

Ancient Atoll, Reef, & Volcanic Islands of the Hawaii-Pacific Remote National Wildlife Refuges: Status Report



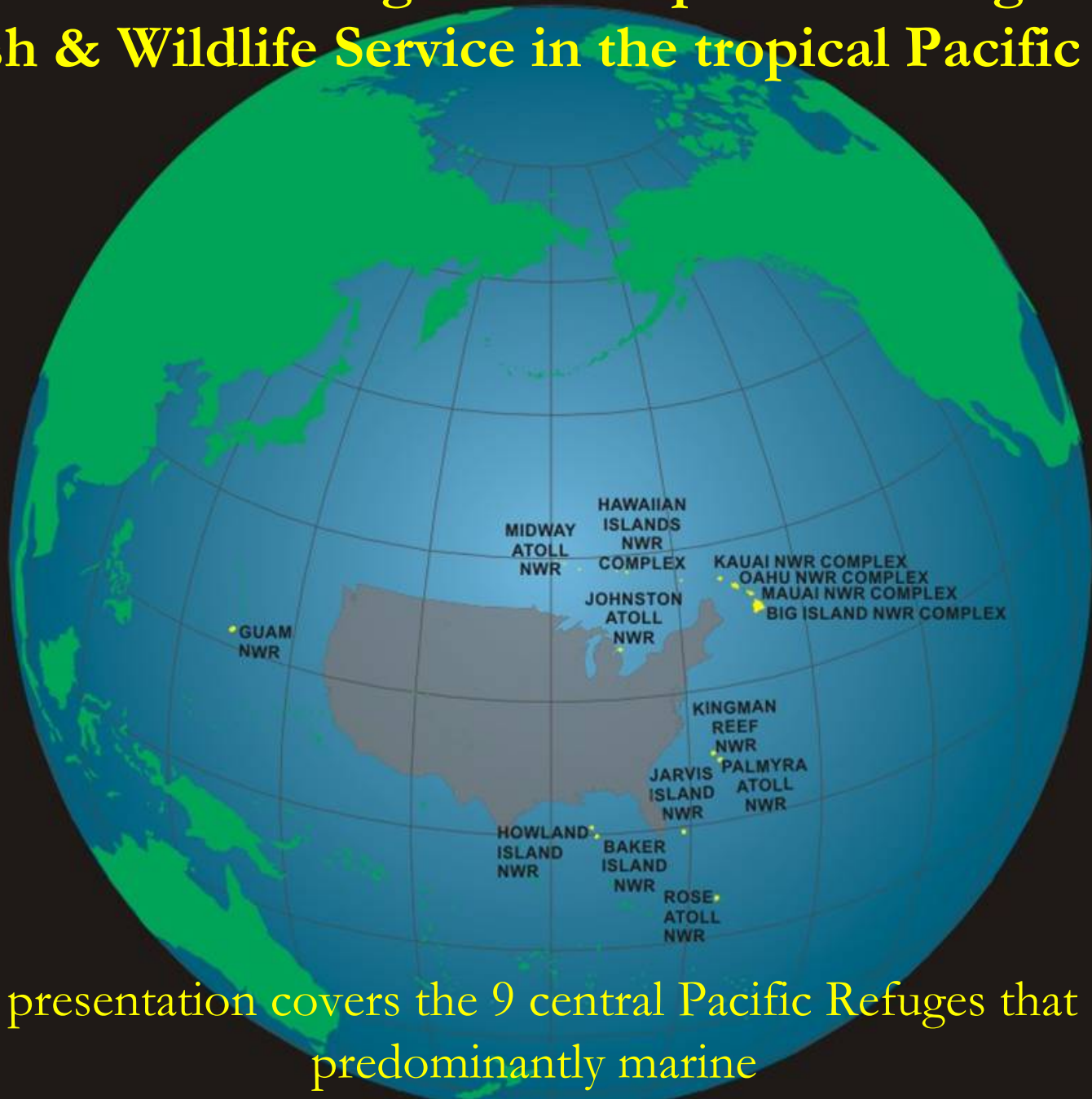
Paracirrhites oxycephalus
in *Pocillopora meandrina*,
Palmyra, 2004

photo
J. Maragos USFWS

by Jim Maragos, Coral Reef Biologist,
U.S. Fish & Wildlife Service, Honolulu

U.S. Coral Reef Task Force meeting, Palau, 7 November 2005

National Wildlife Refuges & Complexes managed by the U.S. Fish & Wildlife Service in the tropical Pacific Ocean



