frequently in nature

wildlife refuge - an area designated for the protection or replenishment of wild animals, within which hunting and fishing are either prohibited or strictly controlled

wind vane - an instrument used to determine wind direction

windlass - a winch used to raise a ship's anchor

windward - refers to the side of an island or reef that faces the prevailing wind

Windward Passage - a channel between eastern Cuba and western Haiti that connects the Atlantic Ocean with the Caribbean Sea

Winogradsky column - a glass column with an anaerobic lower zone and an aerobic upper zone, which allows growth of microorganisms under conditions similar to those found in a nutrient-rich body of water. It is a simple device for culturing a large diversity of microorganisms

work - in physics, the transfer of energy from one object or system to another by applying a force over a distance. The formula for work is $(\text{force}) \times (\text{distance})$

work (taxonomy) - in the International Code of Zoological Nomenclature, any text whether published, unpublished, or carrying a disclaimer containing a name or other information bearing on nomenclature

work of an animal - results of the activity but not part of the animal itself, e.g., tracks, trails, worm-tubes, borings (but excludes some fossil evidence such as internal molds, external impressions and replacements)

World Commission on Protected areas (WCPA) - the world's leading global network of protected area specialists. The mission of the WCPA is "to promote the establishment and effective management of a world-wide representative network of terrestrial and marine protected areas, as an integral contribution to the IUCN mission"

World Conservation Union - the name of the IUCN used since 1990. See IUCN

World Register of Marine Species (WoRMS) - an authoritative and comprehensive list of names of marine organisms, including information on synonymy. While highest priority goes to valid names, other names in use are included so that this register can serve as a guide to interpret taxonomic literature (www.MarineSpecies.org)

WorldFish Center - an autonomous, nonprofit organization which was established as an international center in 1977. Its mission is to reduce poverty and hunger by improving fisheries and aquaculture. The Center is an operational entity with programs funded by grants from private foundations and governments. It is governed by an international Board of Trustees; its policies are implemented by the Director General. In 1992, the WorldFish Center became a research center of the CGIAR (Consultative Group on International Agricultural Research). The CGIAR is an informal association of more than 60 public and private sector members; formerly known as "ICLARM"

worm reef - a massive structure composed of clusters of oval, table-like mounds constructed by marine polychaete worms in the family Sabellariide. They consist of all sorts of sediments consolidated by a mucoprotein cement produced by the worm. This reef may start in the intertidal zone and extend into the subtidal zone. Some are in deeper water. Unlike the colorful and ornate coral reefs, worm reefs are drab, monotonous and rounded clusters, mounds and platforms that grow upward and outward from the durable substrate from which their colonies develop. Worm reefs offer several ecological benefits. They provide feeding and browsing grounds for a diverse community of marine organisms and an ideal home for attaching plants, sponges and shelter-seeking animals. Also, unlike coral reefs, worm reefs are not restricted to the tropics

worm shell - a snail in the gastropod family Vermetidae. Worm shells are gregarious species forming an intertwining mass of long, white, worm-like tubes, often sunken into a reef substrate. They get their common name of "worm shell" because their shells superficially resemble the shells of some tube-building marine polychaete worms. After a short motile existence, they cement their shell to a hard substrate, and as they grow, the shells may coil or meander over the substrate producing a tube that looks quite like a tube worm. Worm shells are filter-feeders which spin a



A crab at the opening of a vermetid worm shell,

mucus net to trap floating food particles, such as plankton

Dendropoma maxima
(Photo: Teresa Zubi)

wrack - organic material, usually from dead seagrass or algae that wash up on shorelines

wrasse - a large family (Labridae) of brightly-colored bony fishes which are common inhabitants of coral reefs. Many have spiny fins, thick lips, and strong teeth. They range in size from about three inches to three meters. Some species of small wrasses are "cleaners," which regularly remove ectoparasites from the skin and gills of larger fishes



The wrasse, *Coris dorsomacula* (Photo: John E. Randall)

WW2BW (White Water to Blue Water Initiative) - the White Water to Blue Water (WW2BW) Initiative was formulated in 2002 during the World Summit on Sustainable Development. WW2BW responds to the World Summit's "Oceans" agenda with an integrated approach to sustainable use of water resources. In an effort to address water pollution and scarcity, United States government agencies, including the State Department, NOAA, USAID, as well as the United Nations, governments of the Wider Caribbean Region, and a number of non-governmental organizations have come together to plan and implement programs which will lead to the conservation and sustainable management of both freshwater and coastal marine resources in the Caribbean. WW2BW stimulates partnerships to promote integrated watershed and marine-based ecosystems management in support of sustainable development. Four thematic areas are supported: integrated watershed management, marine ecosystem-based management, sustainable tourism, and environmentally sound marine transportation. The outcome of the WW2BW partnership in the Wider Caribbean may serve as the blueprint for future programs on watershed and marine ecosystem-based management in Africa and the South Pacific



