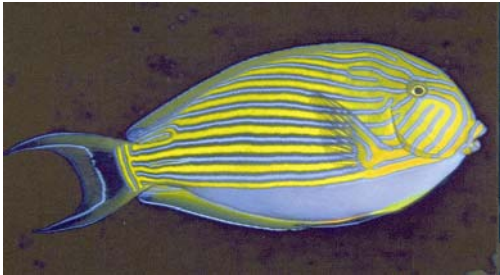


15. Old fish caught locally

This is hard to believe -- an 18 year old *alogo* was caught in American Samoa. That's old enough to get a drivers license.

We're talking about the *alogo*, also known as the blue-lined surgeonfish *Acanthurus lineatus*. Nothing unusual about its size -- it was the typical 8-inch *alogo* you see in the stores. And I ate it. All that remained were the little bones that scientists use to determine the age of the fish. These bones, when looked at under a microscope, have concentric circles, one for each year, just like tree rings. You just count the rings and that's how old the fish is.



What's even more astonishing is that an *alogo* caught in Australia's Great Barrier Reef was 44 years old. I am not kidding. There were also other *alogo* in the Australian sample that were 20-40 years old, so the record age of 44 is believable. These old fish were not unusually large, just the standard size *alogo*.

It turns out that this is not unusual for coral reef fish. Recent studies show that several other species of surgeonfish (*pone*), unicornfish (*ume*), groupers (*gatala*) and snappers (*mu*) can also live up to 20-40 years. These findings are beginning to reshape our understanding about the ecology of coral reef fishes and their vulnerability to overfishing. The occurrence of many long-lived fish in a population indicates that the coral reef fish community is quite stable, with a low replacement of individual fish. Once a young fish gets to the reef, it may be there for decades.

Why would these fish live so long? The answer provides some key information about the environment that the fish live in. Fish typically exhibit this type of life cycle (long life span and repeat spawning) when few of their young survive. That's certainly the case for coral reef fish – their thousands of eggs and larvae drift around with the ocean currents for weeks or months. Very few of them make it back to the reefs. So, if all their young usually die, the adult fish need to live a long time and spawn repeatedly to make sure that at least some young survive. If the adults lived only a short time, the population might disappear altogether.

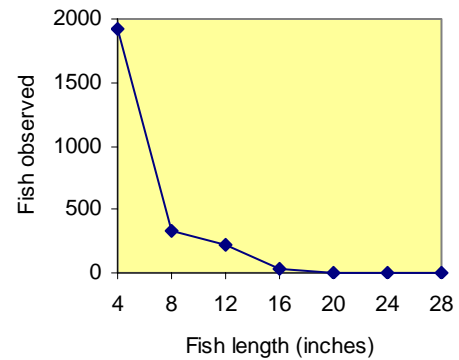
Every so often however, during years when the ocean currents and conditions are just right, massive numbers of young fish survive and appear on our reefs, like *pala'ia* (young *pone* surgeonfish) or *i'asina* (young goatfish).

While this is all very interesting of course, there is an important take-home message. It is easy to overfish populations with these life history characteristics. Having a long life span and spawning repeatedly may be a successful strategy under natural conditions, but it also makes these fish extra vulnerable to overfishing. That's because fishermen tend to harvest the larger (older) fish in the population. Under heavy fishing pressure, all the old fish may be taken, leaving only the smaller, younger fish. That would put the population in a very precarious situation, because the younger fish left may not yet be old enough to spawn.



i'asina in a basket trap (*enu*)

That appears to be exactly what has happened in American Samoa because there are relatively few and/or small sizes of the species commonly taken for food left on our reefs. The graph at right shows the pooled lengths of all surgeonfish, unicornfish, parrotfish, snappers, emperors, groupers, jacks and sharks sighted during extensive scientific surveys on the reef slope at the 30-ft depth. Few fish were 16 inches (40 cm) or larger. This depressing picture is not a sudden event – surveys in 1996 and 2004 show similar results.