This presentation covers the 9 central Pacific Refuges that are predominantly marine

U.S. Hawaii-Pacific National Wildlife Refuges that protect coral reefs



American Samoa NWR:

Rose Atoll 1973

Hawaii NWRs:

Hawaiian Islands 1909

Midway Atoll 1996

Line Islands NWRs:

Johnston Atoll 1926

Jarvis Island 1974

Kingman Reef 2001

Palmyra Atoll 2001

Mariana Islands NWR:

**Guam 1993 – not covered
in this presentation**

Phoenix Islands NWRs:

Baker Island 1974

Howland Island 1974



Palmyra Atoll NWR 1998

photo: J. Maragos

Seaward boundaries extend 3 nm off all except Kingman, Midway & Palmyra which extend to 12nm, and Hawaiian Islands which extend to the 10 or 20 fathom contour depth

Nine central Pacific National Wildlife Refuges that protect coral reefs

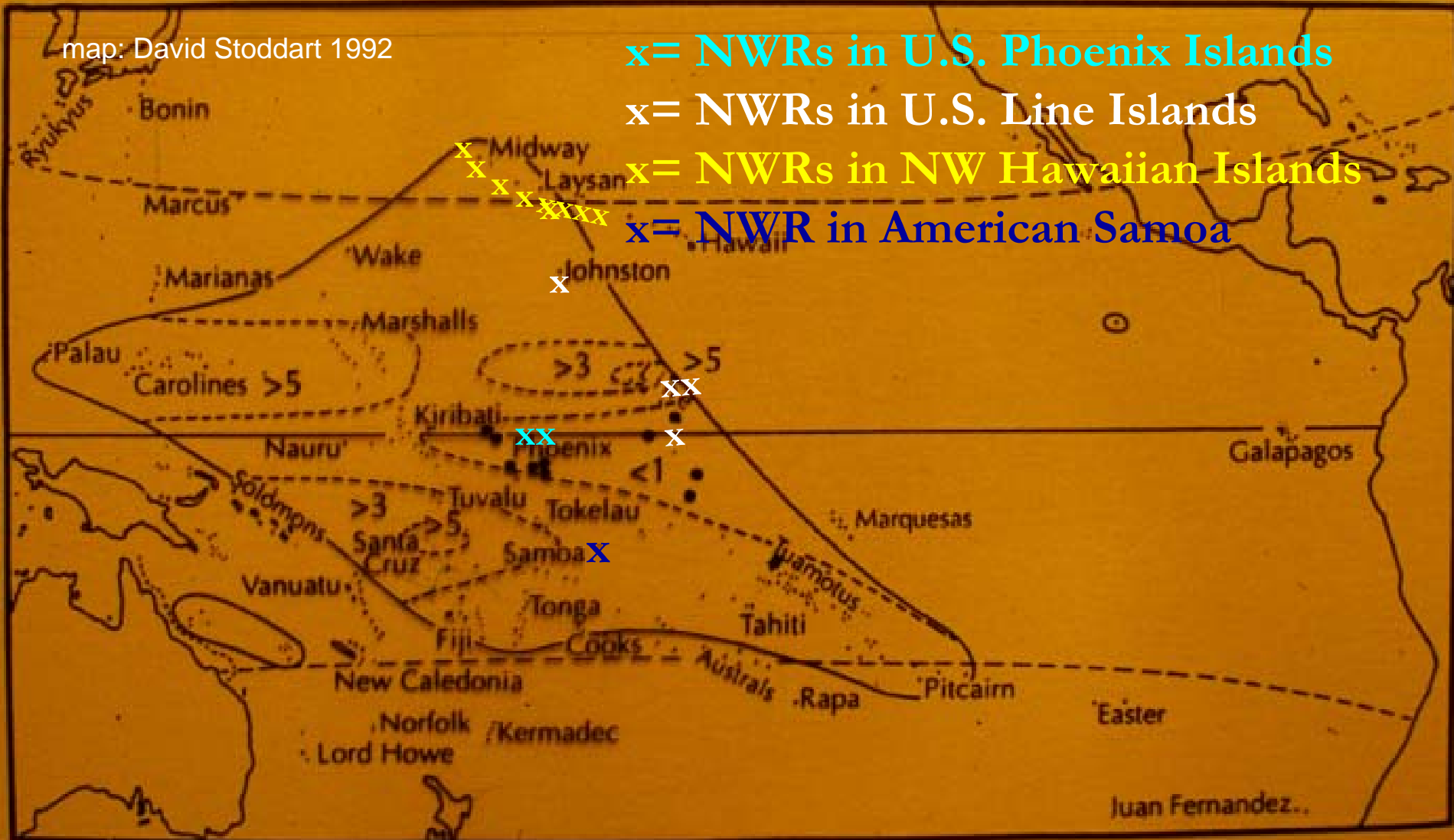
map: David Stoddart 1992

x= NWRs in U.S. Phoenix Islands

x= NWRs in U.S. Line Islands

x= NWRs in NW Hawaiian Islands

x= NWR in American Samoa



U.S. remote central Pacific island NWRs are mostly ancient reef islands & atolls belonging to a single bio-geological province



Pacific Remote Reef Isle & Atoll National Wildlife Refuges

- Are ancient, carrying a long natural history in their rocks
- Have been previously protected by their remoteness and inaccessibility
- Rarely visited and never permanently inhabited throughout their history
- Serve as havens for many depleted and unique species
- Serve as a natural laboratory for large marine ecosystem research & management straddling the Equator
- Support some of the oldest, wettest and driest atolls, islets, and associated habitats on the planet
- Most widespread series of no-take marine protected areas under unified management



map: National Geographic Society

Nine central Pacific National Wildlife Refuges: Johnston Atoll

- Johnston Atoll (JA) is the only U.S. land within 800,000 square miles of ocean SW of Hawaii
- JA is near the center of a string of 9 National Wildlife Refuges in the central Pacific from 28°N to 14°S
- JA is vitally important for fish and wildlife
- JA is the only “stepping-stone” between Hawaii & the Line Islands for fish and wildlife dispersal

Midway Atoll

Hawaiian Is.
XXXXXXXXXXXX

x Johnston Atoll NWR

x Kingman Reef
x Palmyra Atoll

x Howland I.
x Baker I. x Jarvis I.

x Rose Atoll





Johnston Atoll - most northeastern Pacific outpost for hydrozoan corals, some scleractinian corals & other coral reef species