This photograph, used in a poster for WW2BW, suggests the relationships between the forested land, fresh water, the human community, and the sea. The photograph highlights the pitons of St. Lucia in the Caribbean Sea. (Photo: Dr. Anthony R. Picciolo, NOAA)

[\(Top\)](#)



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<http://coris.noaa.gov>


[Main Page](#)
[References](#)

This Site
All of NOAA

Glossary of Terminology: X

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

X linkage - in genetics, the inheritance pattern of genes found on the X chromosome but not on the Y

X-organ - groups of neurosecretory cells in the eyestalks of crustaceans that secrete a molt-inhibiting hormone

xantho- - a prefix meaning yellow

xanthochromic - yellow or golden color

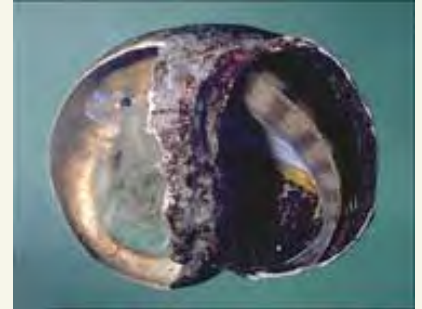


A yellow tang, *Zebrasoma flavescens*. (Photo: Jim McVey, NOAA)

xanthophore - a chromatophore which produces yellow pigments in the form of carotenoids

xenobiotic - a chemical which is not a natural component of the organism exposed to it; a chemical or other stressor that does not occur naturally in the environment. Xenobiotics occur as a result of anthropogenic activities such as the application of pesticides and the discharge of industrial chemicals to the environment; a synthetic chemical believed to be resistant to environmental degradation. A branch of biotechnology called 'bioremediation' seeks to develop biological methods to degrade such compounds

xenoecic - pertains to an organism that inhabits the empty living space or shell of another organism



A xenoecic cichlid fish occupying the shell of a mollusk. (Photo: M.K. Oliver, Ph.D./ Cichlid fishes of lake Malawi, Africa)

xenology - homology that arises via lateral gene transfer between unrelated species (e.g., by retroviruses)

xenoparasite - an organism not usually parasitic on the host but that becomes so because of a weakened condition of the host

xenophyophore - a giant protozoan protist (*Syringammima fragilissima*), up to 25 cm in diameter, that inhabits deep-sea habitats. Large aggregations of xenophyophores appear on the Darwin Mounds



A xenophyophore photographed on the Blake Ridge. They construct complex, golf-ball-sized tests from sand and sediment grains. (NOAA photo)

xenotransplantation - transplantation of tissue from one species to another species

xeric - arid; characterized by dry conditions; requiring only a small amount of moisture

xiphoid - sword-shaped; also called "xiphiform"

xylem - tissue in vascular plants that carries water and nutrients from the roots to the shoot and leaves. The xylem contains tracheids, vessels, fiber cells and parenchyma. It also provides structural support

[\(Top\)](#)



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<http://coris.noaa.gov>


[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: Y

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

Y junction - in genetics, the point of active DNA replication where the double helix opens up so that each strand can serve as a template

Y linkage - in genetics, the rare inheritance pattern of genes found on the Y chromosome but not on the X

Y-organ - a gland situated near the external adductor muscles of the mandible of some crustaceans that secretes the molting hormone

YAC (yeast artificial chromosome) - a vector used to clone DNA fragments from 300 kb to one megabase (unit of length for DNA fragments equal to one million nucleotides) in length. These clones can span large portions of the genome rapidly, but can be highly unstable

year class - fish of a given species spawned or hatched in a given year

yearling - a one-year-old individual in its second year of life

yeast - a single-celled fungus that reproduces by budding

yellow-band disease - a coral disease characterized large rings or patches of bleached, yellow tissue on Caribbean stony corals, although tissue loss is minimal (cm/yr). It affects the star corals, *Montastraea annularis* and *M. faveolata* and is widespread throughout the Caribbean region. No pathogen has been isolated. For more information and illustrations, see: http://www.coral.noaa.gov/coral_disease/yellow_band.shtml

yolk - nutritive material of an ovum, consisting of protein and fat, stored for the nutrition of an embryo or early larva

yolk cell - in a telolecithal egg (an egg in which the yolk is not distributed evenly, but concentrated in one region), the yolk cells are the cells formed when cleavage reaches the yolk region

yolk sac - a vascularized extra-embryonic membrane of amniote embryos that forms around the yolk of the egg cell in birds and reptiles. In mammals, the yolk sac membrane grows out around the empty blastocoel (blastula cavity) formed within the inner cell mass in the cleaving embryo. The blastocoel is renamed the yolk sac. In birds and reptiles, the blood vessels in its walls transport yolk nutrients to the embryo. In mammals, these vessels still form even though they don't supply nutrients to the embryo. They remain to form blood vessels in the digestive tract

yolk-sac larva - a fish larva which has already hatched from the egg but has not yet started feeding and still absorbs the yolk in the ventrally-attached yolk sac

young-of-the-year (YOY) - fish that are less than one year old; hatched during the spawning season

[\(Top\)](#)



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<http://coris.noaa.gov>


[Main Page](#)
[References](#)

This Site

All of NOAA

Glossary of Terminology: Z

The glossary is organized alphabetically by page -- [A through Z](#). Literature sources are listed on the References Page.

The entire glossary is also provided as a [PDF document](#) (7.2 MB). The document includes all terms, photographs, images, and literature sources.

Glossary Pages

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#)
[N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#)

zeitgeber - a periodic environmental signal that entrains a biological rhythm. For example, a cycle for a circadian rhythm, but may also be a temperature or even social cycle

zenith - the point of the celestial sphere which is directly overhead

zip - a compressed file format (.zip); to compress a file using a zip utility. Compression is generally used to speed up the transport of large or multiple files. After the file has been downloaded, a decompression application is needed to "unzip" it

zoanthea - an elongate larval form of Zoanthidea with a ventral band of very long cilia

zoanthid - an anemone of the family Zoanthidae, usually found in intertidal areas and coral reefs . In some species the polyps separate from each other almost completely after budding, while in other species, the polyps are all interconnected by a common mat of tissue

zoanthina - an oval larval form of Zoanthidea with a girdle of long cilia near the oral pole

zoarium - the form of a bryozoan colony

zoea - a free-swimming larval stage of various crustaceans



A zoea larva. (Photo: Marine Ecology Laboratory, Shimoda Marine Research Center, University of Tsukuba)

zonate - divided by parallel planes, e.g., zonate tetraspores, found in certain species of red algae

zonation - the occurrence of single species or groups of species in recognizable bands that might delineate a range of water depth or a range of height in the intertidal zone

zone - a large-scale physical feature within the ecosystem. Reef zones are determined by currents, wave surge, exposure to sunlight and water depth, and may be comprised of a number of habitats

zoning - a process in which a marine protected area is divided into discrete zones and particular human uses of each zone are permitted, often with conditions such as gear limitations in fishing and waste discharge prohibitions in tourism. In the U.S., marine sanctuaries, national parks, national wildlife refuges, and state MPAs are some examples of areas that may be zoned

zoochory - the dispersal of plant seeds or spores by animals. Endozoochory is zoochory within the animal's body. Exozoochory is zoochory where the seeds are attached to the outside of the animal's body

zooecium - the skeleton of a bryozoan zooid

zoogenic - pertaining to changes caused by animals or their activities

zooid - of the distinct individuals forming a colonial invertebrate animal, such as a hydrozoan

zooidal - pertaining to a zooid, as for example, a zooidal form

zoology - the scientific study of animal life. Zoological sciences include the studies of evolution, systematics, cell biology, biochemistry, micro and macro anatomy, development, genetics, physiology, ecology, biogeography, biodiversity, behavior and sociobiology

zoonose - a disease of non-human animals that may be transmitted to humans, or may be transmitted from humans to non-human animals

zoophyte - an invertebrate which resembles a plant in appearance or mode of growth, as for example, hard corals, sea fans, and other soft corals, sea anemones, hydroids, bryozoans, sponges, etc., especially any of those that form compound colonies having a tree-like form

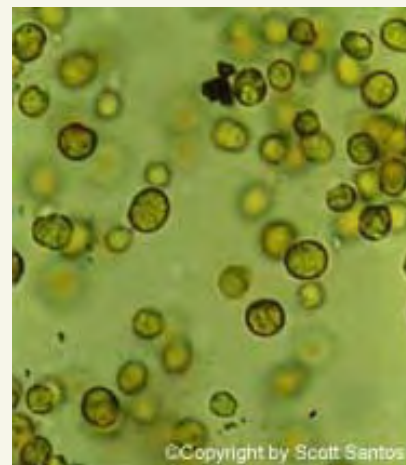
zooplankton - animal component of the plankton community

zoosemiotics - the study or analysis of animal communication

zoospore - a motile, flagellated spore

zootoxin - any poisonous or venomous substance produced by an animal

zooxanthellae - a group of dinoflagellates living endosymbiotically in association with one of a variety of invertebrate groups (e. g., corals). In corals, they provide carbohydrates through photosynthesis, which are used as one source of energy for the coral polyps. They also provide coloration for the corals



Zooxanthellae. (Photo: Scott Santos)

zooxanthellate coral - a coral that has zooxanthellae in its tissues

Zulu time (Z) - one of several names for the 24-hour time period. Other names for this time measurement are Universal Time Coordinate (UTC) or Greenwich Mean Time (GMT)

zygocardiac ossicles - triangular plates, usually bearing denticles, which project into the cavity of the cardiac stomach in decapod crustaceans, such as shrimps, crabs and lobsters; part of the gastric mill

zygote - a fertilized egg with the diploid number of chromosomes formed by the union of the nuclei of male and female gametes

zymogen - an inactive enzyme precursor that requires a biochemical change, such as a hydrolysis reaction revealing the active site, for it to become an active enzyme

[\(Top\)](#)



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