Even though current levels of fishing do not seem excessive, the area of our reefs is rather small and consequently it is easily fished out. Fish stocks may well have been depleted years ago – knowledgeable locals and elder Samoans recall seeing far more fish on our reefs 25 years ago.

A meaningful recovery will require nothing short of a territory-wide reduction in the harvest of coral reef fishes for at least 10 years, with specific protection for the larger fish. That's what the long life span of the fish is telling us. There is no quick fix. Additionally, setting aside some areas as marine protected areas is an essential component for the recovery of fish stocks. To be effective, such areas must provide long-term protection by being permanently closed to all fishing. Marine protected areas that are periodically opened up to fishing may satisfy short-term goals, but they do not allow the fish to grow big and old, and it is these old-timers that produce the most fish eggs. For example, one large snapper (*mu*) 24 inches long releases as many eggs as 212 snappers that are 17 inches long.

So, that 18 year old *alogo* was not just an unusual trophy – it was also a vital member of the fish community that spawned year after year, thereby insuring that some young fish survived to maintain a healthy population of *alogo* on our reefs.

Two fisheries in American Samoa currently target coral reef fish -- the subsistence fishery and the artisanal (small-scale commercial) fishery. Subsistence fishing includes the multiple ways that Samoans have always caught nearshore fish for food. In modern times, this includes rod and reel, bamboo pole and line, free-diving, throw nets, gillnets, and gleaning (hand-picking clams and octopus). Stone weirs for atule and enu baskets for juvenile goatfish (*i'asina*) are still used in Manu'a. On Tutuila, subsistence catches appear to be modest in size and have been declining steadily over the past 20 years due to lifestyle changes (more people have regular jobs).

The artisanal fishery that sells reef fish to local stores is a relatively recent development. It is conducted by teams of night divers who use underwater flashlights and spears to catch sleeping fish. In the mid 1990s, many of these divers switched from free-diving to scuba diving, which greatly increased the number of fish they caught. This type of heavy fishing had a significant overfishing impact on our reef fish populations, so the use of scuba gear while spear fishing was banned in the Territory in 2001.



Roadside fish seller

16. Tuna

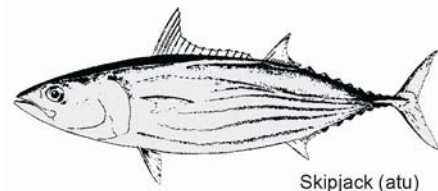
The ocean around us supports a variety of offshore fishes, such as *masimasi* (mahimahi), swordfish, wahoo and marlin, but by far the most commercially important of these pelagic fishes are the tunas. The most common in our local waters are albacore (*apakoa*), yellowfin (*asiasi*), skipjack (*atu*) and dogtooth tuna (*tagi*).

Dogtooth tuna are occasionally seen near shore, but tuna prefer the open ocean and are wide-ranging species. These ultra-streamlined fish undertake impressive oceanic travels -- one skipjack caught here had been tagged near Australia over 2000 miles away. But the general movements of tuna in our area are not known.

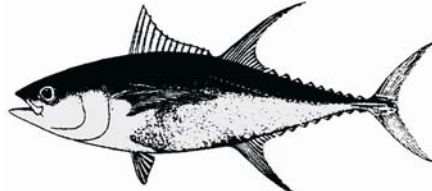
Local fishermen catch tuna in our area by trolling at FADs (fish aggregation devices), offshore seamounts, or wherever seabird flocks are feeding (the flocks indicate the presence of baitfish that the tuna are probably also feeding upon). In recent years, commercial catches of locally-caught tuna have increased in the longline fishery that targets albacore using long lengths (extending 5-40 miles) of monofilament longline with baited hooks.