Distichopora violacea

photos: J. Maragos



Millepora



Stylaster @ 150m

photo: J. Maragos & HURL



Acropora spp

photo: J. Maragos

Johnston Atoll National Wildlife Refuge

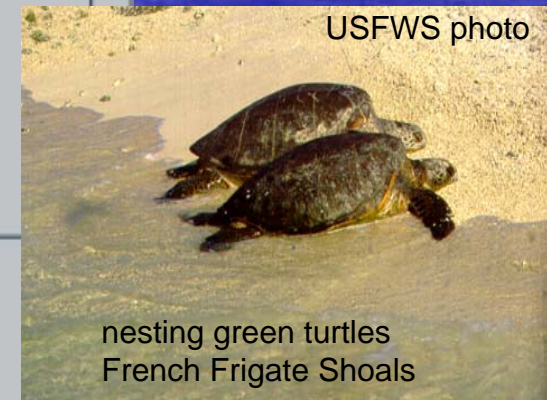
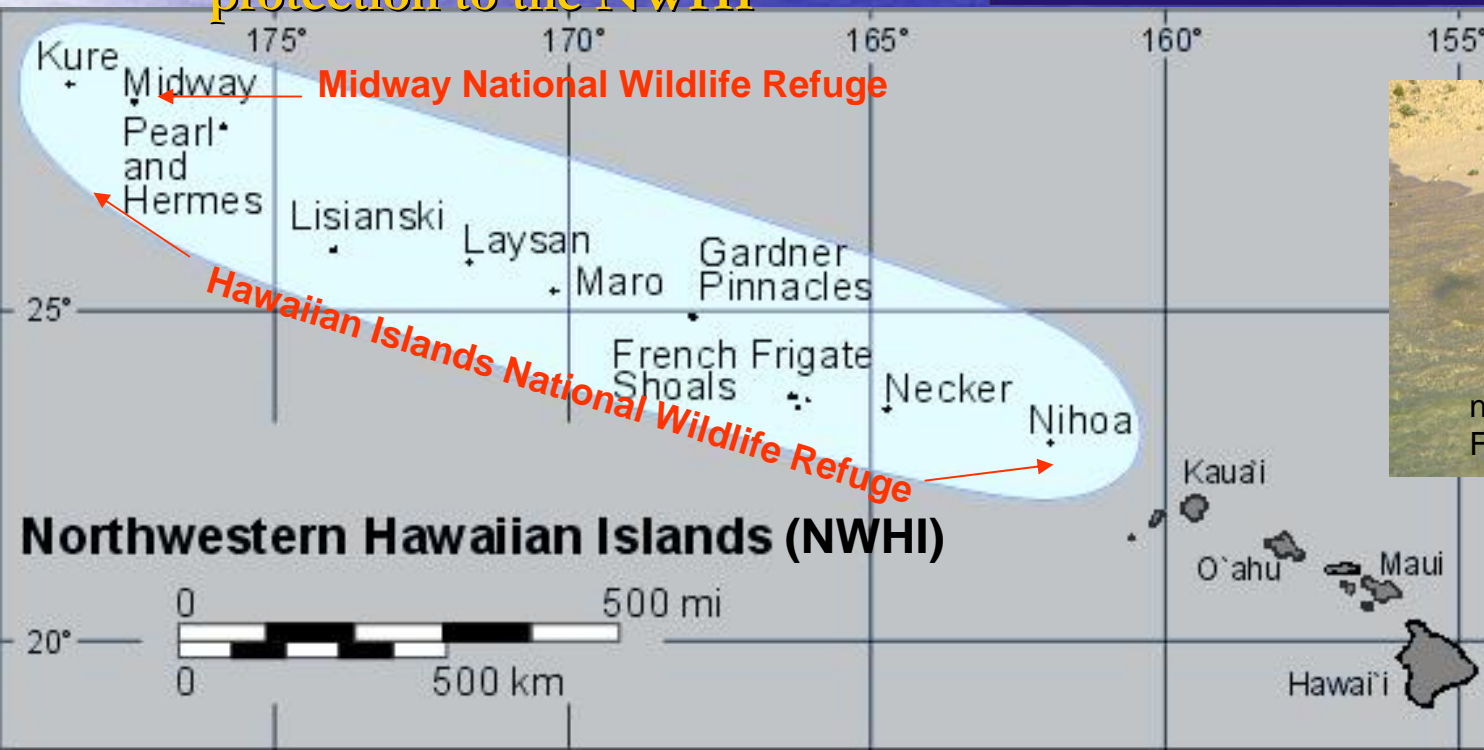
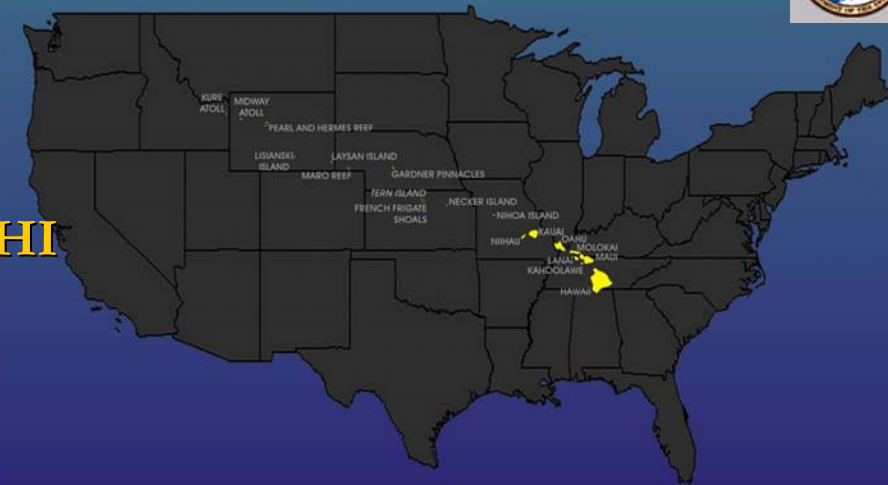
- 3 constructed islands important for seabird nesting & over-wintering shorebirds
- 14 species of seabirds & 5 species of shorebirds rely on Johnston Atoll
- USFWS has freed the atoll of rats, restoring several ground-nesting species
- several bird species are depleted elsewhere (gray-back tern, Xmas Island shearwater, Bulwer's petrel, bristle-thighed curlews, etc)

UPDATE: thousands of seabirds are colonizing Johnston Island, recently abandoned by the U.S. Air Force

Hawaiian Islands and Midway Atoll National Wildlife Refuges



- President Theodore Roosevelt established the Hawaiian Is. NWR in 1909, protecting 8 islands & adjacent reefs in the NWHI
- At the time it was probably the first & largest MPA in the U.S.
- President Clinton established Midway Atoll NWR in 1996, adding more protection to the NWHI



Hawaiian Is. & Midway National Wildlife Refuges:



- The NWHI Coral Reef Ecosystem Reserve of 2001 and the new Hawaii NWHI Marine Refuge of 2005 add to the protection of the NW Hawaiian Islands
- Collectively all four MPAs have elevated protection of the NWHI to the largest no-take MPA in the world
- Designation of a new NWHI National Marine Sanctuary could enhance established protections

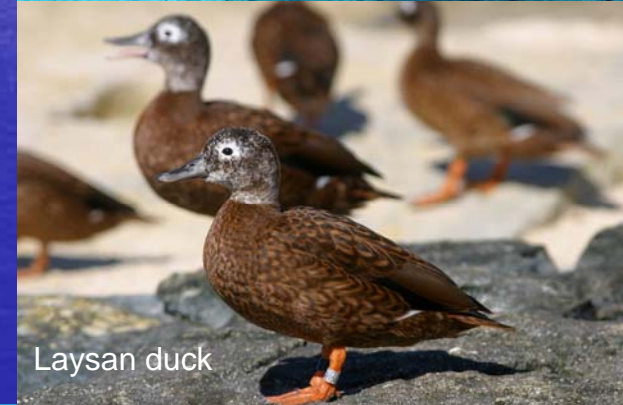
Midway Atoll endemic *Montipora* coral gardens
2000. photo: J. Maragos USFWS



NWHI National Wildlife Refuges- major attributes

- largest pristine archipelagic reef ecosystem
- one-fourth of all species endemic to Hawaii
- apex predator dominated fish populations
- dozens of endangered & threatened species
- some species limited to single islands
- largest seabird rookeries in the Pacific
- significant historical and cultural heritage
- cutting-edge research & “shifting baselines”
- ancient geological & biological evolution
- many non described species & habitats

Hawaiian monk seal



Laysan duck

Hawaiian morwong



Galapagos reef shark



Laysan finch



photo: J. Maragos USFWS

remaining photos: © Jim Watt



Kingman Reef & Palmyra National Wildlife Refuges

- both in the inter-tropical convergence zone & path of the eastward moving Equatorial Countercurrent bringing more rainfall & the larvae of additional reef species from the more diverse W. Pacific
- resulting in higher levels of reef biodiversity at the two Refuges compared to neighboring reefs, isles and atolls
- Palmyra supports lush native beach forests & largest seabird nesting colonies of several seabird species
- The Nature Conservancy is co-owner of Palmyra & supports transportation access and Palmyra Atoll Research Consortium

Kingman & Palmyra NWRs



both Refuges support high abundance of fish, giant clams and corals



E Kingman Reef 2005



Palmyra was the only uninhabited “wet” atoll left in the Pacific before it was provided enduring protection & supports rare native *Pisonia* forest

Kingman and Palmyra support spectacular shallow pools and coral gardens off their eastern reefs