Given that American Samoa has two major tuna canneries and we are the No. 1 port in the United States in terms of value of fish landed (about \$200,000,000 per year), it is somewhat surprising to realize that few of the fish canned here are actually caught within American Samoa's waters. That's because tuna are not particularly abundant in our area, so local catches delivered to the canneries are a small fraction of the 200,000 tons of tuna processed at the canneries each year. Commercial quantities of tuna are generally located 1000s of miles away from American Samoa, so the big purse seiners and foreign longliners that you see docked in Pago Pago Harbor generally do not fish locally. Instead, they must travel for about 1 week just to reach their distant fishing grounds. The reason why these boats deliver their catch to the canneries here is simply because the tuna canned in American Samoa can enter US markets tariff-free as "Made in USA", and the US is one of the largest consumers of tuna.

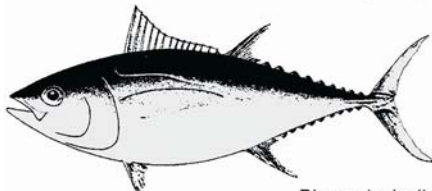
A rather enjoyable feature about tuna is that their meat generally lacks parasites, so people eat raw tuna in a variety of forms (*oka*, sashimi).



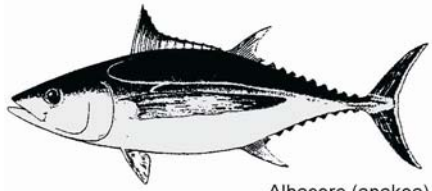
Skipjack (atu)



Yellowfin (asiasi)



Bigeye (asiasi)



Albacore (apakoa)



Tuna purse seiner



Foreign longliners

17. Turtles In trouble

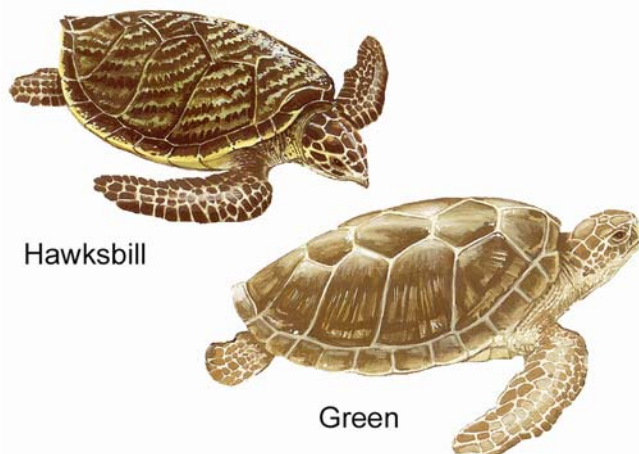
In Samoan folklore, sea turtles were believed to have the power to save fishermen who were lost at sea by bringing them safely to shore. The Samoan word for sea turtle, “*Ia sa*,” translates literally to “sacred fish”, presumably because of this ability.

Samoans have traditionally harvested sea turtles for food, and the shell was often made into bracelets, combs, fishing hooks, and also was used in the headpiece worn by a princess during important dance ceremonies. Turtles were incorporated into Samoan songs and art, and there are even turtle petroglyphs (rock carvings) in Faga'itua and Leone. And, of course, there's the legend about the Turtle and Shark that appear in the sea at Vaitogi when villagers sing a special song.

It therefore seems extra unfortunate that turtle numbers in Samoa have declined so much that they are now considered endangered species. Although it is difficult to determine how many are left, it is clear that few females lay eggs each year in the Territory. This drop parallels the worldwide decline of sea turtles due to overharvest, loss of nesting beaches, and incidental kills in fishing gear. Pacific populations of one of our species (hawksbills) are “rapidly approaching extinction” according to a recent scientific review.

Two turtle species, the green and hawksbill, are the most frequently found turtles in our local waters. The hawksbill or “*laumei uga*” (*Eretmochelys imbricata*) is usually the species that nests on Tutuila beaches. This is a solitary nester, and perhaps only 1 or 2 hawksbill females now use a suitable beach. The hawksbill is occasionally poisonous -- in the late 1950s, people in Anuu'u got very sick after eating one.