E Island Palmyra Atoll 1987

photos: J. Maragos USFWS

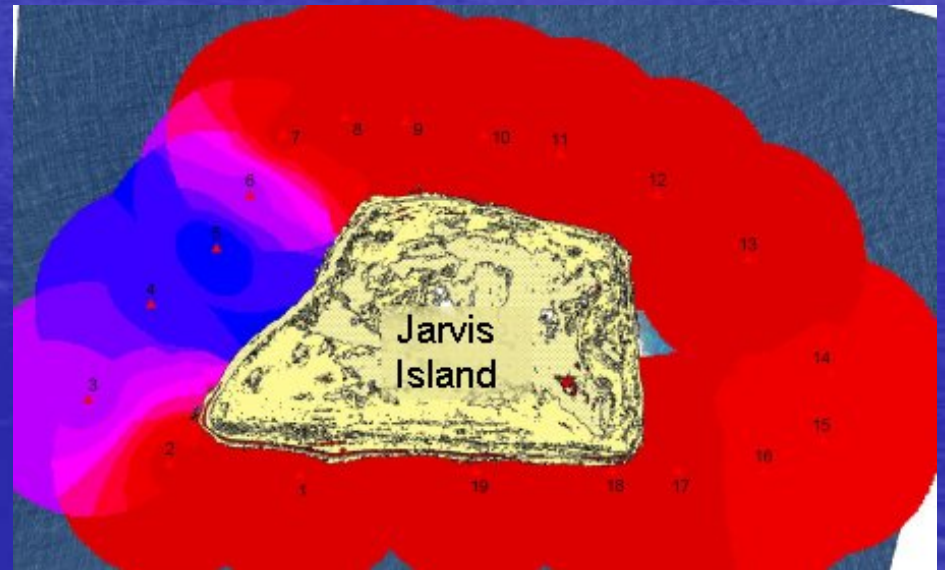
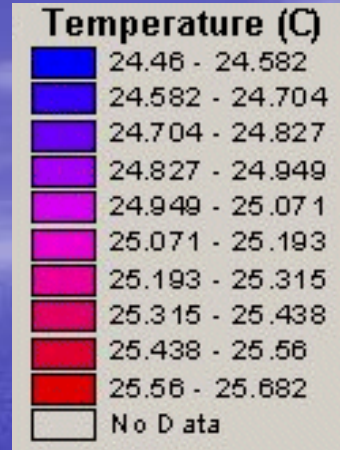
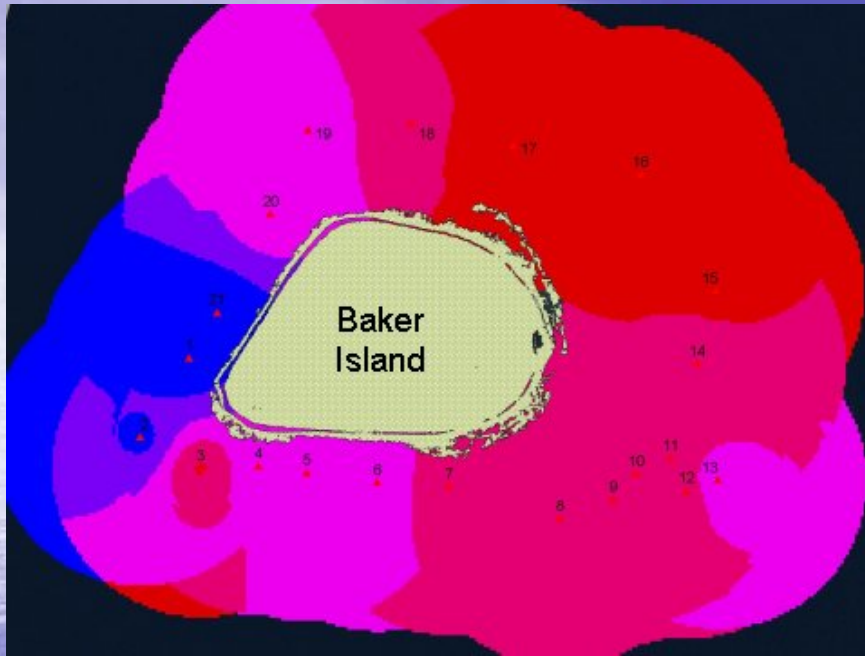
Baker, Howland & Jarvis National Wildlife Refuges:



- all 3 Refuges are low reef islands within one degree of the Equator & important for climate studies
- now free of rats and cats due to USFWS eradication efforts, the numbers of rare ground and burrowing seabirds and shorebirds are increasing
- coralline algae abundance and growth is prolific
- Equatorial Undercurrent upwelling appears to subsidize greater marine productivity, fish biomass, additional species of shallow corals, and large populations of deep “twilight zone” coral forests

photo J Maragos USFWS

Montipora aequituberculata
Jarvis 2000



Nearest-Neighbor interpolation of CTD Station Temperatures, 2000
NOAA/FWS *Cromwell* Equatorial Cruise

Strong evidence of upwelling along Jarvis, Howland & Baker NWRs from sub-surface Equatorial Undercurrent

photo:
J. Maragos USFWS

Baker, Howland & Jarvis National Wildlife Refuges: Upwelling effects

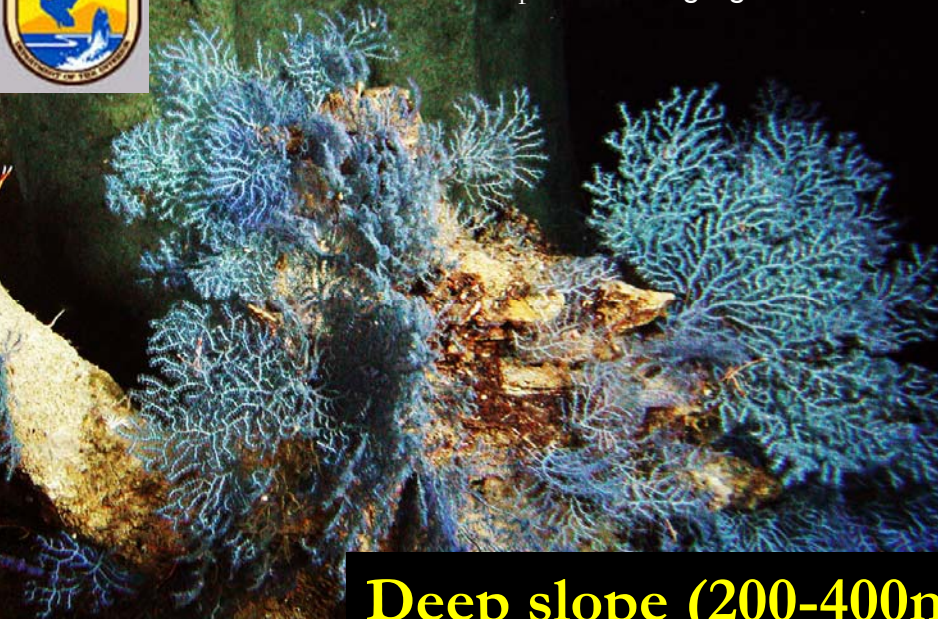


- nutrients in upwelling waters fuel phytoplankton blooms close to the western sides of the 3 islands
- In turn, the higher productivity subsidizes zooplankton and planktivorous fish, soft corals (*Sinularia*) & deep corals & other invertebrates