Our other species is the green sea turtle (*Chelonia mydas*), named after the color of its fat. It is also found around our islands, but it nests primarily at Rose Atoll. These long-lived turtles have rather complicated life cycles that involve repeated long-distance migrations to and from American Samoa. They start life as eggs buried in beach sand. Once a female has laid her first group of about 100 eggs, she will return at 2-week intervals to lay more. In about 60 days, the eggs hatch and the little turtles dart into the ocean. Where they go is not known, but eventually they take up residence at some feeding area that may be far away from American Samoa.

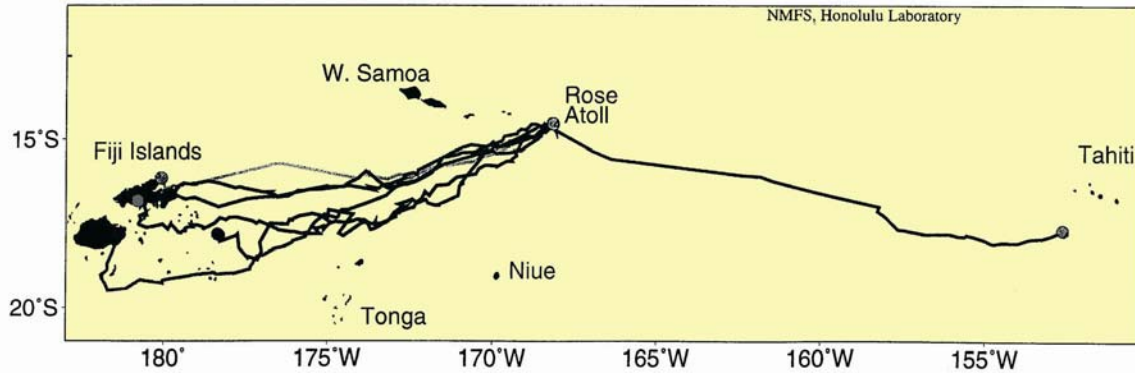


There they remain for some 20-25 years until they become sexually mature, at which time they return to the very same beach where they came from. After laying eggs there, the adult females then turn around and go back to their distant feeding grounds. That's the basic pattern for most sea turtle species throughout the world. Swim far away to some nesting beach, then swim back to their feeding area, back and forth every few years thereafter.



TURTLE PETROGLYPH

We have some very interesting migration data for green sea turtles at Rose Atoll (see map below), where a tagging study was conducted in the mid-1990s. In all, 10 tagged turtles were recovered after nesting at the atoll. Eight swam 800 miles directly to Fiji (unfortunately two of them were eaten when they got there). Another went past Fiji to Vanuatu, and the last one went in the completely opposite direction to French Polynesia near Tahiti.



It's understandable why the adult turtles do not stay at Rose Atoll after nesting, because their favorite food (seagrass) is absent there. But I wonder why don't they just stay in Fiji where they have both seagrass and nesting beaches.

Anyway, this pattern of large-scale movements between a turtle's nesting area and feeding area means that turtle stocks in the South Pacific Ocean are all mixed together. While some of "our" turtles were caught in Fiji, the reciprocal is also true -- turtles that feed in our waters probably originated from islands elsewhere in the South Pacific. This mixing greatly complicates conservation efforts. It means that region-wide cooperation among the island countries of the South Pacific is essential; otherwise, while we try to protect turtles in American Samoa, our turtles may be killed later when they migrate to other islands.

Tough federal and territorial laws exist in American Samoa to protect turtles and their eggs, because they are an endangered species. Depending on the circumstances, there is a \$500 to \$250,000 penalty and up to one year in jail, for killing a turtle or importing any turtle product into the Territory (shells, stuffed turtles, turtle combs, etc.). Fortunately fewer turtles seem to be taken in American Samoa, probably due to their scarcity but also due to outreach programs that inform children and villagers about the endangered status of the turtles.

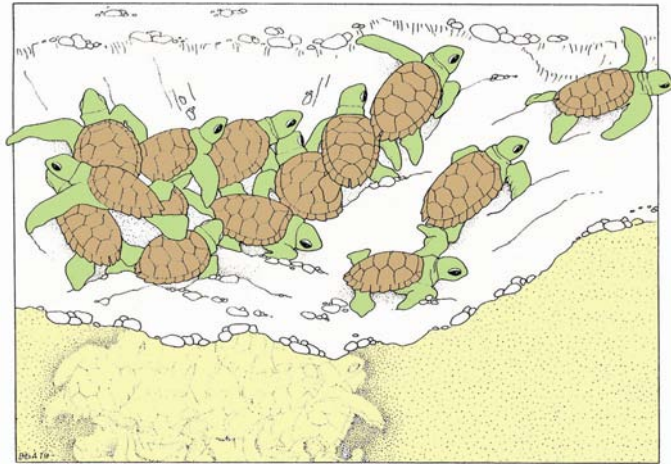
In addition to education efforts, we must protect both the turtles and their habitat. Sandy beaches are essential for turtle nesting areas, so hauling sand away from our beaches results in the loss of critical habitat for these species. No beaches, no nesting turtles.

Although some villagers may still like to eat turtle meat and eggs, the point to remember is that turtles are a disappearing resource in American Samoa. They are a part of Samoa's heritage and need to be vigorously protected, or they may be lost altogether. It is a sad commentary that many young Samoans have never even seen a live sea turtle.



18. Baby turtles: look but don't touch!

Baby sea turtles. They're so neat -- perfectly formed miniatures, all racing down the beach together to get into the water. Kids think they're cute and they want to keep them as pets, and plenty of parents think baby turtles make great pets. After all, they don't bark or fight, and they're so tiny so they don't take up much space. They don't eat much, either.



Also, some people in American Samoa believe that when a nest of turtles hatches and all the babies run to the sea, their mothers are waiting out on the reef to eat them! Because of this misguided belief, some people collect baby turtles and keep them at home or release them on a different beach. But the very best thing we can do for baby turtles is: **LEAVE THEM ALONE!**

Many years of scientific research on sea turtles have taught us that mother turtles do not eat their babies. Adult turtles eat mostly seagrass, algae (seaweed), and sea sponges (the living kind, NOT the kitchen kind). In fact, after the female turtle has laid eggs (sometimes two or three times in the space of a few weeks), she goes back out to the sea and leaves the area. For example, after nesting at Rose Atoll, some of American Samoa's green sea turtles swam to Fiji – over 800 miles away! So, those of you with good intentions out there, rest assured that mom will not be eating her babies, and you do not need to collect the baby turtles from the beach to save them from her.

It is true that baby turtles do have predators, such as large fishes and sharks. Nature provides the turtles with some protection however: (1) most turtles hatch at night when predators might have difficulty



seeing them, (2) baby turtles are dark-colored, and this “cryptic coloration” enables them to be camouflaged as they swim over the reef, (3) female turtles can lay over 100 eggs in a single nest — when this many turtles hatch at the same time, a big jack (*ulua*) or shark (*malie*) can't possibly catch and eat all of them, so some have a chance to hide in the reef. This is called “predator swamping” and is common among reptiles (lizards, snakes, turtles, etc.). For this reason it is a bad idea to take “just a few” baby turtles away, and release them later. The “predator swamping” effect is lost and those baby turtles will probably end up as some fish's lunch.

A critical reason to leave baby turtles on the beach is that **THAT EXACT BEACH** is very important to them. Baby turtles remember or “imprint on” the beach where they hatched. Like many animals, turtles have little natural magnets in their brains that allow them to home-in on their native beach. Years later when it's time for them to reproduce, adult turtles, with their internal “homing devices”, will seek that same beach. If hatchling turtles are removed from their home beaches and kept in someone's bathtub or

bucket, chances are they will become confused and have little chances of surviving, let alone finding their home beach later (that is, if they don't just die in the bucket).

Sea turtles have been around for millions of years and survived just fine before humans started taking their babies off the beach, whether to "protect" them or otherwise. Newly-hatched turtles, just like their gigantic moms and dads, are wild animals and are not meant to be kept as pets. The ocean provides better food and a cleaner, healthier environment for turtles than humans can.



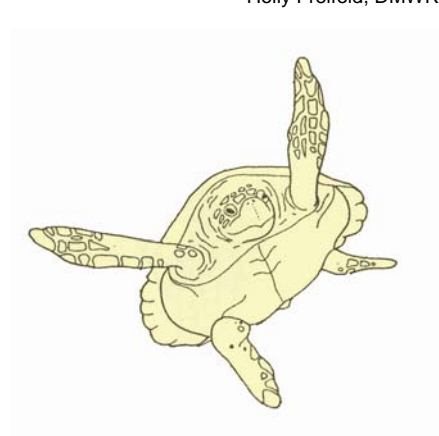
Turtles are far-ranging animals that swim thousands and thousands of miles in the sea during their lifetimes. When they go to their nesting islands, they meet with other turtles, mate, lay eggs, and so keep their species alive. Every time a female sea turtle finds her way back to the beach where she was born and nests there, she completes the ancient, natural cycle that keeps sea turtles alive on Earth. Imagine a turtle imprisoned in a bucket, tub, or garbage can, swimming endlessly in tiny circles, never to see the open ocean, never to meet another turtle, never to help its species survive.

Sea turtles all over the world are dwindling in number. All species are listed as threatened or endangered under the U.S. Endangered Species Act, including our own green and hawksbill sea turtles. If we want our children and grandchildren to be able to see these huge, magnificent sea turtles swimming alive and free in the ocean, where they belong, we have to do our best to protect them now. The very best way we can do that is by protecting the beaches where they nest, letting the baby turtles find their own way into the sea, and not hunting the big turtles. Future generations of turtles (and people) will thank us.



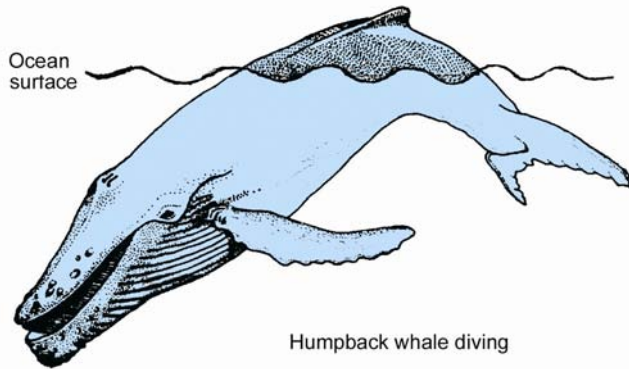
Beach tracks of adult turtle looking for a place to nest.

Holly Freifeld, DMWR



19. Whales Ho !

September and October are the peak months when humpback whales (*tafola*) visit our balmy waters. It's almost impossible not to get excited when one is spotted. Most of us feel inexplicably privileged for a brief glimpse into their mysterious world, and there's an uncontrollable urge to shout 'thar she blows'.



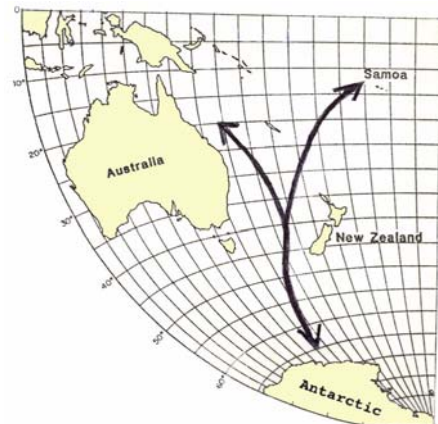
Part of our fascination with whales is their huge size, of course. Adult humpbacks (*Megaptera novaeangliae*) grow up to 50 feet long and weigh about 40 metric tons (which equals the combined weight of 200 sumo wrestlers). We rarely get a chance to see the whole whale, except when they make a spectacular leap ("breach") out of the water. We usually see only their air spout or their humped back as they prepare to dive.

Humpbacks are air-breathing mammals (like ourselves) that live their complete lives in the ocean. They reproduce like all land mammals, but they do it underwater. Whales obviously have to make sure that their babies don't drown while being born. Mother whales nurse their young for about a year.

These whales eat small schooling fishes and krill (small shrimps). They feed by gulping in tons of water in a single mouthful, and then strain the food out as they expel the water. The out-going water is filtered through specialized structures called "baleen", which looks (with a little imagination) like a mouthful of coconut fronds. Humpbacks lack real teeth because they have no need to bite or chew their tiny food items. It seems odd that the whale, which is one of the world's largest animals ever, feeds on such small things.

The appearance of humpbacks in Samoa is an important segment of their grand migration up and down the South Pacific Ocean. During the warm months of the southern hemisphere, our whales feed in the rich waters of Antarctica, located 3,200 miles to the south of us (see map). Biologists call this particular group of whales "Stock-E" (formerly called "Group-5"). When Antarctic's bitter winter sets in, Stock-E whales seek warmer waters. They migrate northward, with some going towards Australia and others migrating towards Tonga. Apparently most of this latter group remains near Tonga, but at least some migrate onward to Samoa. However, one of our whales was sighted near Tahiti, so their migration patterns still hold some surprises for us.

A few humpbacks might arrive in Samoa as early as July or leave here as late as December, but they are most common here in September and October. They occur in small groups of adults or in mother-calf pairs. Humpbacks have been sighted around all 7 of the islands in the Territory, but we don't know how many are actually here. They migrate here to mate and give birth to their young. And, interestingly, they stop feeding while here -- only when they return to the Antarctic do they resume feeding.



While an occasional spout of whale-breath can be seen in our local waters, you can also hear the whales if you stick your head in the water. Humpbacks are famous for their unique “songs”. Yes, whales sing! During mating season, male humpbacks sing to either attract females or to defend their territory from other male whales, much like birds do with their own songs.



Humpback whales (mother and calf)

The whale's song is haunting and complex. It sounds like a eerie series of chirps, squeaks, whistles and grunts. I know that “grunts” don't seem like they could make much of a song, but you just have to take my word for it. It is unlike anything you have ever heard. Scuba divers can hear the singing if they hold their breath and pay attention. Snorkelers can also hear the songs, but they have to dive about 10 feet deep to get below the noisy surface layer of water. The song lasts about 10-20 minutes, it has a beginning, middle and end, and all males of the same stock sing the same song. Biologists can therefore identify where a whale comes from by listening to its song. For example, Hawaiian humpbacks sing a different song (than the Samoan humpbacks), because they belong to a different stock of whales that migrates between Hawaii and Alaska. The whales' song is one of the world's wonders of nature and it's at our doorstep.

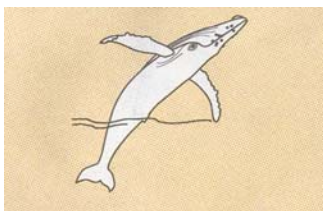
Humpback whales are currently listed as an endangered species because their world-wide populations were decimated by whalers in the 1800's and 1900's. By the time commercial whaling was stopped in 1966, 95% of our stock (Stock-E) had been killed. Recovery of these whales has been unexpectedly slow, probably due to continued whaling by Soviet factory ships as late as 1972 and a subsistence harvest of these whales occurred in Tonga up to 1978. In any event, whales in American Samoa remain few in number, and in some years hardly any are seen here.



Tutuila

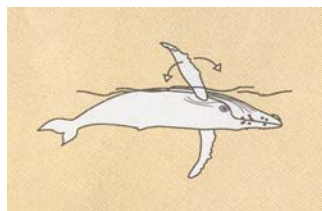
Because humpbacks use our waters to give birth to their young, it is important to protect them when they are here. Enjoy their presence, but don't pester them. Avoid the temptation to boat right up to them or follow them at close quarters. Boaters, divers and swimmers should stay at least 100 yards away, and watch from there.

P.Craig, NPS



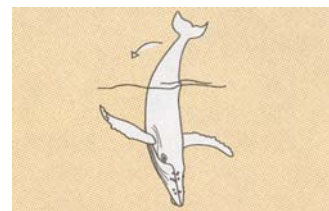
BREACHING

Leaping partly out of the water and landing with a big splash



PEC SLAP

Flapping its pectoral fin



TAIL SLAP

Slapping its tail on the water

20. Marine mammal & reptile checklist for American Samoa

Common and Samoan names	Scientific name
MARINE MAMMALS	
Whales	
Humpback whale (<i>tafolā, ia maanu</i>) ¹	<i>Megaptera novaeangliae</i>
Sperm whale ²	<i>Physeter macrocephalus</i>
Short-finned pilot whale ²	<i>Globicephala macrorhynchus</i>
False killer whale ²	<i>Pseudorca crassidens</i>
Minke whale ³	<i>Balaenoptera acutorostrata</i>
Killer whale ³	<i>Orcinus orca</i>
Cuvier's beaked whale ⁴	<i>Ziphius cavirostris</i>
Dolphins	
Spinner dolphin (<i>mumua</i>) ⁵	<i>Stenella longirostris</i>
Bottlenose dolphin (<i>mumua</i>) ²	<i>Tursiops truncatus</i>
Rough-toothed dolphin (<i>mumua</i>) ²	<i>Steno bredanensis</i>
Potentially present	
Bryde's whale ⁶	<i>Balaenoptera edeni</i>
Dwarf sperm whale ⁶	<i>Kogia simus</i>
Pygmy sperm whale ⁶	<i>Kogia breviceps</i>
Melon-headed whale ⁶	<i>Peponocephala electra</i>
Risso's dolphin ⁶	<i>Grampus griseus</i>
Striped dolphin ⁶	<i>Stenella coeruleoalba</i>
Pantropical spotted dolphin ⁶	<i>Stenella attenuata</i>
Fraser's dolphin ⁶	<i>Lagenodelphis hosei</i>
MARINE REPTILES	
Sea turtles	
Hawksbill sea turtle (<i>laumei uga</i>)	<i>Eretmochelys imbricata</i>
Green sea turtle (<i>laumei ena'ena, fonu</i>)	<i>Chelonia mydas</i>
Olive ridley sea turtle ⁷	<i>Lepidochelys olivacea</i>
Leatherback sea turtle ⁸	<i>Dermochelys coriacea</i>
Sea snakes	
Banded sea snake ⁹	<i>Laticauda columbrina</i>

¹Seasonally present (primarily Aug-Oct).

²Identifications by D. Mattila (NOAA) and/or J. Naughton (NOAA). Also identified from skulls that washed ashore: several pilot whales (near Sita Bay about 1993) and one sperm whale skull (Maloata 1994).

³Reeves et al. 1999. Marine mammals in the area served by South Pacific Regional Environ. Prog. SPREP (Samoa).

⁴Visitor to Pago Pago Harbor in 2002; identified from photograph by J. Mead (Smithsonian Museum Natural History) and W. Perrin (NOAA).

⁵Probably present year-round.

⁶Probably present in region but not yet confirmed in American Samoa (Reeves et al. 1999 – see reference above).

⁷Rare: only three recorded occurrences (DMWR).

⁸Rare: a single juvenile was caught on longline gear near Swains in 1993 (DMWR).

⁹Rare: one verified occurrence in 2000 (NPS).



P.Craig, NPS