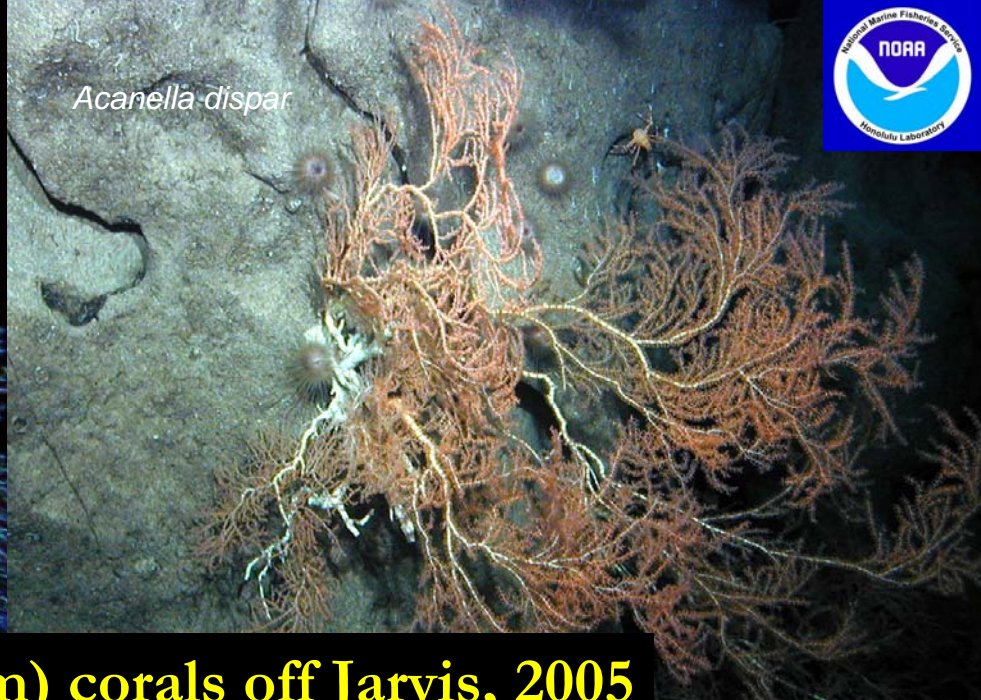
green upwelling waters, Baker 2001



paramuricid gorgonian



Acanella dispar

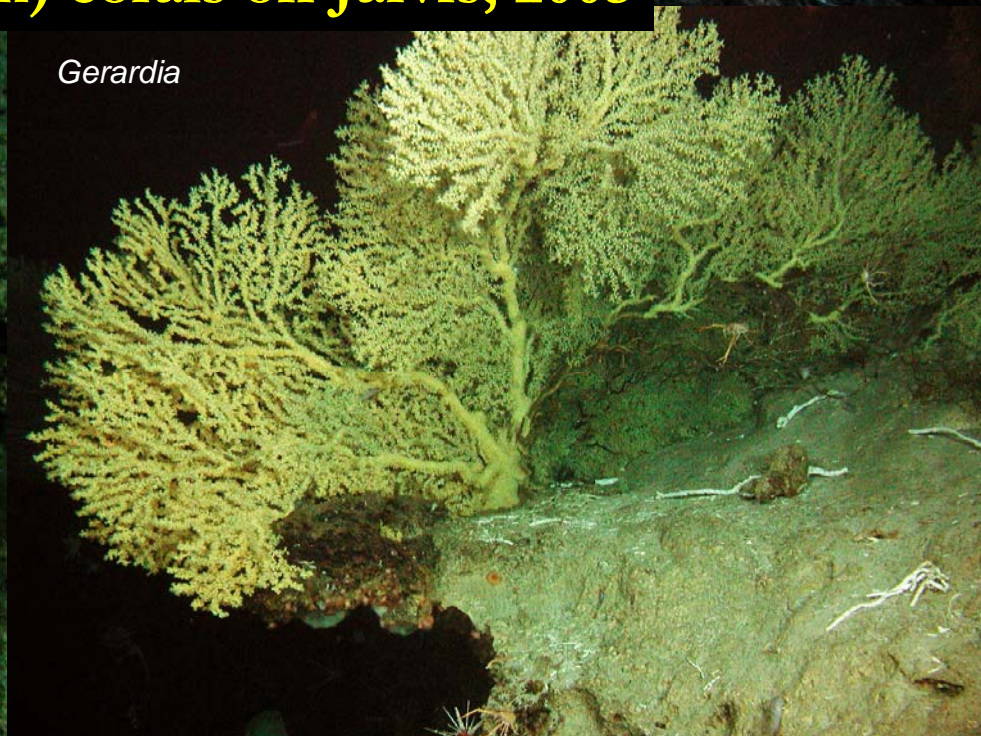


Deep slope (200-400m) corals off Jarvis, 2005

Candidiella helminthophora



Gerardia



all photos: J. Maragos USFWS
& Hawaii Undersea Research Laboratory

Rose Atoll National Wildlife Refuge:



- most important site for nesting sea turtles, giant clams & seabirds in American Samoa
- rare populations of humphead wrasse and bumphead parrotfish
- cleanup of Taiwanese longliner shipwreck nearly done

Mulloidichthys vanicolensis
photo: J. Maragos USFWS 1999

Rose Atoll National Wildlife Refuge 2005



increased fish herbivory



Pocillopora coral re-colonization

SW reefs are recovering now that shipwreck cleanup is nearly finished



invasive algae declining



brain corals recolonize dead lagoon reefs

Rose Atoll National Wildlife Refuge 2005: new fish record and species



(above) cardinal fish reported in the lagoon may be new to science

(to left) a rare anthias reported at a depth of 300 m off the SW reef

• Most of the marine bottoms in the Pacific Remote NWRs are deep unexplored slope and ocean floor habitat

• A dozen deep dives took place at Rose, Jarvis, Kingman & Palmyra using Hawaii Undersea Research Lab *Pisces* submersibles in 2005

decorator crab, Kingman Reef, Max Cremer HURL

• many rare animals and undescribed species were observed and add to the importance of these refuges serving as safe havens for all fish & wildlife within

Brisinga fragilis, Kingman Reef, J. Maragos USFWS & HURL

stalked crinoid, Rose Atoll,
J. Maragos, USFWS & HURL



Pacific Remote Island National Wildlife Refuges & Convention on World Heritage:

- The DOI Assistant Secretary for Fish and Wildlife and Parks Agreed in March 2005 to forward Baker, Howland, Jarvis, Kingman, Palmyra & Rose NWRs to the U.S tentative list and begin the nomination process as part of the Central Pacific World Heritage Project
- Although Johnston NWR is eligible for World Heritage, there is lingering uncertainty on its size, status, and level of protection due to ongoing negotiations between the Depts. of Defense & Interior. If moved to the tentative list, it would also be a part of the serial CPWHP nomination
- The Midway and Hawaiian Islands NWRs are part of a larger and separate proposed serial nomination encompassing the entire NWHI requiring agreement among multiple government partners

Future needs and challenges:

- teamwork with our partners regarding access, surveillance, enforcement, conservation research and monitoring for the Pacific Remote NWRs.
- Clarity on proposed MSA amendments:

