June 6th, 2008

President George W. Bush
The White House
1600 Pennsylvania Avenue NW
Washington DC 20500

Dear Mr. President:

Your protection of the Northwestern Hawaiian Islands in 2006 was a masterful stroke of presidential leadership. As scientists familiar with the problems facing the world's oceans, we were extremely grateful to see you endorse a crucial but little-recognized conservation principle: that the ocean has significant places worth protecting, just as we protect our most important terrestrial ecosystems in national parks, refuges and wilderness areas.

By designating the Papahānaumokuākea Marine National Monument, you have stimulated an international trend. In 2007, for example, the Republic of Kiribati established the Phoenix Islands Reserve, which is now the largest no-take marine protected area in the world. We are hopeful that you and your successors will continue this trend by protecting other superlative marine ecosystems under United States sovereignty as National Monuments.

In this regard, we wish to call your attention to some other conservation opportunities that are ripe for presidential action. Eight little-known US territories and possessions in the central Pacific Ocean deserve National Monument status to better protect their abundant resident and migratory fish and wildlife. These are the islands, ancient reefs and atolls of Baker, Howland, Jarvis, Johnston, Kingman, Palmyra, Rose and Wake.

Our central Pacific Islands are among the world's last relatively intact coral reef ecosystems. They are remarkable for their diverse fish and invertebrate communities, healthy coral reefs, and seabird colonies that are nesting and breeding habitats for millions of birds. The islands serve as important stopover points for migrating fishes, seabirds, and other marine life, and provide sanctuary for threatened species, such as green and hawksbill sea turtles. Several of the islands also have played an important role in exploration, aviation and military history.

Although the eight islands are protected to some degree due to their remoteness, lack of human inhabitants, and their wildlife refuge or military base status, they would benefit greatly from larger surrounding ocean buffer zones to protect them, better surveillance and more active management. Fishing, especially by foreign vessels, is a significant and growing threat that must be deterred. Thousands of modern fishing vessels armed with geopositioning systems now search the last corners of the world for pockets of large fishes and shellfishes, especially around remote coral reefs, such as these. Fish populations around our central Pacific Islands could easily be wiped out by foreign poachers in a short period of time; indeed, there are troubling signs that

poaching already has occurred. In addition, roaming fishing vessels have grounded on the reefs causing major damage at Kingman Reef, Rose Atoll and Palmyra Atoll.

Given the rarity of pristine coral reef islands in the Pacific in general, we believe the highest and best use of our central Pacific Islands is as fully protected biological reserves set within larger buffer zones of surrounding waters and seafloor. Not only do the islands merit National Monument status in their own right because of their rich biological diversity, they also provide essential protection against the impacts of global warming and ecological benchmarks against which to measure the health of coral reefs and seabird populations throughout the Pacific. Studies of these US islands will help coral ecosystem scientists and managers in other nations evaluate environmental conditions in their own countries and set proper restoration and protection goals.

We respectfully recommend that you use your powers under the Antiquities Act to expand the protective mantle covering our eight central Pacific Islands. We firmly believe conservation is the best use of these ecosystems.

Sincerely,

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Commercial and Recreational Fishing in the Waters of the Pacific Remote Island Areas (PRIA)

Synopsis

Commercial fishing for tunas and other pelagic fishes occurs throughout the Pacific Ocean, but is relatively limited in the US waters surrounding the Pacific Remote Island Areas (PRIA). The US Pacific tuna fleet consists of different fishing gears: the purse seine fleet lands 78% of the entire US tuna catch (mostly skipjack tuna), followed by longline vessels (19% of tuna landings), while the remainder is caught by smaller troll, handline, and hook and line vessels.

Within the PRIA —encompassing the exclusive economic zone (EEZ) waters around Wake, Baker, Howland, Jarvis, Johnston, Palmyra, and Kingman Reef —most of the fishing vessels are from the Hawaii-based longline tuna fleet. The longline fleet fluctuates greatly in terms of effort and catch; longliners primarily fish in the waters surrounding Johnston and Palmyra Islands and Kingman Reef. From 2000-2005, between 85-99% of the longline fleet catch within the PRIA came from these areas. PRIA tuna landings represents 7.2% of the total Hawaii-based longline fleet tuna catch in the past 5 years (2003 to 2007); 83 longline permitees fished in the PRIA in 2007. The longline fleet also lands other pelagic fishes, such as swordfish, marlin, wahoo and mahi mahi. The dollar value of PRIA commercial fish landings is not recorded and is difficult to determine because of inexact data collection methods and the necessity to rely on logbook data and many assumptions. Bigeye tuna, which is one of the primary targets of the longline fleet in the PRIA, and a highly valued tuna species, had a landed value of roughly $4M in 2007; this is a very rough approximation. The overall value of bigeye tuna landings in Hawaii in 2007 was nearly $42M.

By far the largest US tuna landings come from the 13-vessel purse seine fleet that targets skipjack tuna, yet landings from PRIA waters represent less than 5% of their overall catch. Due to the more tropical distribution of skipjack most of the fishing by the US fleet is in the Baker, Howland and Jarvis EEZs. Other commercial fishing entrants in the PRIA are small: just four current permitees (as of January 2008), one for bottomfish and three for lobster, but not all of these are actually fishing. No recreational fishing occurs in PRIA waters except for a small amount of catch and release bone fishing at Palmyra Atoll permitted by the Fish and Wildlife Service and some sustenance fishing by resident staff. An unquantified amount of fishing takes place at Wake Island by government contractors and military staff stationed there. No commercial fishing of significance has been reported from waters surrounding Wake Island.

Of the four species targeted by the tuna fleet, the bigeye tuna population is the one most likely to be overexploited at this point in time. Yellowfin tuna is considered to be fully exploited while skipjack and albacore are nearing full exploitation levels. There is also anecdotal information and satellite observation of illegal fishing (e.g., shark-finning) in the region by non-US flagged vessels.

Other environmental concerns from fishing include interactions and entanglements with endangered species such as sea turtles and albatrosses, and the bycatch of fishes, oceanic sharks and marine mammals; the poorly documented--but real--impacts on seabird foraging from the removal of tuna, which drive smaller fish to the surface where seabirds catch them; the accidental introduction of alien species; and pollution from ship groundings and wrecks.

Ecosystem Implications of Fishing

Fisheries throughout the world are depleting the oceans of life, and not just the target fish species. Often top predators are disproportionately affected by fishing[1], and their removal disrupts the food-web by changing the natural abundance of different species[2]. Recent reports have documented the depletion of large predatory fish to levels that are as low as 10% of the original population biomass[3]. Impacts reach beyond the localized depletion of individual species because of linked changes to the ecosystem and the killing of non-target species. Bycatch is also resulting in global declines in some species of sharks, sea turtles, seabirds and marine mammals[4]. For example, despite low bycatch rates, scientists estimate that more than 200,000 loggerheads and 50,000 leatherbacks were likely taken in pelagic longline fisheries in 2000, and that thousands of these turtles die each year in the Pacific Ocean. Given the alarming rates of decline in these species (80–95% declines for Pacific loggerhead and leatherback populations over the last 20 years); this level of bycatch is clearly harmful and must be reduced[5].

The estimated 14 million resident seabirds using the breeding islands and waters of the PRIA EEZs are primarily pelagic feeders that obtain the fish and squid they consume by associating with schools of large predatory fish[6]. (See Appendix D.) Large schools of predatory fish drive smaller prey towards the surface where the seabirds can find and eat them; thus, a reduction by up to 90% of fish populations could have a significant impact on seabirds. Because tropical oceans have very low productivity, higher trophic level species such as tuna and seabirds are adapted to unpredictable and patchy prey distributions[7]. The tunas and seabirds are dependent on ocean current patterns that concentrate prey, and these are often found

[1] Pauly, D., V. Christensen, J. Dalsgaard, R. Froese and F. Torres Jr. 1998. Fishing down marine food webs. Science 279:860-863.
[2] Bascompte, J., C.J. Melian and E. Sala. 2005. Interaction strength combinations and the overfishing of a marine food web. PNAS 102: 54423-5447.
[3] Myers, R.A. and B. Worm. 2003. Rapid worldwide depletion of predatory fish communities. Nature 423:280-283.
[4] Lewison, R.L., L.B. Crowder, A.J. Read, A.J. and S.A. Freeman. 2004. Understanding the impacts of fisheries bycatch on marine megafauna. TREE 19:598-604. Spotila, J., R. Reina, A. Steyermark, P. Plotkin, F. Paladino. 2000. Pacific leatherback turtles face extinction. Nature 405: 529-530. Baum, J.K. and R.A. Myers. 2004. Shifting baselines and the decline of pelagic sharks in the Gulf of Mexico. Ecol. Let. 7:135-145.
[5] Lewison, R.L., S.A. Freeman and L.B. Crowder. 2004. Quantifying the effects of fisheries on threatened species: the impact of pelagic longlines on loggerhead and leatherback sea turtles. Ecol. Lets. 7:221-231.
[6] Fefer, S.I., C.S. Harrison, M.B. Naughton, and R.J. Shallenberger. 1984. Synopsis of results of recent seabird research conducted in the Northwestern Hawaiian Islands. Proc. Res. Inv. NWHI UNIHI-SEAGRANT-MR-84-01
[7] Ashmole, N.P. 1971. Seabird ecology and the marine environment. In: Farner, D.S., King, J.R., editors. Avian Biology, Vol 1. Academic Press, New York, p 223–286 and Weimerskirch, H., M. Le Corre, S. Jaquemet, M. Potier, and F. Marsac. 2004. Foraging strategy of a top predator in tropical waters: great frigate birds in the Mozambique Channel. Mar Ecol Prog Ser. Vol. 275: 297–308.

downstream of oceanic islands allowing for higher local tuna populations[8]. The presence of natural densities of these tunas within the foraging radius of seabird colonies enhances the ability of birds to provide adequate food for their offspring[9]. Breeding seabirds are capable of--and often need to--travel hundreds of kilometers to find prey, even when tied to the colony by the need to feed a chick[10]. Presumably, the shorter distance they must go to find prey conserves energy and enhances survival of chicks. This association of seabirds and tuna also exposes the birds to a higher likelihood of contact with fishing vessels.

Oceanic ecosystems are the least protected areas earth. The opportunity to protect an entire tropical ecosystem from the land to the coral reefs, to the surrounding waters provides a chance to preserve a system intact and complete with healthy coral reefs and populations of large predatory fishes, sea turtles, seabirds and marine mammals. This opportunity is undoubtedly fleeting and critical.

Known Foraging Distances of Seabirds

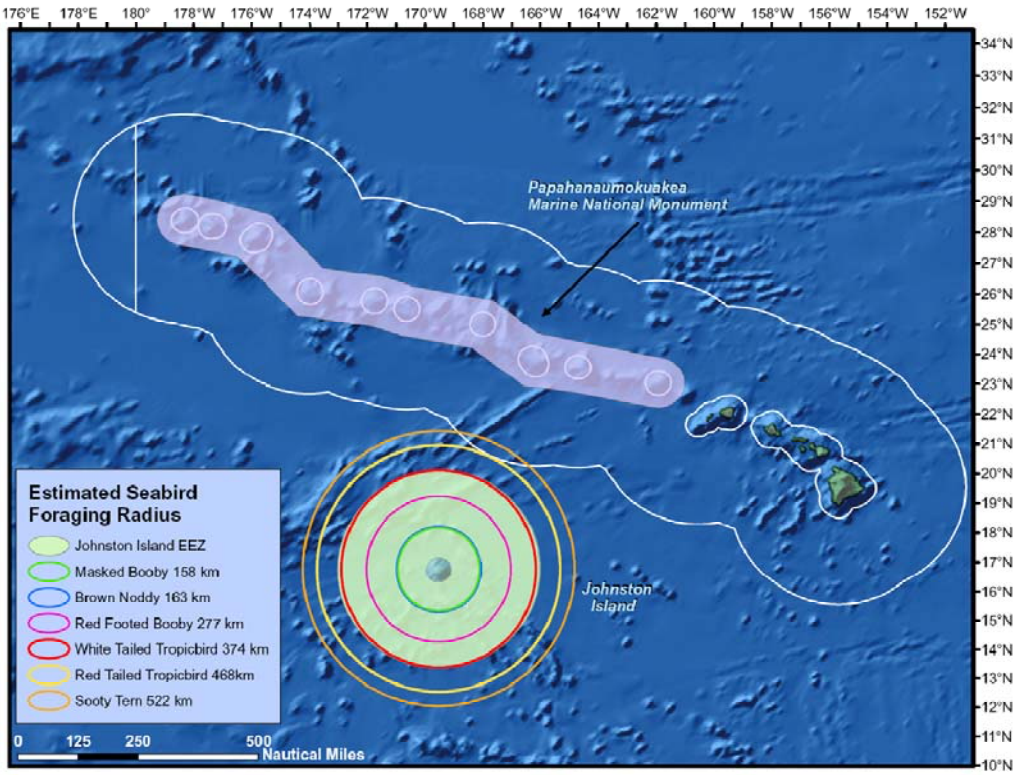
The following map depicts the estimated foraging radiuses of several seabird species superimposed on the Johnston Island EEZ. This indicates exactly how important the entire EEZ is as a feeding ground for resting and nesting tropical seabirds[11].

[8]Ashmole, N.P. and M.J Ashmole. 1967. Comparative feeding ecology of sea birds of a tropical oceanic island. Peabody Museum of Natural History, Yale University Bulletin 24. And Boehlert, G., editor. 1993. Fisheries of Hawaii and the U.S. -associated Pacific Islands. Marine Fisheries Review 55:1-138.

[9]Ashmole, N.P. and M.J Ashmole. 1967. Comparative feeding ecology of sea birds of a tropical oceanic island. Peabody Museum of Natural History, Yale University Bulletin 24. Au, D.W.K. and R.L. Pitman. 1986. Seabird interactions with dolphins and tuna in the Eastern tropical Pacific. Condor 88:304-317. Diamond, A.W. 1978. Feeding strategies and population size in tropical seabirds. American Naturalist 112:215-223.Fefer, S.I., C.S. Harrison, M.B. Naughton, and R.J. Shallenberger. 1984. Synopsis of results of recent seabird research conducted in the Northwestern Hawaiian Islands. Proc. Res. Inv. NWHI UNIHI-SEAGRANT-MR-84-01.

[10] Flint, E.N. 1991. Time and energy limits to the foraging radius of sooty terns *Sterna fuscata* Ibis 133: 43–46. Weimerskirch, H., M. Le Corre, S. Jaquemet, M. Potier, and F. Marsac. 2004. Foraging strategy of a top predator in tropical waters: great frigate birds in the Mozambique Channel. Mar. Ecol. Prog. Ser. 275: 297–308.

[11] Flint, E. 2004. A review of home range or foraging radius of tropical seabirds. Administrative Report. US Fish and Wildlife Service. Pacific Remote Islands National Wildlife Refuge Complex, Honolulu.



Management of Fishing in the PRIA

Commercial tuna fishing is managed by the Western and Central Pacific Fisheries Commission (WCPFC). Permits to fish in US waters are granted by the National Marine Fisheries Service and apply to the US western and central Pacific territories – PRIA, American Samoa, Marianas, and Hawaii. The dominant pelagic fisheries target different species of tuna (yellowfin, bigeye, skipjack and albacore). Purse seine fishing contributes the largest landings by far: 78% of the US catch, compared to 19% for the longline vessels and the remainder by troll, handline, and hook and line vessels[12]. The US tuna purse seine industry in the central and western Pacific is made up of a small number of vessels catching a large amount of fish, primarily skipjack, and to a lesser degree yellowfin. In 2007, the US tuna fleet in the central and western Pacific was only 13 purse seine boats, and 156 longline vessels[13]. The US purse-seine catch in 2007 from these 13 boats was 72,204 t[14] of tuna, with 1,868 t of tuna catch reported in PRIA waters[15], about 2.5% of the fleet's total landings. Some years, there was no catch in PRIA waters. In 2007, the US longline fleet caught only 6% of its tuna in PRIA waters.

[12] Western and Central Pacific Fisheries Commission- Scientific Committee. 2008. Annual Report – Part 1 Information on Fisheries, Research, ad Statistics. WCPFC-SC4-AR PART 1/WP-31.
[13] Western and Central Pacific Fisheries Commission- Scientific Committee. 2008. Annual Report – Part 1 Information on Fisheries, Research, ad Statistics. WCPFC-SC4-AR PART 1/WP-31.
[14] Western and Central Pacific Fisheries Commission- Scientific Committee. 2008. Annual Report – Part 1 Information on Fisheries, Research, ad Statistics. WCPFC-SC4-AR PART 1/WP-31.pdf
[15] South Pacific Tuna Treaty Program, SWFSC HMS Database, unpl. data

Permits for lobster and bottomfish are managed by National Marine Fisheries Service.

Target Catch

Purse-seining for tuna in the central and western Pacific primarily targets skipjack (*Katsuwonus pelamis*), but yellowfin (*Thunnus albacares*), bigeye (*Thunnus obesus*), and albacore (*Thunnus alalunga*) are also caught to a lesser extent. In 2007 the US purse seine catch was composed of 66% skipjack tuna, 15% bigeye tuna, 6.6% yellowfin tuna, and 6.4% albacore tuna[16]. Longline fishing predominately targets and catches bigeye and yellowfin tuna. The longline fleet operates primarily from Hawaii and fishes throughout the US economic exclusive zone and high seas within 800 nautical miles (nm) of Honolulu.

Longline-caught large bigeye and yellowfin tuna, marketed as 'ahi', are primarily sold through the Honolulu fish auction for 'sashimi', or raw fish[17]. Skipjack tuna caught by the US purse seine fleet in the western and central Pacific primarily ends up as canned tuna for the US market. When the tuna is caught it is frozen whole onboard the ship. This results in a lower quality (and therefore less valuable) product than if the same fish were caught on a longline vessel, where it would be chilled instead of frozen.

Status of Tuna Targeted by the US Fleet

The status of tuna stocks varies. Bigeye tuna are being overfished and it is likely that yellowfin tuna are also being overfished. Population estimates for both indicate that they are fully exploited. Skipjack and albacore tuna are currently being fished at rates thought to be below the level of maximum sustainable yield (MSY). The current levels of fishing on bigeye and yellowfin cannot be sustained (see Appendix A).

[16] Western and Central Pacific Fisheries Commission- Scientific Committee. 2008. Annual Report – Part 1 Information on Fisheries, Research, ad Statistics. WCPFC-SC4-AR PART 1/WP-31.
[17] http://hawaii.gov/dbedt/seafood/bigeye.html

Existing Fishing in the PRIA

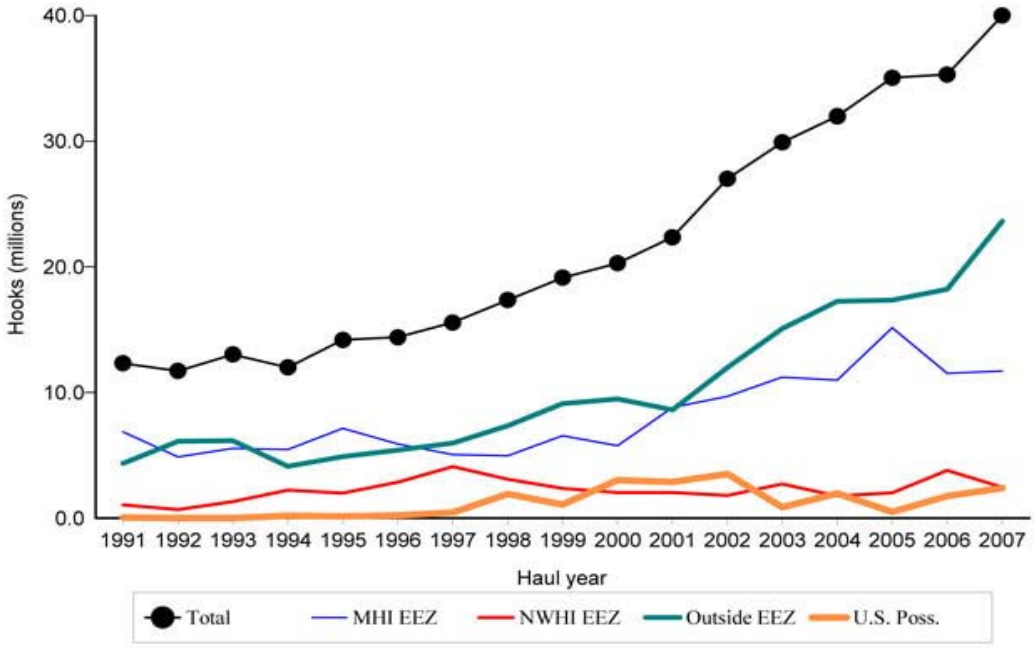
PRIA region	Fish targets	Commercial Fleet	Conservation Issue	Other
• Johnston	bigeye and yellowfin tuna	Tuna deep-set longline – Hawaii based fleet	Fishing impact on seabirds, bycatch of marine mammals and other sharks and protected species	Deep-set tuna fishing
• Palmyra • Kingman	bigeye and yellowfin tuna Bottomfish, Lobster, Sustenancebottomfish, lobster, sustenance fishing, recreational bone fishing (Palmyra)	Tuna deep-set longline – Hawaii-based fleet	Impact on island breeding seabirds, bycatch of marine mammals and other sharks and protected species	Only one bottomfish permit and two lobster permits
• Wake	Near shore fish	None, military personnel and contractors	Possible catch of humphead wrasse and bumphead parrotfish	Military controls access to fishing by personnel
• Baker, Howland, Jarvis	skipjack tuna	Purse-seine fleet, west coast US based fleet	Fish Aggregating Devices (FADs)– deploys masses of marine debris to attract fish	Very small amount of catch predominately in El Niño years

Longline Fishing in the PRIA

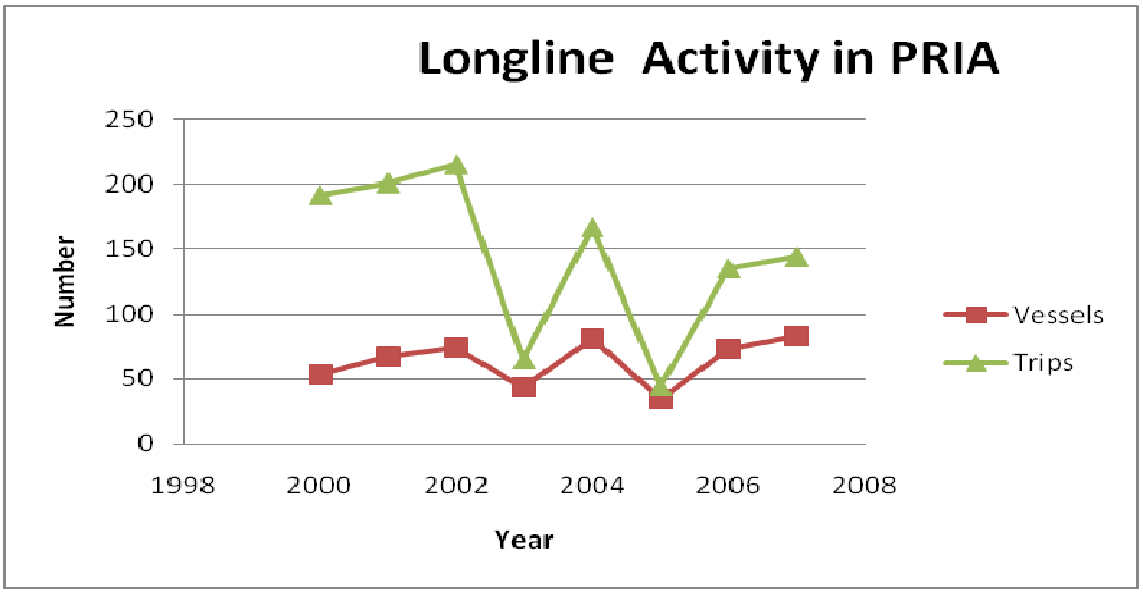
Pelagic longlines are primarily used to target tunas and swordfish. Deep set longline fishing in the PRIA targets bigeye and yellowfin tuna. Free-floating lines with thousands of hooks and up to several miles long are set from the surface to depths of several hundred feet. There is no specific permit that entitles someone to longline in PRIA waters; permission is gained to fish

there by acquiring a Hawaii Longline Limited Entry Permit and/or a Samoan Limited Entry Permit or a Western Pacific General Longline Permit.

Tuna Longline Fishing in the PRIA



The vast majority of Hawaii longline tuna fishing (and therefore value) comes from non-PRIA waters; specifically from around the NWHI, the MHI and the high seas as shown in the graph above. It is difficult to determine the exact number of actively fishing vessels that visit PRIA waters, but there are 224 permits available: 164 for Hawaii and 60 for American Samoa. Based on logbook records there were 156 active vessels in 2007: 129 (HI), 29 (AS) (note 2 boats may have been active in both areas). Of these vessels, 83 fishing boats made 139 trips to PRIA waters in 2007.


Longline Activity in PRIA
250
200
150
100
50
0
Number
1998
2000
2002
2004
2006
2008
Year
Vessels
Trips

Total Tuna Catch PRIA EEZ

Logbook data reported to the Pacific Island Fishery Science Center records the number of fish caught in the PRIA in total numbers. In the last five full years of reporting (2003-2007), fish landings in the PRIA have represented 7.2% of tuna landed in Hawaii, and sometimes as little as 2%[18].

Period	Vessels Active	Total Trips	Tuna Catch in PRIA (no.)	% Tuna Catch in PRIA
2007	83	139	19,565	6.0
2006	73	135	17,533	10.5
2005	34	44	4,577	2.3
2004	81	167	18,017	8.9
2003	43	65	7,059	4.0
2002	74	215	38,501	19.7
2001	67	201	38,488	20.5
2000	53	192	40,665	25.4

Johnston EEZ Tuna Catch

Period	Vessels Active	Total Trips	Tuna Catch In PRIA (no.)	% of Total PRIA Catch
2005	23	28	2159	47.2
2004	64	106	8145	45.3
2003	31	41	3,936	55.8
2002	56	97	12,855	33.4
2001	50	106	14,796	38.4
2000	43	93	17088	42.0

Kingman and Palmyra EEZ Tuna Catch

Period	Vessels Active	Total Trips	Tuna Catch In PRIA (no.)	% of Total PRIA Catch
2005	14	16	1,875	40.9
2004	46	61	9,140	50.7
2003	18	21	2,773	39.3
2002	55	113	19,846	51.5
2001	48	101	23,533	61.1
2000	39	103	23,549	57.9

[18] The data were obtained from longline logbook records on the NOAA Pacific Islands Pacific Science Center website (http://www.pifsc.noaa.gov).

Billfish longline fishing in the PRIA

The majority of the Hawaiian longline fleet targets tuna rather than swordfish, but there are some incidental catches of billfish (mostly striped marlin and shortbill spearfish) from the tuna fleet, most of which are kept. The incidental catch of swordfish by the tuna fleet is small, probably due to the differences in the depth of the lines for the two fisheries. The billfish and swordfish catches in the total PRIA were further broken down by catch at Johnston and Kingman/Palmyra for 2000-2005[19] and tabulated below.

Billfish and swordfish catch in PRIA EEZ, (combined tuna and swordfish targeted sets)

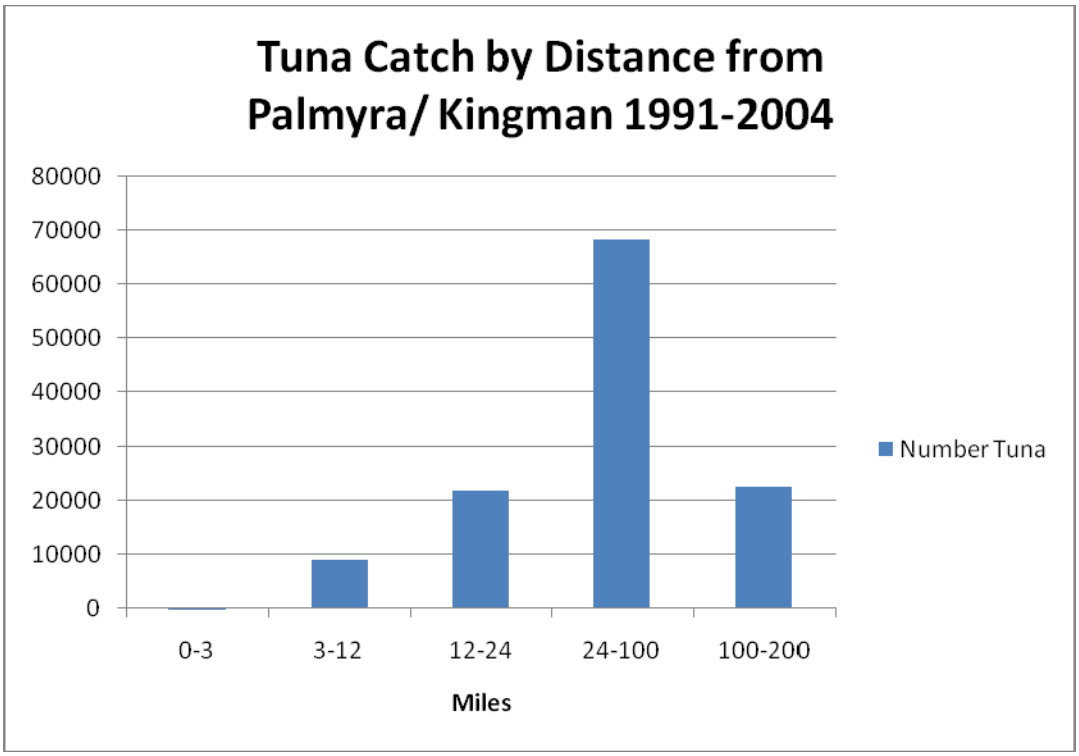
Year	Billfish kept	Swordfish kept	# trips
2007	1,360	229	144
2006	1,638	107	135
2005	464	62	44
2004	1,561	192	167
2003	1,481	74	65
2002	2,507	460	215
2001	2727	204	201
2000	2399	190	197

Billfish and swordfish catch: Kingman, Palmyra and Johnston, (combined tuna and swordfish targeted sets)

	Kingman and Palmyra			Johnston Atoll		
Year	Billfish	Swordfish	# trips	Billfish	Swordfish	# trips
2005	67	24	16	386	37	28
2004	355	94	61	1195	82	106
2003	256	9	21	1163	57	41
2002	823	307	113	1592	113	97
2001	936	131	101	1782	73	106
2000	661	114	39	1738	76	93

[19] The data were obtained from longline logbook records on the NOAA Pacific Islands Pacific Science Center website (http://www.pifsc.noaa.gov).

Distance from Shore of Longline Catch as recorded for Kingman Reef and Palmyra Atoll



Bycatch in the Longline Fishery

Bycatch in the longline fishery is recorded as number of fish. In 2006 the level of discards (i.e., fish not kept – mortality status undocumented) in the Hawaii based longline fleet was 17% (78,884 individual fish). Blue sharks represented the largest number of discarded fish (58,365 individuals)[20]. The average annual percentage of fish discards (including sharks) by the longline fleet in PRIA waters was 13.9% for the years 2000-2007. Sharks were the largest portion of discarded catch. The table below shows number of discards for PRIA alone, and the percentage is similar to that of the longline fleet as a whole.

[20] Bycatch totals compiled by NMFS longline logbook data, published in "Pelagic Fisheries of the Western Pacific Region, 2006 Annual Report" (2007). Western Pacific Fisheries Management Council, Honolulu, HI.

Number of discarded fish (released either alive or dead) recorded in logbooks[21].

Year	Number Caught	Number Discarded (alive or dead)	Percent Discard
2007	31,568	5,129	16.2%
2006	27,746	4,064	14.6%
2005	7,613	1,309	17.2%
2004	30,164	4,908	16.3%
2003	14,813	3,374	22.8%
2002	57,665	8,360	14.5%
2001	53,586	6,315	11.8%
2000	58,892	5,765	9.8%
Totals	282,047	39,224	13.9%

Protected Species Interactions with the Longline Fishery

All Species

A number of sea turtles, seabirds, and marine mammals are incidentally caught or entangled in longline fisheries. Observer programs exist which monitor 100% of the shallow-water set swordfish fishery and 20-23% of the deep-water set tuna fishery in Hawaii. Within the PRIA fishing is primarily deep-set fishing for tuna.

Sea Turtles

Pacific sea turtle interactions with longline fishing gear are a serious cause for concern[22]. The Pacific Ocean wide interaction rate calculated for leatherback sea turtles ranges from 0-2.4 turtles per 1,000 hooks, and for loggerhead sea turtles the interaction rate is 0-14 turtles per 1,000 hooks.

Number of Hooks Set in PRIA Waters

Year	Number of hooks[23]
2007	2,387,385
2006	1,746,697
2005	505,819
2004	1,961,619
2003	879,083
2002	3,529,027
2001	2,891,332
2000	3,015,844

[21] Information from Pacific Island Fishery Science Center website - (http://www.pifsc.noaa.gov). Data from PRIA EEZ in 2006 and 2007, data from "U.S. Possessions" for 2000-2005.

[22] Lewison, R.L., S.A. Freeman and L.B. Crowder. 2004. Quantifying the effects of fisheries on threatened species: the impact of pelagic longlines on loggerhead and leatherback sea turtles. Ecol. Lets. 7:221-231.

[23] Number of hooks from PSFSC logbook summaries (http://www.pifsc.noaa.gov).

Interaction rates with sea turtles are highest for the shallow water swordfish fishery, and as a result this fishery was closed for several years. In 2004, this fishery was reopened after being shut down for four years. New technology that reduced sea turtle bycatch, and new regulations were implemented as well as 100% observer coverage in this fishery. Additionally, a total number of allowed interactions between sea turtles and the swordfish fishery were set that, if reached, would close the fishery for remainder of the year. (leatherback-16; loggerhead-17).

Table of Interactions with Protected Sea Turtles – Swordfish Shallow Set Fishery

	Leatherback	Loggerhead
Annual limit	16	17
Interactions in 2007	5	15
Interactions in 2006	1	*17
Interactions in 2005	8	12
Interactions in 2004	1	1

In 2006 the fishery was closed because the number of allowed interactions with loggerheads was reached. Currently the number of interactions is being reconsidered by WESPAC with potential to increase the number to 46.

Another protected species that interacts with the longline fishery includes the globally endangered black-footed albatross. Data from the National Marine Fisheries Service observer program showed that 25 black-footed albatrosses were killed in the three months between April 1–June 30, 2008. In the entire years of 2005, 2006, or 2007, only 12, 17, and 14 black-footed albatross, respectively, were killed in the deep-set longline fishery.

Based on reports from Hawaii's vessel observer program, longline fisheries also interact with a number of marine mammals. Of significance is the "take" of false killer whales which is exceeding the potential biological removal rate (PBR) of 1.0 per year in the Hawaii-based longline fishery[24]. Most of the observed takes in the tuna longline fishery are false killer whales (18 of 43 observed takes). This number may underestimate the actual level of take of this species, since 11 of the animals observed taken but not identified to species might have been false killer whales (listed as false killer whale or pilot whale on the observer logs). Over half of the takes of false killer whales occurred within the EEZ of the Hawaiian Islands, Johnston Atoll, or Palmyra Atoll. Common prey items of this species include squid and various fish, including yellowfin tuna and mahi mahi, which is part of deep set longline tuna fishery in the PRIA. The most recent (2002) estimate of abundance was 236 false killer whales in the Hawaiian EEZ[25].

[24] Carretta, J.V., K.A. Forney, M.M. Muto, J. Barlow, J. Baker, B. Hanson and M.S. Lowry. 2007. U.S. Pacific Marine Mammal Stock Assessment: 2005. NOAA Tech. Memo. NMFS SWFSC p. 398, 312

[25] ibid

Recent genetic research suggests that the Hawaii EEZ population of false killer whales is distinct[26].

Purse Seine Fishing in the PRIA

Purse-seining is a fishing method in which a large boat encircles a school of tuna and hauls the entire school on board. This fishing method is capable of catching a very large amount of fish. One set alone can haul in over a million pounds of fish. Compared to other fishing methods, purse seining is relatively 'clean', with a small percentage of bycatch of other species, most commonly those associated with schools of tuna such as billfish and dolphins. The staggering volume of fish that are caught by purse seine methods, though, can add up to a significant level of non-target species bycatch. Prior to 1995, the fleet in the Western Central Pacific Ocean fished mainly on free-swimming schools of tunas. During the last five years, the fleet has been fishing equally on both free-swimming schools and schools associated with floating objects, including logs and fish aggregating devices (FADs)[27]. Unlike the tuna purse seine fleet in the Eastern Tropical Pacific the WCP fleet has never targeted fishing on schools of dolphins.

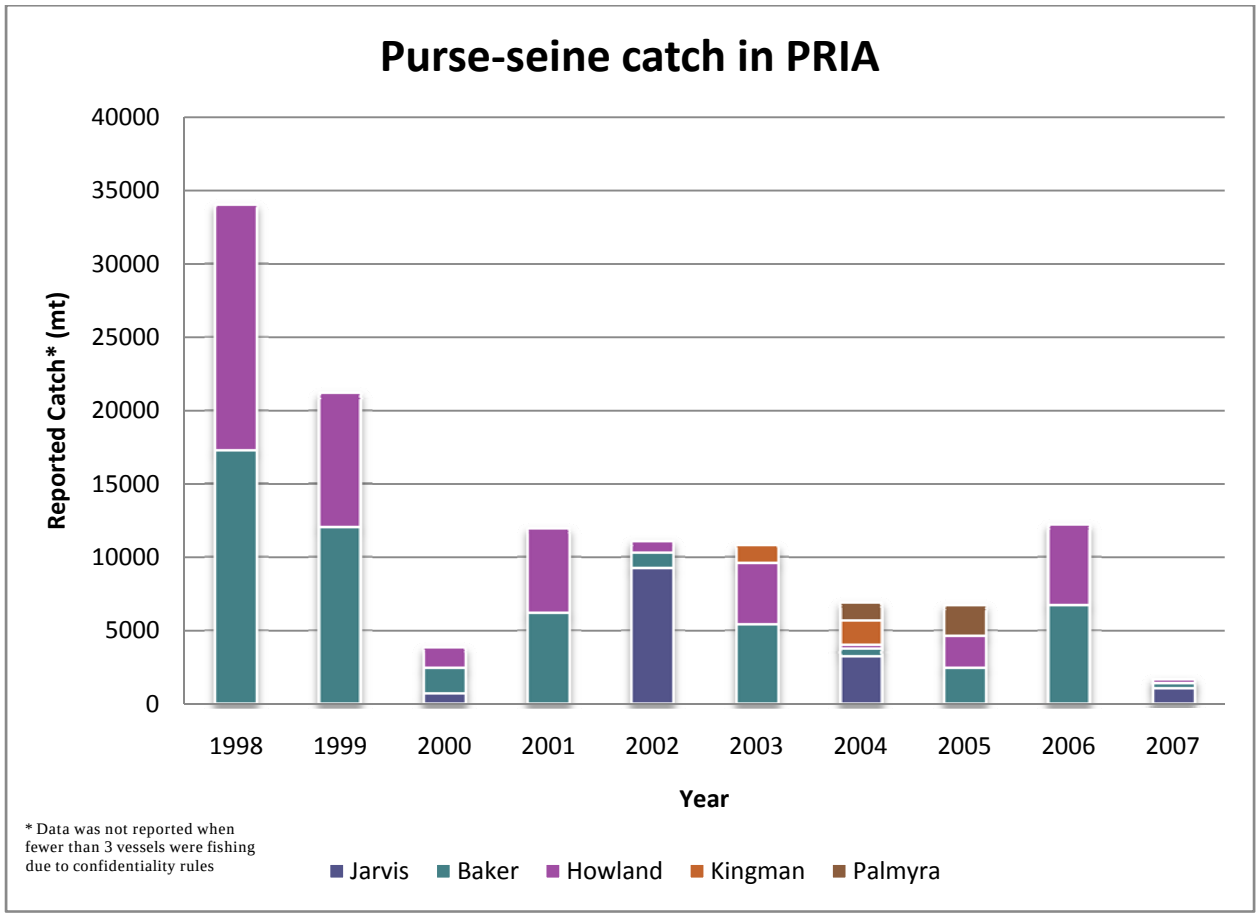
All US purse seine vessels fishing in the western and central Pacific are subject to monitoring by observers. The observers are independent individuals, not fishermen, who collect data and monitor compliance with applicable laws and regulations. The US purse seine fleet has observer coverage on 20% of their trips. The majority of the US purse seine catch is offloaded and processed at the canneries in Pago Pago, American Samoa.

All US purse seine vessels are allowed to fish in the waters of the PRIA. However, few boats choose to fish there, and only a very small portion of the fleet's total catch is caught in PRIA waters. There are so few vessels operating in the PRIA EEZs that much of the data is suppressed due to privacy concerns. (Fishing data is suppressed when fewer than 3 boats reported catch in the area). Last year (2007), purse-seiners caught a reported 1,868 t of tuna in PRIA waters[28], about 2.5% of the fleet's catch. In some years, there is no catch in PRIA waters at all.

Most purse seine fishing in PRIA waters occurs around the islands of Jarvis, Baker, and Howland and to a much lesser extent around Kingman and Palmyra[29]. Presumably the purse seine fleet targets this area of the PRIA because it is where the skipjack tuna are found. Most skipjack fishing in US waters occurs during years with El Niño conditions, when these tuna are found in PRIA waters. No purse seining occurs around Johnston Atoll or Wake Island[30]. We do not know exactly how many boats were fishing in PRIA waters last year due to privacy concerns in the

[26] Chivers, S. J., R. W. Baird, D. J. McSweeney, D. L. Webster, N. M. Hedrick, and J. C. Salinas. 2007. Genetic variation and evidence for population structure in eastern North Pacific false killer whales (*Pseudorca crassidens*). Can. J. Zool. 85: 783-794.
[27] Western and Central Pacific Fisheries Commission- Scientific Committee. 2008. Annual Report – Part 1 Information on Fisheries, Research, ad Statistics. WCPFC-SC4-AR PART 1/WP-31.
[28] South Pacific Tuna Treaty Program, SWFSC HMS Database, unpl. data
[29] South Pacific Tuna Treaty Program, SWFSC HMS Database, unpl. data
[30] Industry Letters to CEQ

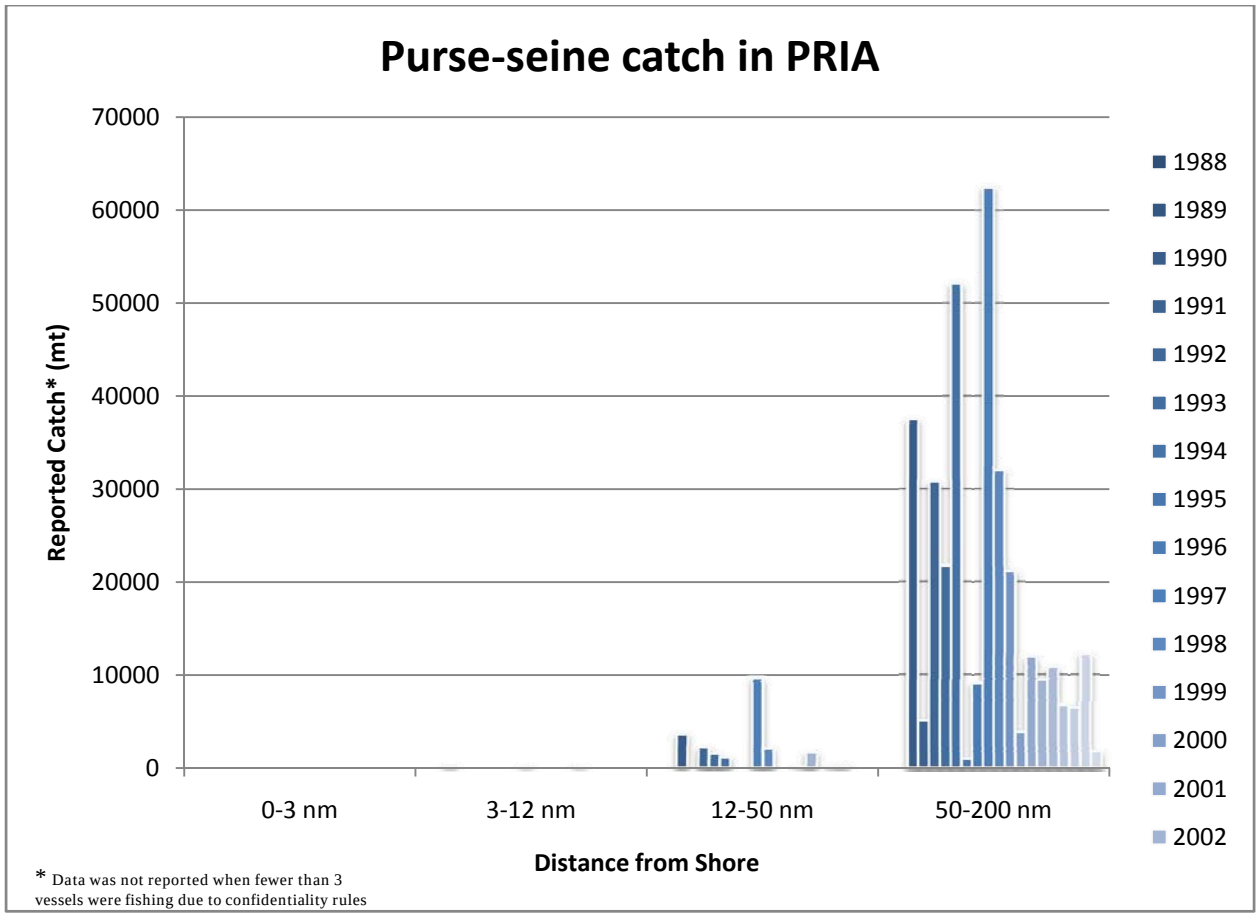
reporting of fishing data, but we do know at least six boats reported catch from PRIA waters last year.[31]



The vast majority of tuna purse seine catch around the PRIA is caught far from shore, between 50 and 200 nm. Logbook data collected over the past 20 years shows that none of the catch occurred within 12 miles of shore, and very little tuna was caught within 50 miles of shore.

The American Tunaboat Association claims they will lose 30,000 metric tons (mt) (per year) of catch if they are no longer allowed to fish in PRIA waters[32]; however, in most years the fleet does not fish in PRIA waters and the majority of the tuna catch comes from the high seas and other, non-US nation's waters. Catches of skipjack tuna in PRIA waters coincide with El Niño events, and that level of catch has not been taken for more than 10 years from PRIA waters. More recent catches are closer to 10,000 mt.

[31] South Pacific Tuna Treaty Program, SWFSC HMS Database, unpl. data
[32] Industry Letters to CEQ, June 13, 2008.



Other Fishing in the PRIA

US Albacore Troll Fishery

In recent years, the US troll fishery for albacore experienced significant decline inactivity. The number of vessels participating in the western central Pacific ocean portion of this fishery declined from 69 vessels in the North Pacific in 2003 (of which 14 also fished in the South Pacific) to only 6 vessels in 2007, down from 8 in 2006. All 6 of these vessels fished the South Pacific in 2007 but only 1 also fished in the WCPO north of the equator, down from 3 in 2006. The albacore troll fishery operated mostly between 35° S and 45° S latitude and 115° W and 170° W longitude. In the North Pacific the location of fishing and catch by the single vessel in the WCPO is company-sensitive (or "fisheries confidential") information and accordingly was excluded from this report. Very little trolling occurs in PRIA waters: of 9 pelagic troll (and handline) permits issued in 2007, only 4 were currently being used as of January 2008.

Other

The data on other US fisheries come mostly from vessels participating in small-scale tropical troll, handline, and pole-and-line fleets, but also include some data from miscellaneous recreational and subsistence fisheries monitored by creel surveys in American Samoa and Guam. These miscellaneous recreational and subsistence data are included in the tropical troll statistics, as this fishing method is the most common recreational and subsistence fishing technique in these areas. Most of the vessels comprising the US tropical troll fishery, and all of the US handline and pole-and-line vessels, are located in Hawaii. Total pelagic longline catch over the last 5 years ranged from a high of 3,081 t in 2004 to a low of 2,432 t in 2006, with a catch of 2,525 t in 2007. The catch was composed primarily of skipjack tuna, yellowfin tuna, and mahi mahi. Seven bottomfish permits (handline gear) were issued for the PRIA in 2007 and only one was current as of January 2008. There are three lobster permits active in the PRIA region. Data on the lobster catch of these vessels (if fishing), are suppressed by NOAA due to privacy concerns.

Appendix A. Summary of Tuna Stock Status[33]

Bigeye Tuna

According to recent stock assessments, there is a high probability that overfishing of bigeye is occurring in the WCPO. The population is not yet in an overfished state with respect to total biomass (i.e., large adult fish and juveniles), but adult biomass has been below MSY for a considerable period. Both adult and total biomass are predicted to become over-fished if current fishing levels continue (assuming average levels of recruitment). There has been a recent decline in biomass under increasing levels of fishing mortality resulting in an increase in the probability of the stock becoming overfished over time.

According to most of the stock models, total biomass for the Western Central Pacific Ocean had declined to about half the virgin biomass level by about 1970, and has gradually declined since. Adult biomass has declined by about 20% over the last decade.

Fishing mortality for adult and juvenile bigeye tuna is estimated to have increased continuously since the beginning of industrial tuna fishing. While total biomass has remained relatively stable since 1970, it has been sustained by above average recruitment, particularly since 1995. Recruitment may have now returned to the long-term average level, which would create a rapid decline in biomass at current exploitation rates. The current level of biomass is 20–26% of the unexploited level with higher depletion estimated with increasing longline catchability. Depletion is more extreme for some regions, including the PRIA waters.

Biomass-based stock assessment models indicate that if fishing continues at the 2003-2006 level, the average biomass would fall below MSY. The bigeye stock in the WCPO is not currently in an overfished state because of above average recruitment. However, the situation is less optimistic with respect to adult biomass.

Stock projections indicate significant reductions in fishery-specific effort are required to reduce fishing mortality below the MSY. A high proportion of the total current fishing mortality can be attributed to longline fishing throughout the WCPO. Significant reduction in the amount of fishing effort is required to achieve sustainable fishing levels, and larger reductions in some fisheries are required if others continue to expand.

Yellowfin Tuna

Current population estimates suggest that yellowfin tuna are fully exploited and there is some evidence that suggests overfishing is occurring. Data indicate that the biomass should stay slightly above MSY if fishing levels remain unchanged therefore the yellowfin stock in the WCPO is not currently in an overfished state. However, present exploitation rates are likely to be approaching MSY.

[33] Western Central Pacific Ocean 2007 Stock assessments, Western and Central Pacific Fisheries Commission

Trends in biomass are consistent with the underlying trends in recruitment, with biomass declining during the early to mid-1970s, increasing in the mid-1970s, and remaining relatively stable during the 1980s. Biomass then declined steadily during the 1990s. Evidence of strong recruitment in recent years is reflected in an increase in total biomass during the later years of the fisheries model; however, there is considerable uncertainty about these recruitment estimates and, therefore, about trends in total biomass.

Biomass has decreased steadily over time, reaching a level of 65% of unexploited level from 2002 to 2005 for the region that includes the PRIA (region 4). This represents a moderate level of stock-wide depletion and, according to over-fishing criteria, the PRIA region is approaching full exploitation.

The Indonesian and Philippines domestic fisheries have the greatest impact on biomass, particularly in their home region, and are contributing significantly to the impact in adjacent regions (including the PRIA region). The purse seine fishery also has a high impact in the equatorial regions, and the longline fishery is responsible for around 10% of biomass depletion in the WCPO during recent years.

Skipjack Tuna

Stock assessment models suggest that skipjack are currently exploited at a moderate level and that overfishing of skipjack is not occurring in the WCPO, nor is the stock in an overfished state. Recruitment variability, influenced by environmental conditions, will continue to be the primary influence on stock size and fishery performance.

According to model estimates, recruitment increased in the mid-1980s and has remained at high levels. Recruitment peaks occurred in 1998 and 2004-2005 following strong El Niño events, and recruitment was lower from 2001 to 2003 following a period of sustained La Nina conditions. Recent recruitment is likely at a historically high level, but fishery data is limited.

The biomass trends for skipjack are driven largely by recruitment. The highest biomass estimates occurred from 1998 to 2001 and from 2005 to 2007, immediately following periods of sustained high recruitment in the eastern equatorial region. The model results suggest that skipjack population in this region of the WCPO has been about 40% higher in recent years than the overall average for the past decade. Fishing mortality has increased over the past decade and is highest in the western region in the most recent years. The impact of fishing is predicted to have reduced recent biomass by about 40% in the western equatorial region and 20% in the eastern region.

Albacore Tuna

The current assessment of the south Pacific fishery indicates lower levels of stock size and maximum sustainable yield which are more realistic than previous assessments. There is uncertainty regarding the sustainability of the south Pacific albacore stock and the science committee recommended that catches of south Pacific albacore remain at current levels considering the current rates of fishing mortality on adult albacore.

Appendix B. Description of the Limited Entry Permits from the NOAA website

Hawaii Longline Limited Entry Permit[34]

A valid Hawaii longline limited entry permit (Hawaii longline permit) is required for anyone:

- Using longline gear to fish for pelagic species within the EEZ around Hawaii.
- Landing or transshipping longline catch in Hawaii or within the EEZ around Hawaii.

The Hawaii longline permit may be used to fish with longline gear and land longline catch in Guam, the Northern Mariana Islands, and the Pacific Remote Island Areas. It may be used to fish outside the EEZ around American Samoa or land fish in American Samoa caught outside the EEZ around American Samoa, but may not be used to fish within the EEZ around American Samoa.

The Hawaii longline fishery is a limited entry fishery with a maximum of 164 permits. Because it is a limited entry fishery, no new (i.e., additional) permits can be issued, but permits are renewable and freely transferable. Permits are renewed annually and expire on March 3 of each year. Renewals and transfers of permits are processed by Pacific Island Regional Office (PIRO).

American Samoa Longline Limited Entry Permit[35]

The American Samoa longline limited entry permit is required for anyone:

- Using longline gear to fish for pelagic species within the EEZ around American Samoa.
- Landing or transshipping pelagic species in American Samoa that were caught within the EEZ around American Samoa.

The American Samoa longline permit may be used to fish with longline gear in the EEZ around Guam, the Northern Mariana Islands, the Pacific Remote Island Areas, and land catch in those areas. It may not be used in the Hawaii longline fishery.

A maximum of 60 American Samoa permits is distributed among 4 vessel size classes. Class A vessels are 40 feet long or smaller, Class B (and B-1) vessels are longer than 40 feet, but no longer than 50 feet; Class C (and C-1) vessels are longer than 50 feet, but no longer than 70 feet, and Class D (and D-1) vessels are longer than 70 feet. Permits are issued by vessel size class and permit holders are restricted to using vessels within their size class or smaller.

Permits may be transferred, but the person receiving the transfer must meet specific requirements, depending on their vessel size class. The permits expire three years from

[34] http://www.fpir.noaa.gov/SFD/SFD_permits_2.html
[35] http://www.fpir.noaa.gov/SFD/SFD_permits_3.html

issuance, and renewal requires meeting minimum landing requirements and having a current Protected Species Workshop certificate.

Western Pacific Longline General Permit[36]

The western Pacific longline general permit is required for anyone:

- Using longline gear to fish for pelagic species in the EEZ around Guam, the Northern Mariana Islands, or Pacific Remote Island Areas.
- Landing or transshipping pelagic species caught with longline gear in Guam, the Northern Mariana Islands, or Pacific Remote Island Areas.

The general longline permit may be used to land in American Samoa pelagic species caught with longline gear outside the EEZ around American Samoa. It may not be used to fish for pelagic species using longline gear in the EEZ around American Samoa or Hawaii, or to land longline caught fish in Hawaii.

Vessel owners or operators fishing with the Western Pacific longline general permit are required to:

- Maintain and submit the Western Pacific daily longline logbook to NMFS within 72 hours of returning to port.
- Carry a valid Protected Species Workshop certificate on board the vessel.
- Carry a valid general longline permit on board the vessel.
- Handle and release protected species and seabirds as directed by PIRO.

There are 164 longline boats that are authorized to fish in PRIA waters and dock in Hawaii. Of the 164, 129 vessels were active and 83 actually fished in PRIA waters in 2007 (the most recent year for which we have data).

American Samoa has 60 limited entry permits available for various sizes of boats. Of these 60 boats, 26 were active in 2007, and an unknown number of these vessels also had permits to dock in Hawaii. It is unknown how many, if any, of these 26 boats fished in PRIA waters.

There is no cap on the number of general longline permits. Last year, 8 general longline permits were issued: 5 for vessels fishing in the American Samoa area, and 3 for vessels fishing around Guam and the Northern Marianas Islands. None of these vessels fished in PRIA waters last year, and it is believed that vessels with these permits rarely, if ever, fish in PRIA waters since their effort is generally concentrated elsewhere.

[36] http://www.fpir.noaa.gov/SFD/SFD_permits_4.html

The entire active WCPO US longline fleet is made up of 156 longline boats, 129 of which are based out of Hawaii, the remainder coming from California and American Samoa. 29 of these vessels fished around American Samoa, some of which also participated in the Hawaii fishery.[37]

[37] Western and Central Pacific Fisheries Commission- Scientific Committee. 2008. Annual Report – Part 1 Information on Fisheries, Research, ad Statistics. WCPFC-SC4-AR PART 1/WP-31.

Appendix C. Status of Protected Species in PRIA Waters Which Have Interactions with the Tuna Longline Fleet

The status of species under the Endangered Species Act (ESA) and the International Union for the Conservation of Nature (IUCN) for which there were documented interactions with the Hawaii-based longline fishery from 2005-2007.

Species[38]	ESA Status[39]	IUCN Status[40]
Marine Mammals		
Striped dolphin (*Stenella coeruleoalba*)		Lower Risk
Bottlenose dolphin (*Tursiops truncatus*)		Data Deficient
Risso's dolphin (*Grampus griseus*)		Data Deficient
Blainville's beaked whale (*Mesoplodon blainvillei*)		Data Deficient
Bryde's whale (*Balaenoptera edeni*)		Data Deficient
False killer whale (*Pseudorca crassidens*)		Lower Risk
Humpback whale (*Megaptera novaeangliae*)	Endangered	Vulnerable
Shortfinned pilot whale (*Globicephala macrorhynchus*)		Lower Risk
Sea turtles		
Loggerhead turtle (*Caretta caretta*)	Threatened	Endangered
Leatherback turtle (*Dermochelys coriacea*)	Endangered	Critically Endangered
Olive Ridley turtle (*Lepidochelys olivacea*)	Threatened	Endangered
Green turtle (*Chelonia mydas*)	Threatened	Endangered
Albatrosses		
Blackfooted albatross (*Phoebastria nigripes*)		Endangered
Laysan albatross (*Phoebastria diomedia*)		Vulnerable
Sharks		
Blue shark (*Prionace glauca*)		Lower Risk
Mako shark (*Isurus paucus)*		Vulnerable
Thresher shark (*Alopias vulpinus*)		Data Deficient
Oceanic whitetip shark (*Carcharhinus longimanus*)		Vulnerable
Silky shark (*Carcharhinus falciformis*)		Lower Risk
Billfishes		
Blue marlin (*Makaira nigricans*)		
Striped marlin (*Tetrapturus audax*)		

[38] 2008_WCPO_UnitedStates_Pelagic_Fisheries_Annual_Report.pdf
[39] http://www.nmfs.noaa.gov/pr/species/esa/
[40] http://www.iucnredlist.org/

Shortbill spearfish (*Tetrapturus angustirostris*)	
Swordfish (*Xiphias gladius*)	Data Deficient

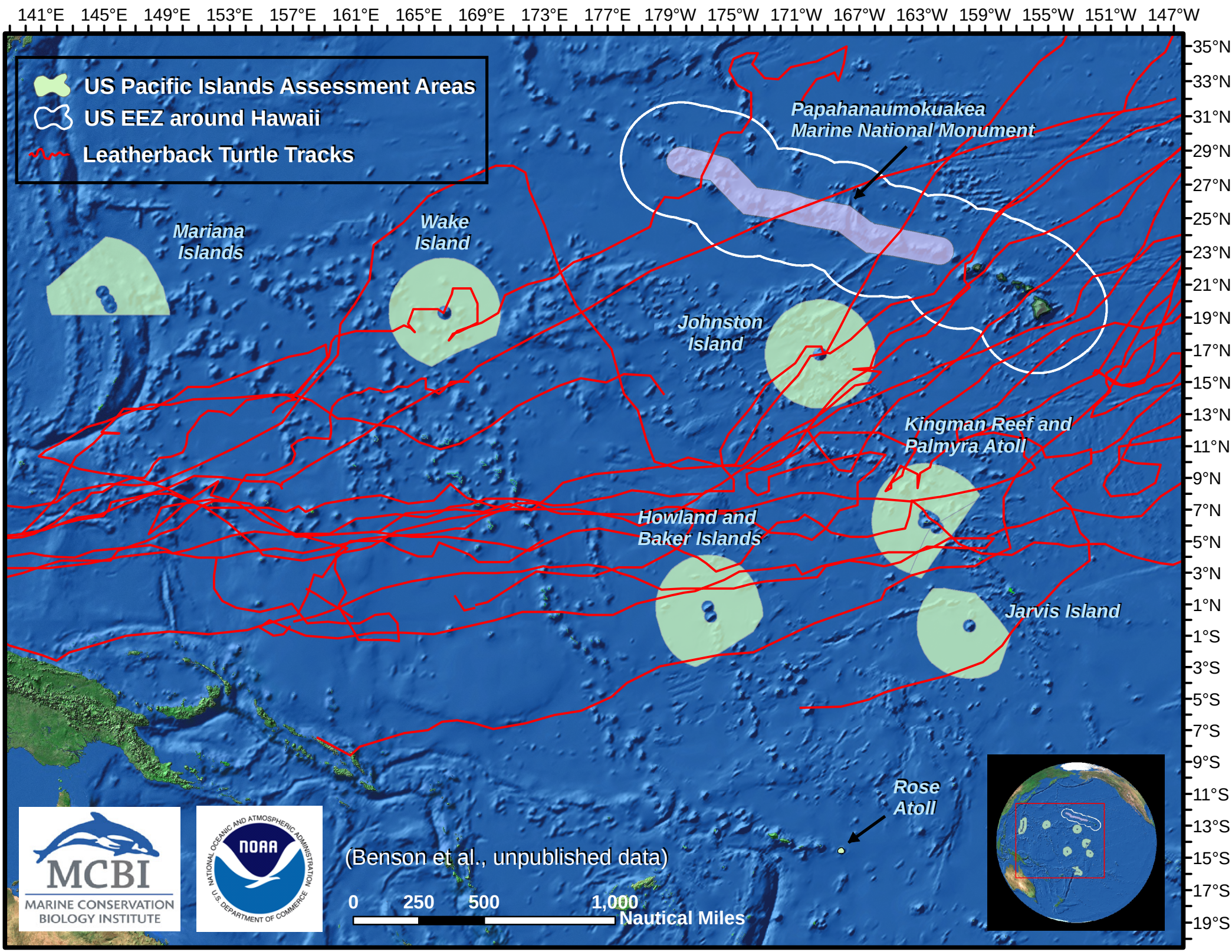
Appendix D. Maximum Spot Counts of Seabirds on the Central Pacific Islands (estimated 14 million seabirds total)

Scientific Name	Common Name	Rose[1]	Palmyra[2]	Baker[3]	Jarvis[4]	Kingman	Howland[5]	Johnston[6]	Wake[7]
Phaethon lepturus	White-tailed Tropicbird	4	8	0	0	0	1	4	10
Phaethon rubricauda	Red- tailed Tropicbird	76	261	72	2,500	0	496	6,500	100
Sula dactylatra	Masked Booby	50	70	3,134	7,000	*	3,763	80	75
Sula leucogaster	Brown Booby	750	742	375	2,000	*	275	1110	350
Sula sula	Red-footed Booby	1382	25,000	714	1,000	0	825	1740	60 (3000-4000*)
Fregata minor	Great Frigatebird	22	400	900	2,400	0	550	380	500 *
Fregata ariel	Lesser Frigatebird	62	5*	16,200	4,000	0	3,850	0	0
Onychoprion fuscatus	Sooty Tern	135,000	876,000	1,600,000	1,000,000+	0	150,000	360000	175,000
Onychoprion lunatus	Gray backed Tern	30	0	2000	1100	0	2,000	1000	80
Anous stolidus	Brown Noddy	408	564	3,600	10,000	*	1,000	17000	1000
Anous minutus	Black Noddy	1492	6,498	0	0	0	0	1000	2000
Procelsterna cerulea	Blue-gray Noddy	0	0	26	650		11	4	0
Gygis alba	White Tern	120	508	38	11	0	50	1000	200
Nesofregetta fuliginosa	Polynesian Storm-petrel	0	0	0	3	0	0	0	0
Puffinus nativitatis	Christmas Shearwater	1*	0	0	20	0	0	220	1
Puffinus Iherminieri	Audubon's Shearwater	0	1*	0	20	0	0	0	0
Puffinus pacificus	Wedge-tailed Shearwater	3*	2*	0	41	0	1*	8000	176
Phoebastria immutabilis	Laysan Albatross	0	0	0	0	0	0	0	3
Phoebastria nigripes	Black-footed Albatross	0	0	0	0	0	0	0	6

* Birds seen in colony but no breeding activity confirmed.

Population numbers for sites represent the largest population of breeding birds documented on trips occurring since 1973. Seabirds spend most of their time at sea, coming inland to care for their young. The estimated 14 million seabirds is derived from an estimate of the number of breeding pairs and the breeding age of each species accounting for species that typically skip years.

[1] Wegmann, A. and S. Holzwarth, "Rose Atoll Research Compendium: 1973-2006," Technical Report prepared for the US Fish and Wildlife Service, 2006.
[2] Depkin, F.C. 2002. Trip Report: Palmyra Atoll NWR, 6 August 2001 to 3 September 2002. Draft Administrative Report, US Fish and Wildlife Service, Honolulu, HI.
[3] US Fish and Wildlife Service, Pacific Remote Islands National Wildlife Refuge Complex, "Baker Island National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment," August 2007.
[4] US Fish and Wildlife Service, Pacific Remote Islands National Wildlife Refuge Complex, "Jarvis Island National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment," August 2007.
[5] US Fish and Wildlife Service, Pacific Remote Islands National Wildlife Refuge Complex, "Howland Island National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment," August 2007.
[6] US Fish and Wildlife Service, Unpublished data
[7] Rauzon, M.J., D. Boyle, and W.T. Everett. Birds of Wake Atoll. Unpublished document.


US Pacific Islands Assessment Areas
US EEZ around Hawaii
Leatherback Turtle Tracks
Papahanaumokuakea Marine National Monument
Mariana Islands
Wake Island
Johnston Island
Kingman Reef and Palmyra Atoll
Howland and Baker Islands
Jarvis Island
Rose Atoll
141°E 145°E 149°E 153°E 157°E 161°E 165°E 169°E 173°E 177°E 179°W 175°W 171°W 167°W 163°W 159°W 155°W 151°W 147°W
35°N 33°N 31°N 29°N 27°N 25°N 23°N 21°N 19°N 17°N 15°N 13°N 11°N 9°N 7°N 5°N 3°N 1°N 1°S 3°S 5°S 7°S 9°S 11°S 13°S 15°S 17°S 19°S
MCBI
MARINE CONSERVATION BIOLOGY INSTITUTE
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
(Benson et al., unpublished data)
0 250 500 1,000
Nautical Miles

Seabird species present in the central and western Pacific remote island areas including Wake and Rose Atolls and their surrounding waters, if they are known to use these islands for breeding, and their conservation status as defined by the Endangered Species Act (ESA) and the International Union for Conservation of Nature (IUCN).

Seabirds [1,2]	**Breeding**[3]	**ESA Status**[4]	**IUCN Status**[5]
Audubon's Shearwater (*Puffinus iherminieri*)	Breeding		Least Concern
Band-rumped Storm-petrel (*Oceanodroma castro*)		Critical	Least Concern
Black Noody (*Anous minutus*)	Breeding		Least Concern
Black-footed Albatross (*Diomedea nigripes*)	Breeding		Endangered
Black-naped Tern (*Sterna lunata*)			Least Concern
Black-winged Petrel (*Pterodroma nigripennis*)			Least Concern
Blue Noddy (*Procelsterna cerulea*)	Breeding		Least Concern
Bonin Petrel (*Pterodroma hypoleuca*)			Least Concern
Bridled Tern (*Sterna anaethetus*)			Least Concern
Brown Booby (*Sula leucogaster*)	Breeding		Least Concern
Brown Noddy (*Anous stolidus*)	Breeding		Least Concern
Bulwer's Petrel (*Bulweria bulwerii*)	Breeding		Least Concern
Christmas Shearwater (*Puffinus nativitatis*)	Breeding		Least Concern
Fairy Tern (*Sterna nereis*)	Breeding		Vulnerable
Flesh-footed Shearwater (*Puffinus carneipes*)			Least Concern
Gould's Petrel (*Pterodroma leucoptera*)			Vulnerable
Great Crested Tern (*Sterna bergii*)			Least Concern
Great Frigatebird (*Fregata minor*)	Breeding		Least Concern
Grey-backed Tern (*Sterna sumatrana*)	Breeding		Least Concern
Hawaiian Petrel (*Pterodroma sandwichensis*)		Endangered	Vulnerable
Herald Petrel (*Pterodroma heraldica*)			Least Concern
Kermadee Petrel (P*terodroma neglecta)*			Least Concern
Laysan Albatross (*Diomedea immutabilis*)	Breeding		Vulnerable
Lesser Frigatebird (*Fregata ariel*)	Breeding		Least Concern
Little Shearwater (*Puffinus assimilis*)			Least Concern
Masked Booby (*Sula dactylatra*)	Breeding		Least Concern
Murphy's Petrel (*Pterodroma ultima*)			Near Threatened
Newell's Shearwater (*Puffinus newelli*)		Threatened	Endangered
Phoenix Petrel (*Pterodroma alba*)	Former Breeder		Endangered
Polynesian Storm-petrel (*Nesofregetta fuliginosa*)			Vulnerable

Providence Petrel (*Pterodroma solandri)*		Vulnerable
Red-footed Booby (*Sula sula*)	Breeding	Least Concern
Red-tailed Tropicbird (*Phaethon rubricauda*)	Breeding	Least Concern
Sooty Tern (*Onychoprion fuscatus*)	Breeding	Least Concern
Streaked Shearwater (*Calonectris leucomelas*)		Least Concern
Tahiti Petrel (*Pterodroma rostrata*)		Near Threatened
Tristram's Storm-petrel (*Oceanodroma matsudairae*)		Data Deficient
Wedge-tailed Shearwater (*Puffinus pacificus*)	Breeding	Least Concern
White Tern (*Gygis alba*)	Breeding	Least Concern
White-bellied Storm-petrel (*Fregetta grallaria*)		Least Concern
White-faced Storm-petrel (*Pelagodroma marina*)		Least Concern
White-necked Petrel (*Pterodroma cervicalis*)		Vulnerable
White-tailed Tropicbird (*Phaethon lepturus*)	Breeding	Least Concern

[1] Flint, Elizabeth. 1996. Status of seabird populations and conservation in the tropical island Pacific. Chapter 9 in: Marine and Costal Biodiversity in the Tropical Island Pacific Region. Editors: Eldrige, L.G., Maragos, J. E., Holthus, P.F., and Takeuchi, H.F.

[2] Personal communication with Beth Flint at the US Fish and Wildlife Service

[3] Personal communication with Beth Flint at the US Fish and Wildlife Service

[4] http://www.fws.gov/endangered

[5] http://www.iucnredlist.org/

Maximum Spot Counts of Seabirds on the Central Pacific Islands (estimated 14 million seabirds total)

Scientific Name	Common Name	Rose[1]	Palmyra[2]	Baker[3]	Jarvis[4]	Kingman	Howland[5]	Johnston[6]	Wake[7]
Phaethon lepturus	White-tailed Tropicbird	4	8	0	0	0	1	4	10
Phaethon rubricauda	Red- tailed Tropicbird	76	261	72	2,500	0	496	6,500	100
Sula dactylatra	Masked Booby	50	70	3,134	7,000	*	3,763	80	75
Sula leucogaster	Brown Booby	750	742	375	2,000	*	275	1110	350
Sula sula	Red-footed Booby	1382	25,000	714	1,000	0	825	1740	60 (3000-4000*)
Fregata minor	Great Frigatebird	22	400	900	2,400	0	550	380	500 *
Fregata ariel	Lesser Frigatebird	62	5*	16,200	4,000	0	3,850	0	0
Onychoprion fuscatus	Sooty Tern	135,000	876,000	1,600,000	1,000,000+	0	150,000	360000	175,000
Onychoprion lunatus	Gray backed Tern	30	0	2000	1100	0	2,000	1000	80
Anous stolidus	Brown Noddy	408	564	3,600	10,000	*	1,000	17000	1000
Anous minutus	Black Noddy	1492	6,498	0	0	0	0	1000	2000
Procelsterna cerulea	Blue-gray Noddy	0	0	26	650		11	4	0
Gygis alba	White Tern	120	508	38	11	0	50	1000	200
Nesofregetta fuliginosa	Polynesian Storm-petrel	0	0	0	3	0	0	0	0
Puffinus nativitatis	Christmas Shearwater	1*	0	0	20	0	0	220	1
Puffinus Iherminieri	Audubon's Shearwater	0	1*	0	20	0	0	0	0
Puffinus pacificus	Wedge-tailed Shearwater	3*	2*	0	41	0	1*	8000	176
Phoebastria immutabilis	Laysan Albatross	0	0	0	0	0	0	0	3
Phoebastria nigripes	Black-footed Albatross	0	0	0	0	0	0	0	6

* Birds seen in colony but no breeding activity confirmed.

Population numbers for sites represent the largest population of breeding birds documented on trips occurring since 1973. Seabirds spend most of their time at sea, coming inland to care for their young. The estimated 14 million seabirds is derived from an estimate of the number of breeding pairs and the breeding age of each species accounting for species that typically skip years.

[1]Wegmann, A. and S. Holzwarth, "Rose Atoll Research Compendium: 1973-2006," Technical Report prepared for the US Fish and Wildlife Service, 2006.
[2] Depkin, F.C. 2002. Trip Report: Palmyra Atoll NWR, 6 August 2001 to 3 September 2002. Draft Administrative Report, US Fish and Wildlife Service, Honolulu, HI.
[3] US Fish and Wildlife Service, Pacific Remote Islands National Wildlife Refuge Complex, "Baker Island National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment," August 2007.
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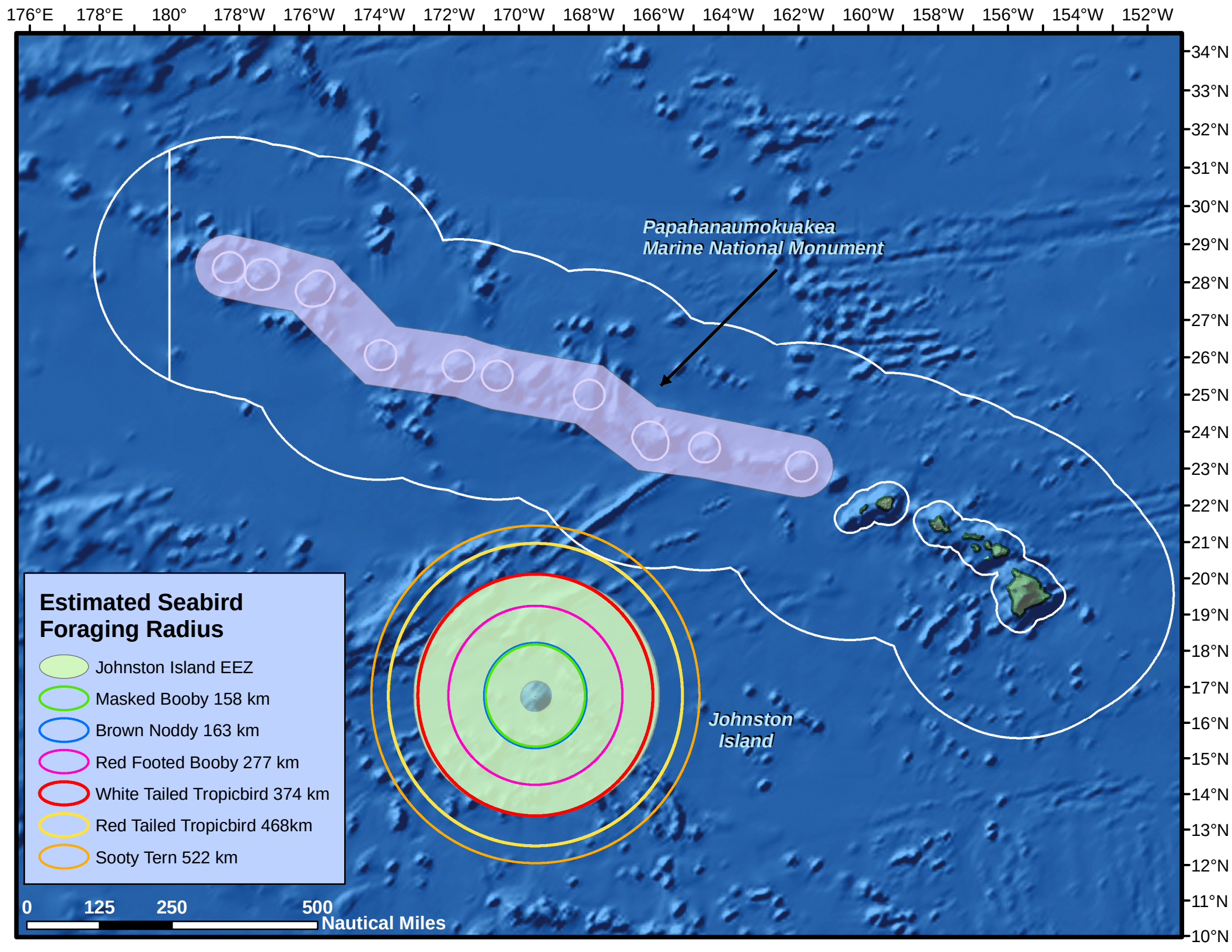
[5] US Fish and Wildlife Service, Pacific Remote Islands National Wildlife Refuge Complex, "Howland Island National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment," August 2007.
[6]US Fish and Wildlife Service, Unpublished data
[7]Rauzon, M.J., D. Boyle, and W.T. Everett. Birds of Wake Atoll. Unpublished document.

For More Information Please Contact Bill Chandler at the Marine Conservation Biology Institute
Phone: 202-546-5346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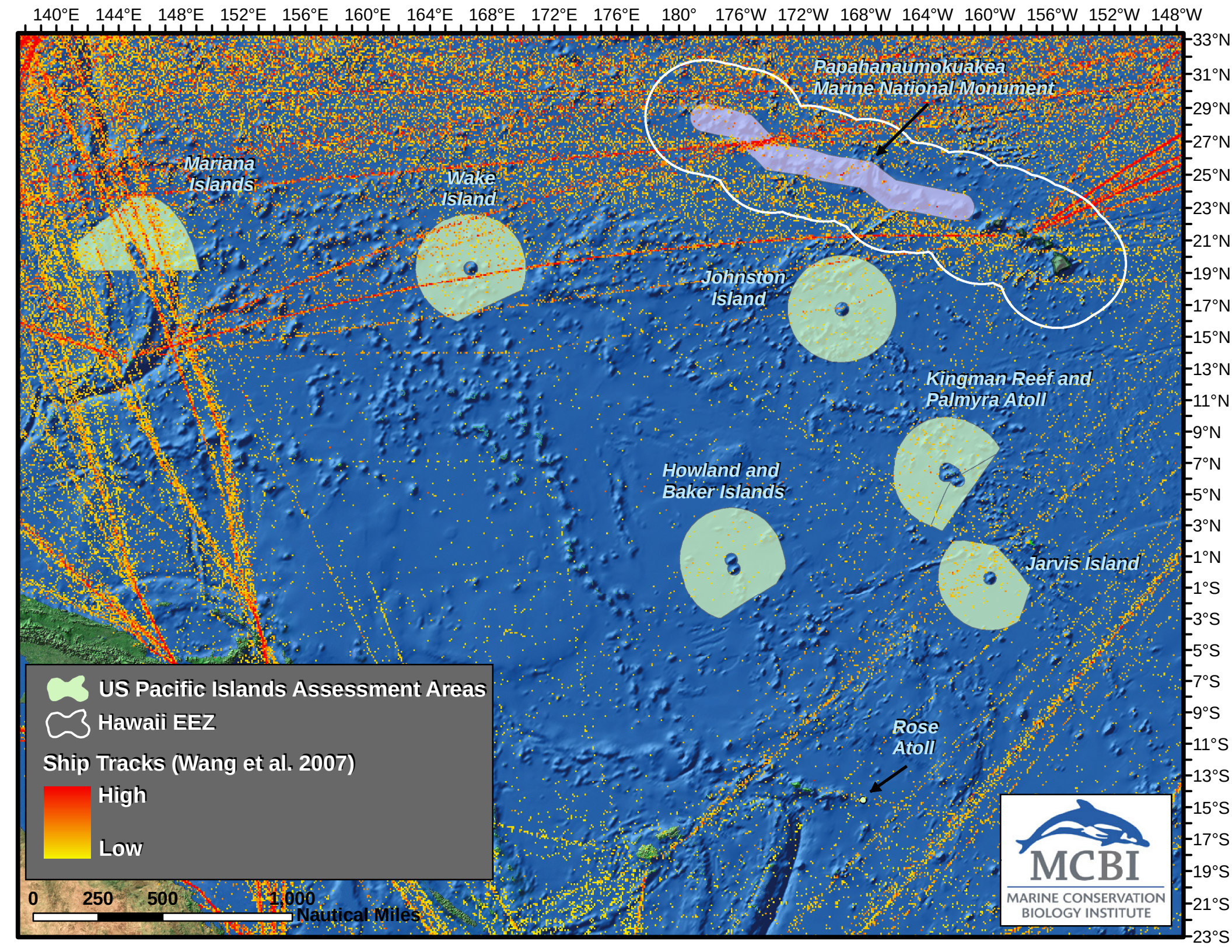
11°N
10°N
Papahanaumokuakea
Marine National Monument
Johnston
Island
Estimated Seabird
Foraging Radius
Johnston Island EEZ
Masked Booby 158 km
Brown Noddy 163 km
Red Footed Booby 277 km
White Tailed Tropicbird 374 km
Red Tailed Tropicbird 468km
Sooty Tern 522 km
0
125
250
500
Nautical Miles


140°E 144°E 148°E 152°E 156°E 160°E 164°E 168°E 172°E 176°E 180° 176°W 172°W 168°W 164°W 160°W 156°W 152°W 148°W
33°N 31°N 29°N 27°N 25°N 23°N 21°N 19°N 17°N 15°N 13°N 11°N 9°N 7°N 5°N 3°N 1°N 1°S 3°S 5°S 7°S 9°S 11°S 13°S 15°S 17°S 19°S 21°S 23°S
Papahanaumokuakea Marine National Monument
Mariana Islands
Wake Island
Johnston Island
Kingman Reef and Palmyra Atoll
Howland and Baker Islands
Jarvis Island
Rose Atoll
US Pacific Islands Assessment Areas
Hawaii EEZ
Ship Tracks (Wang et al. 2007)
High
Low
0 250 500 1,000
Nautical Miles
MCBI
MARINE CONSERVATION BIOLOGY INSTITUTE

Baker Island

Photo: Space Imaging

Key Species

Birds

Red-tailed tropicbirds
Masked boobies
Brown boobies
Red-footed boobies
Great frigatebirds
Lesser frigatebirds
Gray-backed terns
Sooty terns
Brown noddies
Blue noddies
White terns

Reptiles

Green sea turtles (threatened)
Hawksbill sea turtles (endangered)

Invertebrates

87 species of stony corals over 33 genera
5 species of benthic cnidarians over 5 genera
12 species of macro-invertebrates other than cnidarians

Fish

311 species in 46 taxonomic families
Gray reef sharks
Black-tip reef sharks
White-tip reef sharks

Underside of table coral and soldierfish Photo: J E Maragos

Proposal

- Establish a National Monument that includes Baker Island and its surrounding waters
- Expand US Fish and Wildlife Service management authority from 3 to 12 nautical miles (nm)
- Manage the island and nearshore waters to 12 nm as a fully protected National Wildlife Refuge under authority of the Secretary of the Interior
- Establish appropriate conservation measures to protect and conserve the wildlife in the waters and on the seafloor surrounding the fully protected refuge, in particular shallow and deepwater corals, large predatory fishes, and seabirds. This zone from 12 to 200 nautical miles would be managed by the Secretary of Commerce acting through NOAA

Importance

- Located on the equator, Baker Island is an important global climate change research and monitoring site
- Localized upwelling by the Equatorial Undercurrent on the western flanks of the island enrich nearshore waters and provide nesting seabirds food
- Eradication of rats by the FWS led to the revival of nesting seabirds, which now include 11 seabird species and almost one million pairs of sooty terns
- Baker Island (along with Howland Island and Jarvis Island) is one of the few known areas where lesser frigatebirds nest on the ground, rather than in trees
- Strong cultural value for the early history of Polynesians and Micronesians
- Exploited for guano and phosphate rock deposits in the mid to late 19th century
- During WWII, Baker Island was occupied by American troops and a US military airstrip was built in 1943 in an effort to combat Japanese forces

Site Description

Baker Island encompasses approximately 426 acres of emergent reef and land and nearly 32,000 acres of submerged lands. Baker Island and surrounding waters out to 3 nautical miles are currently managed by the US Fish and Wildlife Service as part of the Pacific Remote Island Area Refuge Complex. The refuge is currently closed to all uses.

Baker Island is home to a wide variety of terrestrial and marine species, many of which are threatened or endangered. Baker Island is also known for the high diversity and density of fish species in the waters surrounding the island.

Threats

- Localized upwelling around the island attracts illegal foreign commercial fishermen and shark finners
- Potential shipwrecks, groundings, and oil spills from commercial fishing vessels in refuge waters
- Potential for transiting vessels to ground due to poor charts
- Invasive marine species destroying natural ecology

HOWLAND ISLAND

Photo : Space Imaging

KEY SPECIES

Birds

White-tailed tropicbirds
Red-tailed tropicbirds
Masked boobies
Brown boobies
Red-footed boobies
Great frigatebirds
Lesser frigatebirds
Gray-backed terns
Sooty terns
Brown noddies
Blue noddies
White tern
Pacific golden plovers
Ruddy turnstones
Bristle-thighed curlews

Reptiles

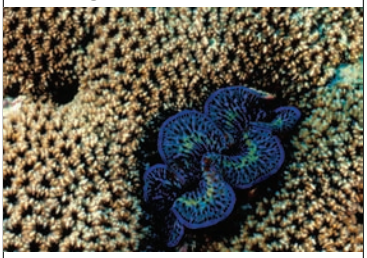
Green sea turtles (threatened)
Hawksbill sea turtles (endangered)

Invertebrates

Giant clams (globally depleted)
93 species of stony corals
4 species of benthic cnidarians
11 species of macro-invertebrates other than cnidarians

Fish

342 fish species
Gray reef sharks
Blacktip reef sharks
Tiger sharks



Tridacna maxima Photo: J E Maragos

PROPOSAL

- Establish a National Monument that includes Howland Island and its surrounding waters
- Expand US Fish and Wildlife Service management authority from 3 to 12 nautical miles (nm)
- Manage the island and nearshore waters to 12 nm as a fully protected National Wildlife Refuge under authority of the Secretary of the Interior
- Establish appropriate conservation measures to protect and conserve the wildlife in the waters and on the seafloor surrounding the fully protected refuge, in particular shallow and deepwater corals, large predatory fishes, and seabirds. This zone from 12 to 200 nautical miles would be managed by the Secretary of Commerce acting through NOAA

IMPORTANCE

- Localized upwelling off the western side of the island from the Equatorial Undercurrent supports higher levels of marine productivity
- Nesting seabird species have increased from 4 to 12 since the FWS eradicated cats from Howland Island in the early 1990s, and approximately 162,822 birds are present
- Restoration potential exists for seven more species, including the blue noddy (the world's smallest tern, exclusively found in the central Pacific), the phoenix petrel, and the white-throated storm-petrel. These last two have been extirpated from most of their range in the Pacific due to vulnerability to rats and other mammalian predators
- Exploited for guano and phosphate rock deposits in the mid to late 19th century
- Strong cultural value for the early history of Polynesians and Micronesians; the last reported destination for Amelia Earhart's ill-fated attempt to fly around the world
- During WWII, Howland Island was occupied by American troops and a US military airfield was built in 1937

SITE DESCRIPTION

Howland includes approximately 453 acres of emergent reef and land and nearly 32,096 acres of submerged lands. Howland Island and surrounding waters from the shore to 3 nautical miles are managed by the US Fish and Wildlife Service as part of the Pacific Remote Islands Area Refuge Complex and the refuge is closed to all uses.

Howland Island is home to a wide variety of terrestrial and marine species, many of which are threatened or endangered, including the globally depleted *Tridacna maxima*, commonly known as the small giant clam.

THREATS

- Localized upwelling around the island attracts illegal foreign commercial fishermen and shark finners
- Potential shipwrecks, groundings, and oil spills from commercial fishing vessels in refuge waters
- Potential for transiting vessels to ground due to poor charts
- Invasive marine species destroying natural ecology
- Lost fish aggregating devices (FADs) wash up on reefs and beaches as marine debris and entangle and kill wildlife; potential groundings by trespassing vessels retrieving FADs

Jarvis Island

Photo: Space Imaging

Key Species

Birds

Audubon's shearwaters
Christmas shearwaters
Wedge-tailed shearwaters
Red-tailed tropicbirds
Masked boobies
Brown boobies
Red-footed boobies
Great frigatebirds
Lesser frigatebirds
Gray-backed terns
Sooty terns
Brown noddies
Blue noddies
White terns
Polynesian storm petrels

Reptiles

Green sea turtles (threatened)
Hawksbill sea turtles (endangered)

Invertebrates

48 stony coral species over 20 genera
2 species of benthic cnidarians over 2 genera
11 species of macro-invertebrates other than cnidarians

Fish

284 fish species over 46 taxonomic families

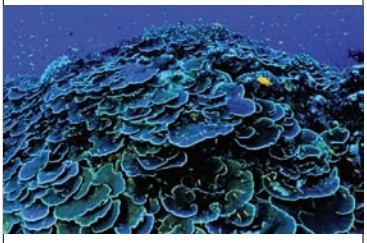


Photo: J E Maragos

Proposal

- Establish a National Monument that includes Jarvis Island and its surrounding waters
- Expand US Fish and Wildlife Service management authority from 3 to 12 nautical miles (nm)
- Manage the island and nearshore waters to 12 nm as a fully protected National Wildlife Refuge under authority of the Secretary of the Interior
- Establish appropriate conservation measures to protect and conserve the wildlife in the waters and on the seafloor surrounding the fully protected refuge, in particular shallow and deepwater corals, large predatory fishes, and seabirds. This zone from 12 to 200 nautical miles would be managed by the Secretary of Commerce acting through NOAA

Importance

- Elimination of rats, goats, mice, and cats by the FWS in 1990 led to the dramatic rise in the numbers of seabirds; 15 species of breeding seabirds is second only to Kiritimati Atoll in the Central Pacific Islands
- Supports communities of deep water corals at depths greater than 1000 meters
- Refuge for resident and migratory fish and wildlife including one of the largest sooty tern colonies, estimated at over one million individuals
- Strong cultural value for the early history of Polynesians and Micronesians
- Exploited for guano and phosphate rock deposits in the mid to late 19th century

Site Description

Jarvis Island encompasses approximately 1,100 acres of emergent reef and land and 36,342 acres of submerged lands. Jarvis Island and surrounding waters out to 3 nautical miles are currently managed by the US Fish and Wildlife Service as part of the Pacific Remote Island Area Refuge Complex, and is currently closed to all uses.

Jarvis Island is home to a wide variety of seabirds including a large population of breeding seabirds. Jarvis Island is also known for high diversity and density of fish species in surrounding waters including a large variety of shark species such as gray reef sharks, blacktip reef sharks, whitetip reef sharks, silvertip sharks, scalloped hammerhead sharks, and great hammerhead sharks.

Threats

- Localized upwelling around the island attracts illegal foreign commercial fishermen
- Potential shipwrecks, groundings, and oil spills from commercial fishing vessels in refuge waters
- Potential for transiting vessels to ground due to poor charts
- Lost fish aggregating devices (FADs) wash up on reefs and beaches as marine debris and entangle and kill wildlife; potential groundings by trespassing vessels retrieving FADs

Johnston Island

Photo: NOAA

Key Species

Birds
- White-tailed tropicbirds
- Red-tailed tropicbirds
- Masked boobies
- Brown boobies
- Red-footed boobies
- Great frigatebirds
- Gray-backed terns
- Sooty terns
- Brown noddies
- Blue noddies
- White terns
- Christmas shearwaters
- Wedge-tailed shearwaters

Reptiles
- Green sea turtles (threatened)

Mammals
- Hawaiian monk seals (endangered)
- Humpback whales (endangered)
- Cuvier's beaked whales
- Spinner dolphins
- Pacific bottlenose dolphins

Invertebrates
- 34 species of Hydrozoan and Scleractinian corals

Fish
- Over 300 fish species
- Gray reef sharks
- Tiger sharks

Great Frigatebird Photo: J E Maragos

Proposal

- Establish a National Monument that includes Johnston Island and its surrounding waters
- Expand US Fish and Wildlife Service management authority to 12 nautical miles (nm)
- Manage the island and nearshore waters to 12 nm as a fully protected National Wildlife Refuge under authority of the Secretary of the Interior
- Establish appropriate conservation measures to protect and conserve the wildlife in the waters and on the seafloor surrounding the fully protected refuge, in particular shallow and deepwater corals, large predatory fishes, and seabirds. This zone from 12 to 200 nautical miles would be managed by the Secretary of Commerce acting through NOAA

Importance

- Important source of coral, fish, and gastropod larvae that flow between the Papahānaumokuākea Marine National Monument and neighboring reefs and islands in the Line Islands
- Only stepping stone between Hawaii and the Line Islands for the dispersal of marine mammals, shorebirds, sea turtles and other fish and wildlife
- Refuge for resident and migratory fish and seabirds, especially after military abandonment of the island in 2005
- Strategic air station in WWII and during Korean War
- Exploited for guano deposits in late 19th century
- Former US nuclear weapons test site and a missile launch site for some of the first spy satellites

Site Description

Johnston Atoll comprises two natural islands (Johnston and Sand Islands) and two human-made islands of dredged coral (North and East Islands). The marine environment consists of a shallow coral reef platform encompassing roughly 50 square miles. The surrounding waters are home to a variety of marine mammals, marine reptiles, coral species, cartilaginous fish, marine invertebrates and algae. Approximately 200 threatened green sea turtles are known to utilize the shores of Johnston Island for feeding and the threatened Hawaiian monk seals have been seen foraging in nearby waters and hauling out on the shore.

Johnston Island is currently under the control of the US Air Force, which has ceased all operations on the island. Measures to transfer ownership to the US Fish and Wildlife Service are currently underway. Prior to Air Force use, Johnston Island was designated as a federal bird refuge in 1926. Waters surrounding Johnston Island up to 3 nautical miles are designated as a Naval Defensive Sea under the Department of Defense.

Threats

- Potential trespass by a handful of US fishing vessels, which cannot be monitored
- Potential shipwrecks, groundings, and oil spills from commercial fishing vessels in refuge waters
- Potential for transiting vessels to ground due to poor charts
- Lost fish aggregating devices (FADs) wash up on reefs and beaches as marine debris and entangle and kill wildlife; potential groundings by trespassing vessels retrieving FADs

KINGMAN REEF

KEY SPECIES

Birds
- Masked boobies
- Brown boobies
- Brown noddies

Reptiles
- Green sea turtles (threatened)
- Hawksbill sea turtles (endangered)

Mammals
- Spinner dolphins
- Undescribed beaked or mellon-head whales

Invertebrates
- 22 stony coral species over 38 genera
- 22 species of benthic Cnidaria over 16 genera
- 27 species of macro-invertebrates other than Cnidarians
- Giant clams

Fish
- 297 fish species in 47 taxonomic families
- Gray reef sharks

Centopyge flavissima Photo: J E Maragos

PROPOSAL

- Establish a National Monument that includes Kingman Reef and its surrounding waters
- Expand US Fish and Wildlife Service management authority from 3 to 12 nautical miles (nm)
- Manage the island and nearshore waters to 12 nm as a fully protected National Wildlife Refuge under authority of the Secretary of the Interior
- Establish appropriate conservation measures to protect and conserve the wildlife in the waters and on the seafloor surrounding the fully protected refuge, in particular shallow and deepwater corals, large predatory fishes, and seabirds. This zone from 12 to 200 nautical miles would be managed by the Secretary of Commerce acting through NOAA

IMPORTANCE

- Kingman Reef lies within the inter-tropical convergence zone and path of the eastward moving Equatorial Countercurrent, bringing more rainfall and the larvae of additional reef species from the more diverse West Pacific
- Most pristine US reef with top predator biomass of 85%
- Highest coral recruitment, live cover, mean diameter, and second highest diversity of coral in Central Pacific Islands
- Serves as a baseline from which to evaluate the condition of other coral reefs and sea-bird populations elsewhere that have been degraded
- Refuge for resident and migratory fish, marine mammals, sea turtles and a resting spot for seabirds and migratory shorebirds

SITE DESCRIPTION

Kingman Reef encompasses approximately 2.6 acres of emergent reef and nearly 483,713 acres of submerged lands. Kingman Reef and surrounding waters out to 12 nautical miles are currently managed by the US Fish and Wildlife Service as National Wildlife Refuge as a fully protected biological reserve.

Kingman Reef is home to a variety of marine species, including the largest populations of large clam species, *Tridacna squamosa* and *Tridacna maxima,* in the Central Pacific Ocean. Kingman Reef has the only known occurrence of any finger coral species within a 2,500 kilometer radius.

THREATS

- Localized upwelling around the island attracts illegal foreign commercial fishermen
- Potential trespass by a handful of US fishing vessel, which cannot be monitored
- Potential shipwrecks, groundings, and oil spills from commercial fishing vessels in refuge waters
- Potential for transiting vessels to ground due to poor charts
- Invasive marine species destroying natural ecology
- Lost fish aggregating devices (FADs) wash up on reefs and beaches as marine debris and entangle and kill wildlife; potential groundings by trespassing vessels retrieving FADs

From: Morton, Sean A.
To: Weiss, Michael I.; Pearce, Hardy L.; Tiari, Logan; Marcelli, Nicholas G.; Savelieff, Ludmilla L.; Boling, Edward A.; Scheve, Christopher S.; Hellmer, Kristen A.;
Subject: Another Cousteau Editorial (not the one previously distributed)
Date: Wednesday, October 08, 2008 2:44:16 PM

The Modesto Bee
modbee.com

Print This Article
Posted on Wed, Oct. 08, 2008

JEAN-MICHEL COUSTEAU: The deepest legacy

last updated: October 08, 2008 10:39:47 AM

I have spent a lifetime exploring the world's ocean and, as the son of Jacques Cousteau, I already had a head start. Even so, I continue feel awe at the magnitude, scope and surprising fragility of this world of water. For example, 80 percent of the biosphere - the life of our planet - is found in the deep sea, making the abyss the largest habitat on earth and still containing unimaginable surprises.

Yet while 72 percent of our planet is covered by water, much of its vitality today is threatened. Ninety percent of the world's large predatory fish are now gone, while pollution and habitat destruction have touched virtually every major body of water.

But we are at the frontier of a clear understanding of how to stop the damage as we restore and protect these vital areas and resources, and we have before us the opportunity to protect a truly unique marine ecosystem. Currently, President Bush is considering the creation of several new marine national monuments, including one that encompasses part of the Mariana Trench in the western Pacific. It's crucial to make our voices heard on why it's so important that we protect these underwater treasures

while we still can.

I have visited many stunning locales above and below the waves, and the roughly 100,000 square miles of water in the proposed marine monument off the coast of the Northern Mariana Islands is a natural marvel. The proposed monument area contains the deepest part of the ocean and the deepest location on earth, as well as a significant cross-section of the Ring of Fire - the planet's most volcanically active region.

The combination of the deepest water in one of the most geologically active zones creates a unique and extraordinary ecosystem that is supplemented with undersea volcanic structures called seamounts. Because of the unprecedented size of the proposed monument, the seamount ecosystems would be insulated from any effect of future local development and would continue to provide zones of biodiversity for the region and the ocean's overall health. This area also holds a kaleidoscope of marine life. In 2007, the first survey of whale and dolphin populations conducted in the Marianas region reported 19 species of migratory cetaceans. Sharks, which have plummeted by 90 percent from their historic numbers, exist in the area in some of the highest densities seen in the Pacific.

The uninhabited islands of Maug, Asuncion and Uracus also serve as an oasis and breeding grounds for birds. Off the coasts of the islands, corals thrive, fed by nutrients from the deep ocean and carried in a rich food web to the seabirds of the sky. Sadly, though, signs of trouble are already apparent.

The Mariana Trench, relatively untouched now, is under threat from increasing populations and development in Asia that pose an imminent risk to the health of this remarkable region. Without protection, we could lose a fascinating and vital habitat, one of the world's most undamaged natural wonders.

I have witnessed, time and again, that every creature, no matter how small, plays a role in making an ecosystem healthy and rich, whether we fully understand its importance or not. The biodiversity seen in this proposed Marine National Monument in the Marianas is rare and delicate.

The proposed monument would complement local protections in the

region but would provide broader and deeper safeguards for every link in this complex chain - birds, seamounts, predatory fish and corals.

People around the world may be more familiar with the Grand Canyon or Yosemite, but not all national treasures lie above the waves. An opportunity now exists for us to protect the ocean's deepest canyon and the sea life that surrounds it as a one-of-a-kind region, by declaring it a Marine National Monument.

In my travels, I've been able to see firsthand how dependent we are on the health of our marine surroundings, and am convinced that when we protect the ocean, we protect ourselves. We must seize this unique moment and opportunity while there is still time to save these natural treasures. If we make our voices heard during the assessment and public comment period for this historic conservation proposal we might yet be able save these treasures for generations yet to see their first ocean waves.

ABOUT THE WRITER

Jean-Michel Cousteau is president of the Ocean Futures Society, 325 Chapala Street, Santa Barbara, Calif. 93101-3407; e-mail: jmcousteau@oceanfutures.org.

AMERICAN MUSEUM OF NATURAL HISTORY

13 October 2008

Dr. James Connaughton
Chairman, Council on Environmental Quality
722 Jackson Place, N.W.
Washington D.C. 20503

Dear Dr. Connaughton:

I'm writing in support of the designation of eight remote U.S. territories and possessions in the central Pacific as fully protected national monuments. These areas, including the full exclusive economic zones surrounding Baker, Howland, Jarvis, Johnston, Kingman, Palmyra, Rose and Wake atolls, deserve full protection for their significance as some of the last remaining near-pristine coral reef ecosystems, their diverse fish and invertebrate communities, the habitat they provide for millions of seabirds, and the sanctuary they offer many threatened and endangered species.

As a coral reef scientist who has worked extensively at Palmyra Atoll, I can personally attest to the importance of these atolls to the protection of coral reef species and ecosystems in U.S. waters. Not only do these areas support nearly four times as many shallow-water reef-building coral species as the Florida Keys, they are also home to hundreds of fish species, dozens of seabird species, and a still unknown number of invertebrate species, including many found nowhere else. Moreover, these atolls serve as critical sanctuaries for large migrating fishes and endangered and threatened species such as green and hawksbill sea turtles, giant clams, and marine mammals. Millions of seabirds also use these areas as critical stopover points, breeding areas and feeding grounds, including tropicbirds, boobies, frigatebirds, terns, petrels, shearwaters, and albatrosses.

As recent studies have shown, these atolls, because of their isolation and a history free from many human impacts, offer important natural laboratories for our growing understanding of how coral reefs functioned before recent and widespread degradation from overfishing, pollution, and coral bleaching. Full protection from the impacts of mining, fishing, and other extractive industries would therefore ensure that these laboratories remain as natural as possible both for further scientific research and for posterity. In addition, such national monuments, once funded for effective management, would create a true legacy of marine ecosystem protection for President Bush.

Sincerely,

Daniel R. Brumbaugh, Ph.D.
Senior Conservation Scientist
Center for Biodiversity and Conservation

CENTER FOR BIODIVERSITY AND CONSERVATION
Central Park West at 79th Street New York, New York 10024-5192
PHONE: (212)769-5742; FAX: (212)769-5292; http://research.amnh.org/biodiversity/

Center for Biodiversity and Conservation
American Museum of Natural History

Dr. James Connaughton
Chairman, Council on Environmental Quality
722 Jackson Place, N.W.
Washington D.C. 20503

October 14, 2008

Dear Dr. Connaughton:

I write to enthusiastically endorse the designation of eight remote U.S. territories and possessions in the central Pacific Ocean as fully protected marine national monuments. Baker Island, Howland Island, Jarvis Island, Johnston Island, Kingman Reef, Palmyra Atoll, Rose Atoll, and Wake Island, along with their exclusive economic zones, are some of the most unique biological and geological environments on our planet and therefore they warrant full protection.

I encourage you to preserve these areas of both global and national importance as part of the nation's legacy of protected areas. As a conservation biologist studying sea turtles, corals, and algae at Palmyra Atoll, I can attest to the significance of these areas to the conservation of marine ecosystems and their species in U.S. waters. These areas harbor some of the world's remaining near-pristine coral reef ecosystems, hundreds of fish species, and a still unknown number of invertebrate species, undoubtedly many of which are endemic, found nowhere else in the world. Threatened and endangered migratory species, such as the green and hawksbill sea turtles as well as several marine mammals and sea and shorebirds, depend on these waters for specific portions of their lives.

In part because of the lack of historical occupation by humans and the remoteness of the systems, these areas have experienced virtually no sustained fishing or extractive pressure and they are believed to have intact marine food webs. They are therefore critical regions for research. Our emerging understanding of how healthy systems function will contribute to effective island and coastal management in other US waters and beyond. It is therefore critical to fully protect these eight territories and possessions from the detrimental impacts of drilling, fishing, and mining and to allow for continued research that aids in conservation management of these areas as well as coastal, island, and marine systems globally.

Sincerely,

Eleanor J. Sterling, Ph.D.
Director, Center for Biodiversity and Conservation
American Museum of Natural History
Phone: 212-769-5266, Email: sterling@amnh.org

P.O. Box 502522
Saipan, MP 96950

October 20, 2008

The Honorable George W. Bush
President
United States of America
White House
1600 Pennsylvania Avenue
Washington, DC 20500

Dear Mr. President:

I am writing to you to protest the proposal to designate marine waters surrounding the Asuncion Island, Maug and Uracas as a national marine monument. We do not international publicity; we need to be able to harvest our fishery resources and to be responsible members of the US family.

The present local and federal fishery management regimes are sufficient and are effectively managing our marine resources in sustainable manners. Our government in collaboration with the federal governments has effectively managed our marine resources. We have voices in the Western Pacific Fishery Council and we have access to our fishery resources. Fisherman from Saipan can apply for federal permit to fish in the Northern Marianas. This Council has fishery management plans (Bottomfish FMP, Precious Coral FMP, etc) for the sustainable management of our marine resources. There is no need to add additional layer of federal bureaucracy (Office of Marine Sanctuary), which will enforce “no take” on fishing and prohibit access to subsea minerals permanently in the monument.

I am providing Mr. James Connaughton, Chairman of Council on Environmental Quality, petitions that I have circulated which reflect the views of our people who object to the monument. There are many more voices in our community against the proposal. Our local leaders who represent the voices of our people clearly objected to the proposed monument by the passage of Senate Joint Resolution 16-04 and House Joint Resolution 16-13 that were sent to your office. Our local mayors have also expressed their rejection of the proposal in their letters sent to your office.

Fishery is an option for economic activity and we have to ensure that there is access to allow our people to continue to fish in these waters. Japan had a large fishing industry once in the Northern Marianas. Please allow us to prove that fishery is a viable industry. We cannot depend solely on tourism industry as evident by SARS scare, 9/11 effects,

high costs of travel and etc. Our garment industry is on the verge of collapse and our economy is in shamble.

Access for exploitation of the subsea mineral should also be open in view of potential economic values of subsea minerals such as manganese nodules and others. The economic viability of deep-sea mining is on the experimental stage; however, there is a future there. We should not permanently close the door. In fact, Palau will be exploring the potential of offshore oil resources.

With all due respect, 115,000 square miles of water or 1/3 of the EEZ in the Northern Mariana Islands is too big of an area to push such a "rush agenda" so that you will be known as an "ocean president." Please allow us more time as you have allowed the State of Hawaii five (5) years in the designation of the NW Hawaiian National Marine Monument to review the proposal. There is no need to rush this designation.

Portion of the the Gulf of Mexico near Lousiana or "Islands in the Streams" was taken off the list for monument designation due to strong objection by Senator Vitters and others. We have no voice in the US Congress and we are powerless against the power of the president under the Antiquities Act. I see my mother country, USA, as "Goliath with a giant club" threatening to close off the fishery and deny us of our rights to fish. The plan to make decision before the end of your term is not in the best interest of the Northern Marianas.

Some of our people are presently residing in the Alamangan Island, Pagan Island and Agrigan Island near the proposed monument area. In order to visit these areas, boat captain who take visitors there often go fishing around the proposed monument areas (Maug, and Asuncion) while they wait for the visitors to be ready. Please allow them as well our commercial fishermen who fish in those areas continued access. This is necessary for economic reasons.

I have some questions that I am requesting answers. These are:

I understand that the United States is extending its Exclusive Economic Zone (EEZ) beyond the 200 miles in the Northern Marianas. That means 400 miles EEZ. What is the size of the marine waters that the federal will designate around Maug, Asuncion and Farallon de Pajaros? PEW is proposing 115,000 square miles.

Since the Northern Marianas will be loosing substantial fishing areas (115,000 square miles) and access to subsea mining resources, what trade off will the Northern Marianas get?

Our government needs infusion of federal funds to rehabilitate our dilapidated infrastructures such as CUC power plants, water system, road, and public facilities. How much money is the federal willing to give us as a trade off for permanent ban on fishing and mining activities?

We want the passage of federal bill to grant the Northern Marianas 12 miles territorial zones and management of the submerged lands.

Our people (John Gourley) have been trying to get a list of jobs under the NW Hawaiian Island Marine Monument under the Freedom of Information; but were unsuccessful. What types of jobs will be available to our local people if these areas are designated? How many jobs will be available?

What role will the Northern Marianas play if the monument is designated? Who are the major players in the governing body for the monument? What is the role of the military? Will the public have a say in the regulations to be promulgated? Will there be a public advisory body?

Mr. President, please allow us the opportunity to utilize our living and non-living resources. I and many of our people voted in favor to be permanent members of the American family knowing that our rights will be protected. I served in the US. Army and I love my adopted country.

We need your support and the assistance of the federal government in enhancing the lives of our people by allowing us access to these resources.

Thank you in advance for your favorable consideration.

Respectfully,

Joaquin P. Villagomez

CAROLINIAN AFFAIRS ADVISORY COMMITTEE RESOLUTION NO. 2008-001

A RESOLUTION

To assert that we (CNMI Descent) are the rightful owner of lands and ocean resources established throughout this great Commonwealth as provided in any CNMI laws and recognized and guaranteed in creation of the Covenant as codified in 48 U.S.C. § 1801 and that the issues on traditional rights and belief should not be viewed as a comprehensive list, but rather as points to facilitate further discussion and identification of any other issues that may be of concerns to native indigenous (CNMI Descent).

WHEREAS, RECALLING that CNMI people have owned the lands and ocean on which conservation and monument designation are to be located on since time immemorial and continue to so own; and

WHEREAS, RECOGNIZING that since the federal government is pursuing its intent on creation of monument designation without recognition of the native indigenous title (CNMI Descent) is an un-remedied appropriation of NMI Descent traditional land and ocean ownership rights; and

WHEREAS, NOTING that the Honorable President George Bush desires to reform existing arrangements for accommodating conservation and to leave an environmental legacy in the White House with limited consultative discussion on just compensation and access for the CNMI Descent rights and ownership of land including the ocean is a breach on the Covenant, which is an agreement entered into between the United States government and the government and people of the Northern Mariana Islands. The parties entered into agreement as two separate but equal sovereign entities; and

WHEREAS, the Federal Government has proposed the Marianas Trench Monument encompassing 115,000 square miles of surrounding waters of the three northernmost islands, [Asuncion (Songschool), Maug (Longeiraw), Uracas (Schughppul)]; and

WHEREAS, CALLING on the US Federal Government to recognize, in negotiation, the position of CNMI Descent traditional rights as land and ocean owners and

parties of equal status rather than relegating Commonwealth people (CNMI Descent) to the position of 'stakeholders' or 'interest groups' and the imperative for a lasting commitment by Honorable President George Bush or the US Federal Government to engaging CNM Descent or Commonwealth people on this basis; and

WHEREAS, we (CNMI Carolinian Descents) call on the US Federal Government to implement a fair and equitable process including a mutually reasonable timetable to enable adequate CNMI Descent wide approval of new policy for Indigenous (CNMI Descent) rights in, and ownership of, land and ocean and to provide adequate resources for the process; and

WHEREAS, in negotiating a fair process the CNMI Descent calls' on the US Federal Government to recognize and fulfill obligations on the traditional rights of indigenous (CNMI Descent) people and the environment; and

WHEREAS, the US Federal Government must recognize and accept CNMI Descent ownership of lands and ocean including all cultural and intellectual properties throughout CNMI lands and ocean boundaries established in CNMI Public Law 2-7, to enable the development of a CNMI Descent conservation management control of lands and ocean; and

WHEREAS, those identified areas by the US Federal Government in the Commonwealth for the sole purpose of monument designation, protected conservation areas, and for others purposes that the CNMI Government and the US Federal Government may establish agreement on in the future will not diminish or extinguish any rights of CNMI Descent ownership, nor prevent the exercise of such rights; and

WHEREAS, that where identified indigenous (CNMI Descent) negotiations have determined that Commonwealth land and or ocean is to be used for conservation areas and or monument designation purposes or for other purposes, the US Federal Government will compensate CNMI Descent owners for the loss of full use and enjoyment of indigenous (CNMI Descent) ownership and stewardship on land and ocean in the form of a negotiated annual rental payment or package in the amount not less than its fair market value but not in form of grant assistance or technical assistance agreements; and

WHEREAS, the people of the Mariana Islands currently have total and free

access to the entire Northern Mariana Islands Exclusive Economic Zone and should the Federal Government implements the designation of a national marine monument such action would greatly restrict the people of the Marianas Islands from entering the ancestral waters that have been culturally accessible without restriction for thousand of years; and

WHEREAS, the local and traditional care of Mother-Ocean in the NMI, as provided in the Covenant, was officially transferred from the Government of the Trust Territory of the Pacific Islands and returned to Northern Mariana Island people; and

WHEREAS, we the people of this great Commonwealth have proven and continue to demonstrate as worthy stewards and owners of NMI land, water and cultural resources; and

WHEREAS, the Carolinian Affairs Advisory Committee strongly opposes any form of transfer of resource management authority over Northern Mariana Islands Ocean/Sea (water) to the National Marine Sanctuary Program or other federal agencies than the present arrangement governed by the Magnuson –Stevenson Act involving the National Marine Fisheries Service and the Western Pacific Regional Fisheries Management Council; and

WHEREAS, It is the intention of this resolution to support the Paramount High Chief Governor Benigno R. Fitial and the residents of the Commonwealth in their strong objection to the designation of any national marine monument within the Northern Mariana Islands water; and

NOW, THEREFORE BE IT RESOLVED, by the Carolinian Advisory Committee, that the Carolinian Affairs Advisory Committee presents a unitary strong opposition of monument designation, identified protected or conservation areas and other purposes on lands and in the ocean within the Commonwealth without consultation process between the CNMI Government and the US Federal Government for mutual consent is a breached on the Covenant; and

BE IT RESOLVED, that our ocean provides greatest opportunities for economic development and such the CNMI Descent as Pacific Island communities immemorial to time have recognized that we inhibit the islands scattered throughout this ocean in the Commonwealth which some of the most inspiring migration in human history have taken

place, over thousands of years; and

BE IT FURTHER RESOLVED, that the ocean/sea has been the major influence in the history of Pacific Island communities which includes the CNMI Descents (Carolinian and Chamorro) throughout this CNMI region on customary association with the sea forms the basis of present day social structures, livelihoods and tenure systems and traditional systems of stewardship and ownership rights on governing its use; and

BE IT FURTHER RESOLVED, that it is the position of the Carolinian Affairs Advisory Committee Members that every national marine proposal for the Mariana Islands (Commonwealth) be rejected in its entirety; and

BE IT FURTHER RESOLVED, that the Chairman shall certify, and the Executive Assistant of the Carolinian Affairs Office shall attest to the adoption of this Resolution and thereafter transmit certified copies to, the Honorable Benigno R. Fitial, Governor of the Commonwealth of the Northern Mariana Islands; the Honorable James L. Connaughton, Chairman Council on Environmental Quality; the Honorable Juan B. Tudela, Mayor of Saipan; the Honorable Arnold I. Palacios, Speaker of the House; the Honorable Pete P. Reyes, Senate President;

AND NOW, BE IT FURTHER RESOLVED, We (the undersigned parties), acknowledges the affirmation of this resolution and its contents and exercises to effectuate adoption and passage of this resolution.

Date: 10-20-2008

Melvin LO Faisao

David R. Omar

Frank M. Rabauliman

Jesus M. Elameto

Carmelita M. Rabauliman Faisao

Isidro K. Seman

Vivian W. Odoshi

Vincent M. Rabauliman

Patricia O. Rabauliman

Rosa L. Ayuyu

CAROLINIAN AFFAIR ADVISORY COMMITTEE RESOLUTION NO. 2008-001

Enrique K. Magofna (Henry)

Victoria S. Magofna

Rosa T. Castro

Catherine P. Anderson

Felix R. Fitial

Attest for the Adoption of this resolution by: 10/20/2008
Angelica W. Iginoef-Mangarero, EACAO

Certified By: 10/20/08
Melvin LO Faisao, Chairman CAO Advisory Committee

PMB 166 PPP
P.O. Box 10000
Saipan, MP 96950
September 26, 2008

DOCUMENT TITLE C2008.09.26_Esplin
DATE 10/23/2008

CHRON
CHRON – OUTGOING ☐
SCHEDULING ☐
SUBJECT ☐
SENSITIVE ☐

CONNAUGHTON
HALL
BANKS
BOLING
BREYMAN
GRECZMIEL
GUSKY
HELLMER
KUNICKIS
LADT
MCINTOSH
MILLS
MORTON
PEARCE
SAVELIEFF
SCHEVE
SCHILDWACHTER
SCHULTZ
SKIDMORE
STEWART
TREADO
VAN DYKE

George W. Bush, President
1600 Pennsylvania Avenue
Washington, DC 20500

Dear President Bush,

I am writing to express my approval for the Marianas Trench Memorial proposal. Although, I am a new resident of Saipan, I've been reading about it and following both sides of the issue locally since the idea was first publically introduced. Personally, I can see no downside the preservation of this mysterious and unique place. There are obvious ecological, scientific, and economic benefits by the establishment of the Marianas Trench Memorial.

Ecologically, this place is like no other place on earth. I've visited Yellowstone, Olympic Peninsula, Mt. St. Helen's, Yosemite, Lassen, and other incredibly unique places that are protected as National Parks. I'm always in awe of the amazing things I see and learn there. We now have an amazing Hawaiian ocean monument that features coral reefs, but deep water is such a different environment. The amazing diversity of sea life and earth science in the deepest place on earth has not even been well studied yet. We do not know how the balance of sea life is affected by this area. Allowing this area to exist, unadulterated, has the potential to populate surrounding areas with unique species.

Scientifically, the development of a visitor's center to feature the waters of the Marianas Trench has great potential for educational opportunities. This could affect us on many levels—from inspiring local school children with a renewed and refreshed love of the sea, as well as providing a jumping off point for scholarly studies of marine biologists and earth scientists. We have no idea what exciting surprises of life and earth science will be added to our current body of knowledge with proper and controlled access to this preserved area. When we arrived in Saipan, I really wanted to take a marine biology class at the college. Imagine my disappointment to find that there is no longer anyone locally who can teach such a class. That would change with this monument, which could inspire even us curious middle aged moms.

Economically, this could stimulate the local economy of Saipan, should the visitor's center be located at the closest populated island to the monument. Saipan and the CNMI is suffering economically at this time and this has the potential to bring "scientific" tourism to our area. I can imagine the development of a center for study abroad for marine biologists in training from distant universities. This would bring in high quality, educated people for both short term and long term stays.

Just think about what intellectually stimulating opportunities this would bring to our beautiful island! Also, the islands within these waters are already protected by the CNMI government, but CNMI lacks the finances to patrol these protected areas, so we have no idea how protected or unprotected they truly are. With the federal designation of a memorial, this would relieve the local government of the burden patrolling and protecting, allowing them to focus on more crucial issues.

So, President Bush, it is my hope that you will preserve this amazing one-of-a-kind place as part of your presidential legacy. Please make the Marianas Trench Memorial a reality.

Thank you for reading my letter.

Sincerely,

Dianne C Esplin

Dianne Esplin

Cc:

The Honorable Dirk Kempthorne, Secretary of the Interior
James Connaughton, Chairman Council on Enviromental Quality
Vice Admiral Conrad C. Lautenbacher, Jr. NOAA
Rebecca Rimel, CEO Pew Charitable Trusts
Angelo Villegomez, Friends of the Marianas Trench

Assessment c/o Council on Environmental Quality
722 Jackson Place
Washington, D.C., 20503
oceans@ceq.eop.gov

Name: Dr. Judith P. Guthertz, Assistant Majority Leader, Guam Legislature

Comments: As a former member (1998-2001) and Chair (2001-2003) of the Western Pacific Fisheries Management Council, I am very familiar with the area being considered for designation as a Marine Conservation Management Area. I am strongly opposed to such designation.

Guam is a non-self governing territory and is on the list of the remaining 16 such areas under the United Nations. Each year our State Department reports to the United Nations on what the United States is doing to bring Guam to self-government.

With this status, it would be unethical and imperialistic for the United States to place Guam's waters under a conservation regime without the approval of the people it is entrusted with leading to self-determination and self-government. The United States should be in the process of transferring authority and governance to the people of Guam, not taking authority away from the local government.

The Indigenous People of Guam have been fishing in those waters for about 4,000 years and have not damaged the natural resources. If anyone is over-fishing the area, it would be foreign fishing interests. It is an insult to all residents of Guam and the CNMI to take an action assuming that they cannot govern themselves.

If President Bush sincerely wants a legacy, he should have taken steps to further the development of self-determination and self-government for Guam. He has done absolutely nothing for the past eight years. He should be ashamed of himself. His father made a grand statement near the end of his term in favor of statehood for Puerto Rico if that is what the people of Puerto Rico desired.

President Bush still has time to make a similar contribution and establish a legacy in this regard . He could announce that the United States Government will accept whichever political status option is desired by the Chamorro people as expressed in a United Nations observed plebiscite.

Just looking at a map in an office inside the beltway and dreaming of a "Blue Legacy" is a ridiculous exercise in imperialism. If the people of Guam and the CNMI desire such a designation, they will be sure to let you know. Until then, please resist the temptation to interfere in our business.

Senseramente:
Signed
Judith P. Guthertz
Senator

MARIANA TRENCH monument

Friends of the Monument
PO BOX 500921
Saipan, MP 96950

September 15, 2008

Senate President Pete P. Reyes
16th Commonwealth Legislature
Capitol Hill
PO BOX 500126
Saipan, MP 96950

RE: Please work to fulfill the intent of our Constitution

Dear Senate President Reyes:

Article XIV, Section 2 of the Northern Marianas Constitution addresses two important concepts with respect to "Uninhabited Islands." First, it restricts the use of Managaha Island for "cultural and recreational" purposes only. Second, it identifies four islands to be "maintained as uninhabited places and used only for preservation," namely the islands of Maug, Uracas, Asuncion, Guguan.

During the Second Northern Marianas Constitutional Convention of 1985, the Committee on Personal Rights & Natural Resources, of which I was a member, found that the islands of Uracas and Asuncion, two of the three islands in the proposed Mariana Trench Marine National Monument, are volcanically active and are generally unsuitable for permanent habitation. The Committee found that in their "undisturbed state", these islands have acquired a "unique flora and fauna" and are "well suited for preservation or sanctuary status."

We also found that "in order to protect and preserve these unique biological characteristics, including the native wildlife and habitats, access to these islands must be controlled."

Furthermore, we found that these islands warranted protections because they had not sustained "substantial environmental damage caused by feral pigs and goats."

Finally, we found that "management or protection of fish could be addressed by an appropriate agency of the government if necessary."

The arguments I have heard in the media against the proposed Mariana Trench Marine National Monument all run counter to the intent of the writers of our beloved Constitution.

You have heard from that the current administration does not support the preservation of these northern islands. They support "sustainable use," which conflicts with the Constitutional purpose to preserve these islands.

You have heard that if a monument were declared we would have to "ask permission" to go there. Our original intent in protecting those islands was for everyone to "ask permission." That is the best way to protect and preserve their unique biological characteristics.

You have heard that there is no need to protect these islands because they are "so beautiful, so lush." That is exactly why we intended to protect those islands in the first place. These islands are undisturbed and they are unique and they can serve as a source of population of wildlife to be used for restocking other islands where certain species, such as fruit bats and coconut crabs, have been depleted. They are also the last vestige of what the Marianas were like before the Spanish arrived.

Finally, you have heard that this is nothing more than another "federal takeover." While our intent was to protect all the resources in the far north, we do not have jurisdiction or control over any of our surrounding waters. The Federal government has jurisdiction from the mean high water mark out to 200 nautical miles. The National Oceanic and Atmospheric Administration (NOAA) is the federal agency focused on the condition of the oceans and NOAA Sanctuaries is the appropriate government agency for preservation of our marine resources, not NOAA Fisheries.

I have attached a copy of the "Report to the Convention by the Committee on Personal Rights & Natural Resources: Committee Recommendation No. 29" for your reference. It will help you understand our constitution better.

In closing, I urge you to support the proposed Mariana Trench Marine National Monument. It will fulfill the original intent of our constitution and benefit generations of Chamorros and Carolinians to come.

Si Yu'use Ma'ase for your time and consideration,

Karl T. Reyes

CC: Governor Benigno Fitial
Speaker Arnold Palacios
Legislature

SECOND NORTHERN MARIANAS CONSTITUTIONAL CONVENTION

SAIPAN, CM 96950

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REPORT TO THE CONVENTION BY THE
COMMITTEE ON PERSONAL RIGHTS & NATURAL RESOURCES

Subject: Committee Recommendation No. 29

The Committee on Personal Rights and Natural Resources recommends that the Convention adopt the attached proposed constitutional amendment.

In recommending the proposed amendment (CR No. 29), the Committee reviewed Delegate Proposal Nos. 95-85, 130-85, and 314-85.

Currently, Article XIV, Section 2 of the Northern Marianas Constitution, addresses two important concepts with respect to "Uninhabited Islands." First, it restricts the use of Managaha Island for cultural and recreational purposes only. Second, it identifies two islands, Sariguan and Maug, to be maintained as uninhabited places and used only for preservation. The Committee intends to perpetuate these concepts and, in addition, finds appropriate to include three other uninhabited islands to be protected and preserved.

Delegate Proposal No. 95-85 had similar intention, but fell short by eliminating the second and very important concept. In addition to Managaha, it restricts "other islands provided by law" for cultural and recreational purposes only. The Committee finds that the concept of preservation of uninhabited islands well suited for that purpose must be continued as espoused by our present Constitution.

Delegate Proposal No. 314-85 maintained both concepts promoted by our present Constitution. However, it added additional language which the Committee finds unnecessary and included two other uninhabited islands for preservation which are not appropriate for that purpose. The island of medinilla has been leased to the United States for military purposes. The island of Aguiguan, which is in close proximity to Tinian, may be feasible for economic development. Its biological value as unique habitat for flora and fauna has been reduced by the presence of feral animals.

Delegate Proposal No. 130-85 maintains both concepts as expressed in our present Constitution. The proposal, however, excluded the island of Sariguan, but added the islands of Uracas, Asuncion and Guguan for preservation.

During the deliberations, the Committee reviewed a report from the Department of Natural Resources and finds that Uracas, Asuncion and Guguan are volcanically active and are generally unsuitable for permanent habitation. They have not been occupied since the war. Thus in their undisturbed state, these islands have acquired a unique flora and fauna and are, therefore, well suited for preservation or sanctuary status. In order to protect and preserve these unique biological characteristics, including the native wildlife and habitats, access to these islands must be controlled. One very important feature of these islands is that there are no feral animals. The compelling reason for excluding Sariguan from the list of uninhabited islands for preservation is because of substantial environmental damage caused by feral pigs and goats. It appears that public hunting is the only practical means presently available for controlling these animals, and thus the recommendation to open it up for public access. While fruit bats and coconut crabs are present on Asuncion, these, including goats and pigs, the game animals most popular with hunters, are more abundant on the other Northern Islands (i.e. Anatahan, Sariguan, Alamagan, Pagan, and Agrigan).

If the uninhabited islands are protected, they could serve as source of population of wildlife to be used for restocking other islands where certain species have been depleted. For example, fruit bats, which are present on Guguan and Asuncion, could be used to replenish the already declining (or perhaps extinct) population on Tinian and Saipan.

The Committee deleted the protection of fish from Delegate Proposal No. 130-85, because it finds that it would be difficult to determine how much area of the ocean surrounding each island and what species of fish are to be protected. The Committee decided that management or protection of fish could be addressed by an appropriate agency of the government if necessary.

In view of the above findings, the Committee unanimously supports Committee Recommendation No. 29 for adoption by the Convention.

Respectfully submitted,

Delegate Esteven M. King
Chairman

Delegate Joaquin A. Tenorio
Vice-Chairman

Delegate Aniceto H. Mundo
Member

Delegate Ramon G. Villagomez
Member

Delegate Karl T. Reyes
Member

SECOND NORTHERN MARIANAS
CONSTITUTIONAL CONVENTION, 1985

COMMITTEE RECOMMENDATION NO. 29

A PROPOSED CONSTITUTIONAL AMENDMENT

To amend Article XIV, Section 2 to include two other uninhabited islands to be protected and preserved.

BE IT ADOPTED BY THE SECOND CONSTITUTIONAL CONVENTION:

Upon ratification pursuant to Section 5 of Article XVIII of the Commonwealth of the Northern Mariana Islands Constitution and Public Law No. 4-30, the Constitution of the Commonwealth of the Northern Mariana Islands is amended as follows:

Effective upon ratification, Section 2 of Article XIV is amended to read:

"Section 2: Uninhabited Islands. The island of Managaha shall be maintained as an uninhabited place and used only for cultural and recreational purposes. The islands of Maug, Uracas, Asuncion, Guguan and other islands specified by law shall be maintained as uninhabited places and used only for the preservation and protection of natural resources, including but not limited to bird, wildlife and plant species."

Committee on Personal Rights and
Natural Resources

SAN DIEGO STATE UNIVERSITY

October 8, 2008

DOCUMENT TITLE C2008.10.03_Rohwer
DATE 10/23/2008

CHRON
CHRON – OUTGOING
SCHEDULING
SUBJECT
SENSITIVE

CONNAUGHTON
HALL
BANKS
BOLING
BREYMAN
GRECZMIEL
GUSKY
HELLMER
KUNICKIS
LADT
MCINTOSH
MILLS
MORTON
PEARCE
SAVELIEFF
SCHEVE
SCHILDWACHTER
SCHULTZ
SKIDMORE
STEWART
TREADO
VAN DYKE

Rohwer Laboratory
San Diego State University
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San Diego, CA 92182

Subject: Establishment of Marine Protected Areas in US Territories of the Central Pacific

Dear President Bush,

First, we would like to convey our deepest THANK YOU for your protection of the Northern Hawaiian Islands. This was a ground-breaking move, and it is extremely important to the future of coral reefs. Your administration's support of marine conservation is greatly appreciated.

As you know, the USA is the main line of defense for protecting coral reefs, and we are writing to strongly urge you to establish full protection of the entire exclusive economic zone of the remote US territories and possessions in the central Pacific Ocean, including Baker, Howland, Jarvis, Johnston, Kingman, Palmyra, Rose and Wake. Immediate protection of these areas is crucial for the preservation of some of the few remaining pristine coral reefs of the world. These magnificent habitats are home to diverse fish and invertebrate communities, provide habitat for millions of seabirds, and offer sanctuary for many threatened and endangered species. Our work has established that these areas are also home to millions of novel microbial species.

As you know, coral reefs are being lost at a dramatic rate worldwide. An estimated 25% of reefs have already been lost, and future projections indicate that we could lose nearly all of the world's coral reefs in the next few decades unless major action is taken to protect these ecosystems. Much of the current loss is due to human activities in and surrounding coral reefs. In a recent study conducted by our lab including the islands of Kingman, Palmyra, and Kiritimati, we found that increasing human activity led to a shift from healthy coral reefs to degraded alga-dominated coral reefs. The degraded reefs were high in coral disease, had higher abundances of bacteria, including potential pathogens, and lacked many prominent reef organisms including sharks, giant clams, sea turtles, and large fish. Protection of these areas will save them from the degradation that is occurring at other islands in the region and reefs around the world that remain subject to exploitation by unregulated human activity.

The coral reefs in question are an invaluable resource that we cannot afford to let go to waste. They are home to hundreds of fish species, dozens of seabirds, and an untold number of invertebrate species, including many found nowhere else in the world. In recent studies in the Great Barrier Reef of Australia, hundreds of new species of coral and other reef fauna were discovered in one small area of the reef. The potential for discovery of new organisms like those found on the GBR in the central Pacific is extremely high, but without protection the biodiversity found in these areas could be lost within our lifetimes. These reefs provide the closest reference we have to the way healthy coral reefs function, and without this baseline we will have no grasp of what we stand to lose. Furthermore, understanding how a healthy coral reef ecosystem functions provides valuable insights into how to manage and protect coral reefs in areas already influenced by human activity.

The USA coral reefs are uniquely situated in parts of the ocean that will probably best survive global climate changes. To serve as refuges, they need to be as biologically robust as possible and it is crucial that these unique ecosystems be protected to the fullest extent possible. We strongly encourage you to designate these coral reefs as a protected area. Nations of the world look to the United States to set an example, and by protecting these coral reefs you would set an important standard. We need to protect the wealth and beauty of our natural ecosystems today so that our children can treasure them in the future. Please take this opportunity to make a major difference in the future of our planet.

Sincerely,

Forest Rohwer, Ph.D.

Florent Angly, M.S.

Katie Barott, B.S.

Elizabeth Dinsdale, Ph.D.

Michael Furlan, B.S.

Matthew Hanes, Ph.D.

Linda Kelly, B.S.

Tracey McDole, B.S.

John Mokili, Ph.D.

Bahador Norsat, B.S.

Rebecca Vega Thurber, Ph.D.

Dana Willner, M.S.

Microbial Ecology of Four Coral Atolls in the Northern Line Islands

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Abstract

Microbes are key players in both healthy and degraded coral reefs. A combination of metagenomics, microscopy, culturing, and water chemistry were used to characterize microbial communities on four coral atolls in the Northern Line Islands, central Pacific. Kingman, a small uninhabited atoll which lies most northerly in the chain, had microbial and water chemistry characteristic of an open ocean ecosystem. On this atoll the microbial community was equally divided between autotrophs (mostly *Prochlorococcus* spp.) and heterotrophs. In contrast, Kiritimati, a large and populated (~5500 people) atoll, which is most southerly in the chain, had microbial and water chemistry characteristic of a near-shore environment. On Kiritimati, there were 10 times more microbial cells and virus-like particles in the water column and these microbes were dominated by heterotrophs, including a large percentage of potential pathogens. Culturable *Vibrios* were common only on Kiritimati. The benthic community on Kiritimati had the highest prevalence of coral disease and lowest coral cover. The middle atolls, Palmyra and Tabuaeran, had intermediate densities of microbes and viruses and higher percentages of autotrophic microbes than either Kingman or Kiritimati. The differences in microbial communities across atolls could reflect variation in 1) oceaonographic and/or hydrographic conditions or 2) human impacts associated with land-use and fishing. The fact that historically Kingman and Kiritimati did not differ strongly in their fish or benthic communities (both had large numbers of sharks and high coral cover) suggest an anthropogenic component in the differences in the microbial communities. Kingman is one of the world's most pristine coral reefs, and this dataset should serve as a baseline for future studies of coral reef microbes. Obtaining the microbial data set, from atolls is particularly important given the association of microbes in the ongoing degradation of coral reef ecosystems worldwide.

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Introduction

The roles of microbes, both Bacteria and Archaea, and viruses on coral reefs are just starting to be elucidated. Most studies concern microbes in the water column, although actual densities are much higher in the benthos [1]. Microbes may play an important role in the nutrition of reef organisms. For example, the number of microbes in the water column declines from the windward to leeward (forereef to backreef) areas of coral reefs [2], suggesting ingestion by coral reef organisms [3–5]. Similarly, decreasing densities of bacteria have also been documented within the vertical structure of a coral reef, with the over-lying water column containing approximately 4.5 times the amount of bacteria compared with the water within crevices of the coral reef structure [6].

Our ability to understand these microbes has increased greatly with the development of molecular and genomic approaches that provide a far more accurate picture of community composition and activities. In the marine environment molecular techniques have identified new organisms and new metabolic processes [7]. For coral reefs, molecular techniques, such as 16S rDNA analysis has identified that microbial communities associated with corals are diverse and develop both species specific [8], and generalist associations [9]. These molecular techniques have also revealed the etiological agents of diseases of coral reef organisms, such as, corals [10] and sponges [11,12]. In some cases the etiological agents are not specific to corals, but infect multiple and distinctive marine organisms [13], leading to difficulties in identify causative agents of the increasing number coral diseases that are described

[14]. The lack of identified pathogens suggests opportunistic bacterial infections or hard-to-culture pathogens (e.g., viruses) are important mediators of coral disease. Because of these difficulties, metagenomics, which allows the entire genome of all the micro-organisms within an environment to be sampled rapidly [15], may be required to describe microbial associations on coral reefs and how they change with environmental fluctuations and anthropogenic activities. Metagenomic studies are not restricted by targeting single gene regions, but provide information on all genomic regions, enabling both taxonomic descriptions and potential metabolic functions of the micro-organisms within an environment to be described [16]. For coral reefs, a comprehensive evaluation of the microbial and viral community may be particularly important because coral diseases are an increasing factor in the global collapse of reef ecosystems [14,17].

In this study, the coral reef microbial communities associated with four coral atolls in the Northern Line Islands (central Pacific) were surveyed. These atolls are of interest because although they are relatively close to each other (750 km), they span an array of oceanographic conditions and are variably impacted by human activities. One of the atolls is pristine with respect to local anthropogenic effects, and thus provides an important microbial baseline against which other reefs can be compared. Microbial and viral abundances were complemented with metagenomic analyses of these communities. Coral cover and disease prevalence were also measured to determine if there were correlations between microbial communities and coral health. A companion study complements the microbial data by measuring functional changes of the fish and benthic communities [18].

Materials and Methods

Study sites

Surveys were conducted on four atolls in the Northern Line Islands in the central Pacific (Figure 1; [18]). The atolls are separated by ~750 km and span a gradient in oceanic productivity and climate. The level of rainfall declines from north to south [19], whereas oceanic productivity declines from south to north.

Two atolls, Kingman and Palmyra, are part of the US national refuge system and have little or no local anthropogenic impacts. The most northern atoll, Kingman, is uninhabited and has only a few emergent sand bars (<0.1 km^2), and the reef crest surrounds a relatively large lagoon (60 km^2). As such, it is expected to have a high flushing rate and no terrestrial influence of any kind (e.g., human sewage, bird guano, agricultural runoff). Palmyra has ~7 km^2 of land and a relatively small lagoon (15 km^2) that was extensively remodeled during World War II. There are only ~20 people on Palmyra at any one time, and sewage is treated and contained. Seabirds are numerous and a potential source of nitrogen, but guano was never mined on Palmyra because it does not accumulate in significant quantities. Ammunition dumps are also potential sources of nitrogen compounds. There are a number of small wrecks and former military structures, which may increase local levels of iron. Shark finning occurred on Palmyra in the past.

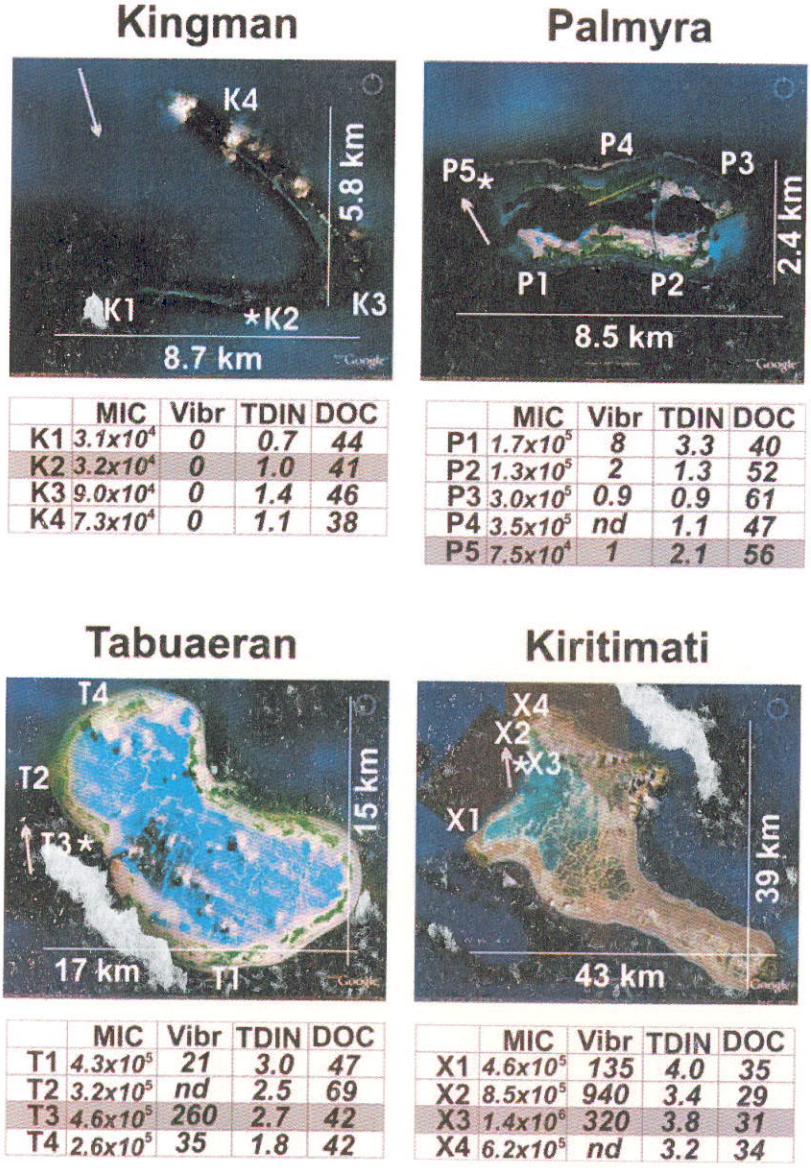
The remaining two atolls, Tabuaeran and Kiritimati, are inhabited and part of the Republic of Kiribati. Tabuaeran has 34 km^2 of land and a 110 km^2 lagoon; a natural passage on the west side of the island was widened by blasting of coral heads by the British, in the 1890s. There are ~2500 people and a large wreck just north of the lagoon passage. All that visually remains of this wreck are a number of large boilers. Kiritimati has 390 km^2 of land and 324 km^2 of lagoon, and ~5500 people. Human sewage is untreated on both Tabuaeran and Kiritimati and there was no evidence of any traditional management of sewage. There are some septic tanks associated with the hotel and larger buildings on Kiritimati; many of these leak, and combined with the untreated sewage, there are a number sanitation problems associated with the island's water supply. Recently installed composting toilets are often not used because of local customs and beliefs (http://www.unep.or.jp/ietc/publications/techpublications/techpub-15/3-8IlandPacific/8-11-2_1.asp). There have been several agriculture initiatives on Tabuaeran and Kiritimati, including seaweed and coconuts. Guano was mined on Kiritimati in the 1850's and 1860's, but it is not known how much mining actually took place; mining stopped in 1866 because it was unproductive. Atomic bomb testing was conducted on Kiritimati between 1957 and 1962 by both the British and American military. Kiritimati has a series of lagoons, a large main one and then many smaller lagoons that are both connected and unconnected to the main lagoon. The highest fluctuations in physio-chemical properties occurs in the unconnected lagoons [20,21], however the main lagoon has salinities and pH similar to seawater. Dissolved oxygen levels were low in the main lagoon and found to increase only in close proximity to settlements, suggesting eutrophication of small areas [20]. Microbial activity in the lagoon sediments was high, but similar to levels in other Pacific lagoons [21].

Survey overview

Microbial communities were surveyed in the coral reef waters on each of the four atolls at 10–12 m depth (<400 m from shore), between August 4th and September 6th 2005. We used the following approaches: 1) Quantification of Bacteria and Archaea (microbes), virus-like particles (VLPs), and protists using direct counts on water collected from above the reef substratum, 2) Abundances of culturable *Vibrio* spp. determined by counting colony forming units (cfu) on thiosulfate citrate bile sucrose plates (TCBS), and 3) Taxonomical and metabolic potential of the microbial and viral communities using metagenomic analyses. In addition, we characterized the coral community (percent cover, disease prevalence) and the water chemistry [concentrations of total dissolved inorganic nitrogen compounds (TDIN: ammonium, nitrate, nitrite), phosphate, and dissolved organic carbon (DOC)].

At each atoll we used the same sampling strategy (one site for metagenomic analyses, four to five sites for other microbial and water chemistry samples, 10–12 sites to characterize the benthic community, ~30 sites (separated by 2 km) to characterize the fish community). The general sampling scheme was centered at the leeward side and worked out in both directions around the island (Figure 1, see Sandin et al [18]; further details below). Because of the differing rates at which the fish, benthic, and microbial surveys could be conducted, not all groups were characterized at each site. Thus about 50% of total sites sampled for coral cover and other benthic properties were also microbiologically characterized.

For the metagenome samples, areas underneath the lagoon currents were targeted because: 1) It was expected that these areas would be the most likely to show signs of human disturbance, 2) Time and resources limited the survey to one microbial and one viral metagenome per atoll, and 3) This limited sampling meant that it was necessary to target an area of the reef that had similar hydrological characters, and lagoon currents are a relatively constant feature of coral reefs. The lagoons of Palmyra, Tabuaeran, and Kiritimati tend to flush in a northerly direction. The samples for the metagenomes were taken from benthic sites that are flushed with the lagoonal waters. In the case of Kingman, the water flows over the reef. The prevailing current, during the cruise was from the north to south (as determined with a float), so this metagenome sample was taken on one of the gaps on the southside of the atoll (Figure 1).



	MIC	Vibr	TDIN	DOC
K1	$3.1x10^4$	0	0.7	44
K2	$3.2x10^4$	0	1.0	41
K3	$9.0x10^4$	0	1.4	46
K4	$7.3x10^4$	0	1.1	38

	MIC	Vibr	TDIN	DOC
P1	$1.7x10^5$	8	3.3	40
P2	$1.3x10^5$	2	1.3	52
P3	$3.0x10^5$	0.9	0.9	61
P4	$3.5x10^5$	nd	1.1	47
P5	$7.5x10^4$	1	2.1	56

	MIC	Vibr	TDIN	DOC
T1	$4.3x10^5$	21	3.0	47
T2	$3.2x10^5$	nd	2.5	69
T3	$4.6x10^5$	260	2.7	42
T4	$2.6x10^5$	35	1.8	42

	MIC	Vibr	TDIN	DOC
X1	$4.6x10^5$	135	4.0	35
X2	$8.5x10^5$	940	3.4	29
X3	$1.4x10^6$	320	3.8	31
X4	$6.2x10^5$	nd	3.2	34

Figure 1. Maps of the sites surveyed on the four Northern Line Island atolls. The locations for the water chemistry, microbe/viral direct counts, and *Vibrio* spp. culturing are indicated with the first letter of the atoll name (X for Kiritimati sites) and sequentially numbered. The sites for the metagenomes are labeled with an *. Coral cover, fish counts, and other macro-organism data were sampled at all of these sites, as well as additional sites [18]. The prevailing current is shown as a grey arrow. **MIC** = number of microbes per ml; **Vibr** = number of culturable *Vibrio* spp. on TCBS plates per ml; **DOC** = dissolved organic carbon in μM; **TDIN** = total dissolved inorganic nitrogen in μM (nitrite and nitrate, and ammonium). Maps were taken from Google Earth.
doi:10.1371/journal.pone.0001584.g001

Direct counts of Bacteria, Archaea and virus-like particles

The numbers of microbes (both Bacteria and Archaea) and virus-like particles (VLPs) in the water column were determined via direct counts using epifluorescent microscopy. Pre-washed diver-adapted polycarbonate Niskin bottles were used to sample the water at each site. Each Niskin bottle sampled 2 liters of seawater, which was used for the direct counts, culturing, and water chemistry. Four of the bottles were collected from the reef surface (~10 m depth), two bottles were collected 25 cm above the benthos, and two bottles were collected 500 cm above the benthos. No statistical difference was found between counts taken at various depths ($F_{32} = 0.321$, $P = 1$ for microbes and $F_{32} = 0.320$, $P = 1.0$ for VLPs), therefore samples were analyzed at the site level. The counts were conducted on 2 or 8 ml of sea water (two concentrations were prepared to ensure that we obtained countable slides). The samples were fixed with electron microscopy-grade paraformaldehyde (4% final concentration) and stained with SYBR Gold (1× final concentration; formally Molecular Probes, Inc., now Invitrogen, Solana Beach, CA) and filtered onto 0.02 μm Anodisc filters (Whatman, Inc, Florham Park, NJ), mounted on glass slides and directly counted by epifluorescence microscopy. Cells and VLPs were counted (>200 per sample) in 10 fields selected at random. The microbes and VLPs counts were log transformed and compared using an unbalanced multivariate analysis of variance with sites nested within atolls. Normality and heterogeneity were tested using Kolmogorov-Smirnov and Levene tests, respectively. Atoll pairings were tested using a Wilcoxon one-sided analysis.

Enumeration of protests

The protist samples were counted from 100 ml of seawater taken from each of the Niskin bottles, fixed with Lugol's solution and formalin, de-stained with sodium thiosulfate, filtered onto 0.6 μm polycarbonate membranes (Millipore, Billerica, MA) and stored at −20°C. Filters were stained for three minutes with 400 μl DAPI (1 μg ml^{-1}; Sigma), rinsed with deionized water and mounted onto glass slides using Vectashield (Vector Laboratories, Inc.; Burlingame, CA) [22]. Filters were observed via epifluorescence microscopy with a BX51 microscope (Olympus America, Inc) and protist abundances were determined based on average counts of ~20 fields per filter. Pigmented and non-pigmented protists were differentiated using the TRITC band excitation filter set (excitation ~550 nm; emission ~600 nm). Pigmented protists were classified as autotrophic-mixotrophic and non-pigmented protists as strictly heterotrophic. Protist count data were normally distributed and homogenous and therefore were not transformed (tested as described above). An unbalanced ANOVA with sites nested within atolls was used to analyze the data, and Tukey's post-hoc test was used to identify the difference between atolls.

Microbial and viral metagenomes

A sample of approximately 150 l of seawater was collected at one site per atoll (Figure 1). The water for the metagenomes was collected from below the boundary layer (in crevices and against the benthos) to avoid confounding problems with the water column. The sampling was conducted at the same time of day to help minimize diurnal effects. The water was collected from over ~20 m^2 of reef using a modified bilge pump connected to low density polyethylene (LDPE) collapsible bags (19 l; Cole-Parmer, Vernon Hills, IL; Figure S1). The containers were transported to the surface and the research vessel within two hours of collection, thereby reducing potential *in situ* community changes. To remove potential sources of DNA contamination, containers, bilge pumps, and tubing were washed once with 10% bleach, three times with freshwater, and once with 100 kDa filtered seawater prior to sampling.

Two size fractions were prepared for the metagenomic analysis from the seawater samples: 1) A large fraction containing mostly microbes, some small eukaryotes (such as dinoflagellates and protists), and a few VLPs, and 2) a small fraction containing mostly VLPs and some small microbes. To obtain these fractions the seawater was processed through a series of filters. The large eukaryotes were removed by filtering the entire sample through 100 μm Nitex, into a barrel lined with a clean, high-density polyethylene bag. The filtrate was then concentrated to ~500 ml on a 100 kDa tangential flow filter (TFF), which captured the unicellular eukaryotes, microbes and VLPs (i.e., the water was removed). During the filtration, pressures were kept below 0.6 bar (10 psi) to ensure that the viruses were not destroyed. The concentrated sample was then passed through 0.45 μm Sterivex filters (Millipore, Inc) using a 50 ml syringe. In this step, the large metagenomic fraction consisting of microbial cells was caught on the filter (microbiomes) and the filtrate was the small metagenomic fraction (viromes). All filtrations were performed on the research vessel, and the samples were stored for further processing in the laboratory at SDSU. The Sterivex filters were frozen at −80°C. The 0.45 μm filtrates (i.e., the virome) were extracted with chloroform to kill any residual cells (10% vol:vol; most viruses are resistant to chloroform) and stored at 4°C.

The DNA for the microbiomes was isolated from the Sterivex filters by removing the filter membranes and performing DNA extractions using a bead-beating protocol (MoBio, Carlsbad CA). The DNA obtained was amplified with Genomiphi (GE Healthcare Life Sciences, Inc, Piscataway, NJ) in six to eight 18-hour reactions [23–28]. The reactions were pooled and purified using silica columns (Qiagen Inc, Valencia, CA). The DNA was then precipitated with ethanol and re-suspended in water at a concentration of approximately 300 ng μl^{-1}.

The viruses in the small metagenomic fractions (i.e., 0.45 μm filtrate treated with chloroform) were purified using cesium chloride (CsCl) step gradients to remove free DNA and any cellular material [29,30]. Viral DNA was isolated using CTAB/phenol:chloroform extractions and amplified in six to eight 18-hour Genomiphi reactions. These reactions were pooled and purified using silica columns (Qiagen Inc, Valencia, CA). The DNA was then precipitated with ethanol and re-suspended in water at a concentration of approximately 300 ng μl^{-1}.

Both the virome and microbiome DNAs were sequenced at 454 Life Sciences (Branford, CT) using their parallel pyrosequencing approach.

Initial bioinformatics on metagenomes

The DNA sequences generated by 454 Life Sciences, Inc, were analyzed *without* assembly. This approach simplifies the statistical analysis and avoids problems with chimera assemblies. Thus, these sequences represent environmental gene tags [31]–short fragments of genes that are found in the different samples. To characterize these sequences, several independent approaches were taken. In the first approach, the sequences were compared to the extant sequence libraries using the Basic Local Alignment Search Tool (BLAST) algorithm. Several boutique databases were used for rapid comparisons and categorization of the DNA sequences. All sequences were compared to the 16S ribosomal DNA database (version 9) available from http://rdp.cme.msu.edu/; the Phage Genome Database and the viral genome database http://phage.sdsu.edu/phage; the European Ribosomal DNA database (http://www.psb.ugent.be/rRNA/); and the ACLAME (A Classification of Genetic Mobile Elements) database (http://aclame.ulb.ac.be/) [32–35]. Results from these analyses are all available at the Line Islands section of our website http://scums.sdsu.edu. Sequences were also compared to the SEED platform [36,37] using the BLASTX algorithm [38]. This database contains the protein sequences from all the available complete and draft genomes. The comparisons were run on the Life Sciences Gateway to the Teragrid (Judson, Edwards, Papka, and Stevens, in preparation). The number of sequences obtained from the 454 pyrosequencing and the number that showed significant similarities are provided in Supplementary Table S1.

The metagenomic sequence fragments with significant similarities (E-value≥0.01) to the SEED platform (http://metagenomics.theseed.org/) were assigned functions based on their closest similarity. This approach allows rapid assessment of the metabolic potential of the sample and provide reliable taxonomic and functional assessments [29,30,39].

Taxonomy and guild assignments

Taxonomical assignments of uncultured microbes are routinely based on sequence data. In the case of microbial metagenomes, this is done in two ways: 1) closest hits to 16S rDNAs, and 2) closest hits to any sequence from a known organism. In the former case, it is relatively easy to just compare the metagenome results to those obtained from traditional 16S rDNA surveys. Using this approach, it has been shown that both qualitatively and quantitatively, the 16S rDNA genes in metagenomes are very similar to those found by 16S rDNA sequencing [39]. This is true regardless of whether the metagenome is made by cloning and Sanger sequencing or by the cloneless 454 pyrosequencing approach. In the latter case, the shorter sequences (~100 bp)

yield the same overall result as the longer Sanger sequences. Though less established than the 16S rDNA approach, taxonomical assignment of metagenomic sequence fragments based on their closest hits to any sequence from a known organism is accurate and informative, and much more metagenomic data are utilized in the analysis. Ground-truthing in this case has been done by a variety of comparisons to coding genes, as well as to cloned 16S rDNA libraries [39]. This approach has also been validated for 454 pyrosequencing data [40].

Both 16S rDNA cloning approaches and metagenomics suffer from the fact that the microbes are not in culture. Very closely related microbes can have quite different phenotypes based on just a few genes (e.g., exotoxins). Therefore, assignment of microbes to guilds based on uncultured data needs to be qualified. For this study we chose to assign the metagenomic fragments to autrotrophs, heterotrophs, and potential pathogens (see below for details). While there might be some overlap between these guilds, the results are very similar whether just the 16S rDNA assignments are considered or functional assignments are used. Although as noted above, small genetic differences can result in major guild differences, the methods were applied consistently across all the atolls so that bias associated with the method would be systematic in nature.

The "habitat" of each microbe with a genome in the SEED platform was manually curated from Bergey's Manual of Determinative Bacteriology [41]. For example, cyanobacteria were assigned to the "autotroph" guild and SAR11 was assigned to the "heterotroph" guild. The "potential pathogen" guild consisted of metagenomic sequence fragments most closely related to the human pathogenic genera *Staphylococcus*, *Vibrio*, and *Escherichia*, the fish pathogens belonging to *Aeromona*, and plant pathogens from the *Xylella* genera. A complete list of the organisms that we described as autotrophic, heterotrophic or potential pathogens is provided on the Line Islands section of our accompanying website at http://scums.sdsu.edu under the section titled "Bergey's listing". This categorization was used to estimate the proportion of microbes that could be described as belonging to one of these three groups on each atoll.

SEED-based assignments of metabolic potential

The metabolic potential of each sample was identified by examining the similarities between the metagenomic sequence fragments and genes in metabolic subsystems. A metabolic subsystem is a group of genes that together form a metabolic function or pathway. The complete list of genes that was similar to metabolic subsystems for microbiomes is provided on http://scums.sdsu.edu. Descriptions of each of the subsystems are available from http://www.theseed.org/. The frequency that each metabolic subsystem was found at each atoll was visualized using a novel interactive web interface which color-codes the frequency to which each subsystem is found in each metagenome sample (http://metagenomics.theseed.org/).

Two different methods were used to calculate the statistical significance of the presence and absence of different metabolic subsystems in each sample: 1) The XIPE-TOTEC subsampling method [37], and 2) the G-test (a maximum likelihood test), neither of which depend on a normal distribution of the data. The two approaches identified which metabolic subsystems were statistically over-represented between the atolls (results are provided at http://scums.sdsu.edu). The analyses of the subsystems and accompanying statistics were used to calculate the seven most abundant subsystems that were different between Kingman and Kiritimati. Relative representation of each subsystem was calculated as the number of similarities to a particular subsystem divided by the total number of similarities to any subsystem; using percentages allows comparisons between samples regardless of the number of sequences obtained from each pyrosequencing reaction.

Bioinformatics of the viromes

The small fraction metagenomic libraries were compared to the known phage genomes in the phage database (v. 5; http://phage.sdsu.edu/phage). This database contains 510 phage genomes and was used to construct the latest version of the Phage Proteomic Tree [34,42]. To compare the relative numbers of phage hosts at each atoll, the incidence of each phage host genome per atoll was counted. Counts were normalized for the number of sequences per metagenome, enabling direct comparisons between metagenomes. The microbe that the phage infects was then compared against the "Bergey's List" to describe the phage as either infecting an autotrophic, heterotrophic or potentially pathogenic bacteria identified as described above.

Two individual phage and prophage strains (*Escherichia coli* Φ CP4-6 prophage and *Prochlorococcus marinus* SSMP4 phage) were used to provide information on the spread of sequence similarities across individual genomes. The coverage maps were constructed by creating a database with the phage or prophage genomes of interest and comparing the metagenomes against them by using TBLASTX. Sequences with E-values$\leq$0.0001 were binned into 1000 base pair windows along the reference genomes. The total number of sequence similarities within a window was calculated and divided by the total number of sequences for each metagenome, allowing comparisons between metagenomes.

Pfam and GO term analysis

The metagenomic libraries were also analyzed using the Pfam database as a comparison to the SEED platform conclusions. To identify conserved protein domains in the metagenomes, all sequence fragments from a sample were translated into each of the six reading frames. To save computational time, translated sequences with an in-frame stop codon were excluded from further analysis. The remaining sequences were locally aligned to each Pfam family using the pHMM from the Pfam_fs database (version 20.0). To search the Pfam_fs database, hmmpfam was run on a computer cluster at the Center for Biotechnology (CeBiTec; Bielefeld University, Germany) [43]. The E-value cut-off was set to 0.01.

Conserved protein domains were categorized into functional groups according to the Gene Ontology (GO) [44]. For each identified domain, GO terms were obtained from its Pfam family description. A pair-wise comparison of all samples versus all samples was performed to identify overrepresented GO terms in a sample. To determine if a GO term was significantly overrepresented, the G_{adj}-test was employed under the null hypothesis H_0: there is no difference in the abundance of identified domains in the two samples to which the GO term was assigned. Values of G were adjusted by the Williams' correction factor. The significance level was set to $P<0.05$.

To predict the species composition of a sample, 454 pyrosequencing fragments that had a Pfam hit were labeled according to the longest common prefix shared by the most similar members of the Pfam family. The strategy for assignment was as follows: First, the sequence was compared to each member of the Pfam family with a pair-wise alignment using BLAST. Second, E_{min} was assigned as the minimal E-value obtained in the BLAST comparisons. The taxa of the organisms of all Pfam family members that hit the sequence with an E-value$<E_{min}+5\%\cdot E_{min}$ were fetched from NCBI. Finally, the sequence was labeled with the longest common prefix of these taxa. For example, *Bacteria:Cyanobacteria* is the longest common prefix of the two taxa

- *Bacteria:Cyanobacteria:Prochlorales:Prochlorococcaceae:Prochlorococcus*
- *Bacteria:Cyanobacteria:Chroococcales:Synechococcus*

The taxonomic identification provided by this analysis was categorized according to the definitions in Bergey's manual, thus enabling a comparison of the metagenomic data using a separate database.

Vibrio spp. Culturing

Bacteria were cultured using thiosulfate citrate bile sucrose (TCBS; Remel; Lenexa, KS USA) plates to provide an estimate of the number of culturable *Vibrio* spp. present on each atoll. Water was sub-sampled from the Niskin bottles and 0.1 ml was inoculated on eight plates for each site. To determine the numbers of *Vibrio* spp. associated with coral, mucus samples were obtained from six corals per site using specially developed "super-suckers". This apparatus allows the mucus to be gathered from the coral colony while minimizing the entry of surrounding seawater. Once again, 0.1 ml of coral mucus was spread onto plates. *Vibrio* spp. colonies forming units were enumerated after 24 hours incubation at 28°C (ambient sea water temperature). Differences in *Vibrio* spp. concentrations per ml of seawater or mucus were compared across all four atolls simultaneously using a non-parametric ANOVA. To further assess differences in the number of culturable *Vibrio* spp. between atolls, pairwise comparisons for all possible pairs of atolls were conducted using non-parametric exact Wilcoxon tests, testing a one-sided alternative hypothesis (i.e., that one atoll in the pair had a higher concentration of *Vibrio* spp. than the other). The one-sided test was conducted for all atoll pairings. On Kingman no culturable *Vibrio* spp. were observed in either the seawater or coral mucus, so the TCBS plates were tested with isolates from Kiritimati. In all cases, the plates were able to support growth of *Vibrio* spp.

Water chemistry

Dissolved organic carbon (DOC), total dissolved inorganic nitrogen (nitrate, nitrite and ammonium), and dissolved inorganic phosphate were determined for all Niskin bottles. For DOC analysis, the water samples were filtered through a pre-combusted Whatman GF/F glass fiber filter and collected in pre-combusted amber glass vials (Wheaton) with acid-washed Teflon lined lids. Samples were acidified (~pH 2) with analytical grade 30% hydrochloric acid (Fluka) and stored at 4°C. DOC concentrations were analyzed by Expert Chemical Analysis (San Diego, CA) using the high-temperature combustion method and a O.I. Analytical Model 1010 TOC analyzer (Texas, USA). To ensure quality control, DOC consensus reference materials (CRM: DSW Lot 05-05 at 45-46 μM C; LCW Lot 12-01 at 2 μM C; supplied by Dr Wenhao Chen, University of Miami) were used, and the high-carbon standard was run every six samples. The methods described for the DOC analysis are the same as those prescribed by the Intergovernmental Oceanographic Commission for the collection of DOC samples. These protocols avoid many of the uncertainties associated with earlier research on DOC levels [45,46].

For inorganic nutrient analysis, samples were filtered through 0.2 μm Nuclepore Track-Etch membrane filters (Whatman) into HDPE scintillation vials with cone-shaped plastic lined lids (Fisher Scientific), after rinsing both the bottles and lids three times with filtrate. Each sample consisted of 15ml of filtrate, which were then stored at −20°C until analyzed. Analysis of inorganic nutrient (nitrate, nitrite, ammonium and phosphate) concentrations was carried out by Marine Science Institute Analytical Lab at University of California at Santa Barbara (Santa Barbara, CA) using a QuikChem 8000 flow injection analyzer (Lachat Instruments, Wisconsin, USA). All chemical components were found not to vary between depths (DOC $F_{32} = 0.872$, $P = 0.660$; TDIN $F_{32} = 0.968$, $P = 0.572$; Phosphate $F_{32} = 1.048$, $P = 0.442$), and therefore, analyses were conducted on the site level. All water chemistry variables were normally distributed and did not show heterogeneity (tested using test described earlier). The differences between the concentrations of each chemical component on each atoll were compared using a MANOVA with sites nested within locations.

To determine natural isotopes of nitrogen, 1 liter of seawater was filtered through GF/F filters to collect particulate organic matter. The filters were folded in half, wrapped in foil, and stored at −20°C. The $^{14}N/^{15}N$ ratios were determined at the Marine Sciences Institute at UCSB (Santa Barbara, CA) using a Finnigan Delta Plus Advantage with a Costech Elemental Analyzer peripheral. Measurements conducted at Kingman and Kiritimati only.

Respiration experiments

Micro-respiration experiments were used to estimate the "nutritional quality" of the waters from the four atolls. On each atoll, water collected from three sites only, was 0.2 μm filtered to remove microbes, and stored frozen at −80°C. Upon return to San Diego State University, the samples were thawed and inoculated with the same microbial community to determine whether the waters from one atoll would support more or less microbial activity. The microbial community was obtained by centrifuging 1 ml of water from a laboratory coral reef tank at ~5,000×g in a microfuge. The supernatant was aspirated away, and the microbial pellet was resuspended into 1 ml of the previously thawed water from the different atolls (each sample run in triplicate). The mixture of the aquarium microbes and atoll water was placed in micro-respirometry chambers and the oxygen concentrations were measured using micro-oxygen sensor probes (Unisense, Aarhus C, Denmark). The microbes were grown for a total of four hours and oxygen concentrations (nmol O_2 ml^{-1}) were measured every minute. Negative controls were conducted by running the experiments without microbial inoculations. To calculate respiration rates, the slopes of the oxygen concentration curve between 75 to 175 minutes were determined. The time-frame was used because it produced the most consistent oxygen utilization levels (i.e., a linear slope after the lag phase). The number of cells in each chamber was determined by direct counts (described above) at the end of the experiment and the respiration rate per million microbes was calculated by dividing by the number of microbial cells. Conventional methods of measuring growth rates of microbes (e.g., using ^{3}[H]-thymidine) were not performed because there was no access to a "rad van" on the cruise. Measurements of microbial activity using Br-dUTP incorporation were attempted, but failed because of technical problems. In the end, however, measuring the oxygen consumption by the same microbial community in the different water samples was probably more illustrative than comparing growth rates of different communities in different waters.

Coral health

Surveys describing the health status of corals were conducted on two 2 m×20 m belt transects at 10–12 sites on each of the four atolls. These techniques for the assessment of coral health were developed by the Coral Disease working group of the Global Environmental Facility/World Bank coral reef targeted research program [14]. All coral colonies, both healthy and those showing signs of potential disease were counted. Most coral diseases do not have known microbial pathogens, but the colony displays signs that can be distinguished. These signs included White Syndrome, Skeletal Eroding Band, Brown Band, Black Band and other

cyanobacterial infections [47], tissue necrosis caused by sediments containing a high mucus load and low numbers of cyanobacteria, algal interactions with corals that cause tissue erosion, bleached white patches, and pink coloration [48,49]. Predator feeding scars from *Drupella* spp. and *Acanthaster planci* were identified and excluded from the analysis. Corals showing signs of compromised health were used to analyze the relationship between the number of unhealthy and healthy corals at each site. The prevalence of unhealthy corals was calculated by dividing the numbers of unhealthy corals by the total number of corals on each transect. Only scleractinian corals were used in the assessment.

Percent cover of benthic organisms

Quantitative assessments of the benthos were made using the photoquadrat method [50]. Ten points were randomly selected and surveyed per transect (i.e., the same transects that were laid for the coral health surveys). At each point a photograph was taken using an Olympus 7070 digital camera that was connected to a tripod (1 m high) and a frame (0.9×0.6 m or 0.54 m^2). Therefore, for each site 20 photoquadrats were sampled. During surveys, notes were made for each photoquadrat and collections were made for organisms that were unidentifiable *in situ*. Upon return to the research vessel, the twenty photographs were numbered and color adjusted using Adobe Photoshop v. 7.0. Image analysis was completed using the program Photogrid 1.0. For each photograph, 100 points were randomly generated and the organism under each point was identified. Therefore, for each site 2000 points were quantified. All organisms were identified to the finest level of resolution possible (genus level for scleractinian and soft corals, functional group for algal turfs and crustose coralline algae, and species level for macroalgae and macroinvertebrates where possible). The percent of coral cover was calculated by dividing the number of points that were assigned to scleractinian corals by the total number of points counted for each photoquadrat. Percent cover of scleractinian corals was used to identify the density dependent nature of the distribution of unhealthy corals on each atoll.

Results

Microbial and viral abundances

The microbial abundances (Bacteria and Archaea) and virus-like particles (VLPs) both increased by about an order of magnitude from Kingman to Kiritimati (Figure 2A and B; $F_{3,\ 12} = 11.5$, $P<0.001$ for microbes; $F_{3,\ 12} = 10.5$ $P<0.001$ for VLPs). In both cases, the increase was progressive from Kingman ($7.2\times10^4\pm1.7\times10^4$ microbes ml^{-1} and $5.1\times10^5\pm1.5\times10^5$ VLPs ml^{-1}) to Palmyra ($2.0\times10^5\pm1.7\times10^4$ microbes ml^{-1} and $1.0\times10^6\pm3.7\times10^5$ VLPs ml^{-1}) to Tabuaeran ($4.0\times10^5\pm2.3\times10^4$ microbes ml^{-1} and $2.5\times10^6\pm1.2\times10^6$ VLPs ml^{-1}) to Kiritimati ($8.4\times10^5\pm1.4\times10^5$ microbes ml^{-1} and $4.9\times10^6\pm1.1\times10^6$ VLPs ml^{-1}) (Wilcoxon one–sided pairwise test was significant for all atoll pairings at the $P = 0.05$ level). Protist abundance doubled from Kingman and Palmyra (3575±457.1 and 3486±275.4 protists ml^{-1}, respectively) to Tabuaeran and Kiritimati (7917±2037.1 and 7124±868.1 protists ml^{-1}, respectively) ($F_{3,\ 12} = 15.5$, $P<0.001$; Figure 2C).

Taxonomical and metabolic potential of microbial metagenomes

Taxonomic analyses of sequences from the large metagenomic fraction showed a non-monotonic change in the relative fractions of autotrophs and heterotrophs on the atolls (Figure 3A). Sequence comparisons with the 16S rDNA database showed that the microbial communities were increasingly autotrophic moving from Kingman (50% of identifiable metagenome sequence were similar to known autotrophs) to Palmyra (84%) to Tabuaeran (89%), but at Kiritimati the proportion of autotrophs sharply declined to 12% (Figure 3A). The robustness of this trend was supported further by comparisons of the DNA sequences against the SEED platform [36] and the Pfam database [43], which revealed similar changes in the relative proportion of autotrophs across the atolls (Figure S2). Further, the proportion of heterotrophs that were potential pathogens also increased on Kiritimati. The number of culturable *Vibrio* spp. from the water column and coral mucus samples also increased progressively from Kingman to Kiritimati (Figure 3B).

The metabolic potential of the microbial community, determined by comparing the sequences to the SEED platform and categorizing them into metabolic subsystems [36], showed similar patterns. Changes in relative abundance of autotrophic subsystems

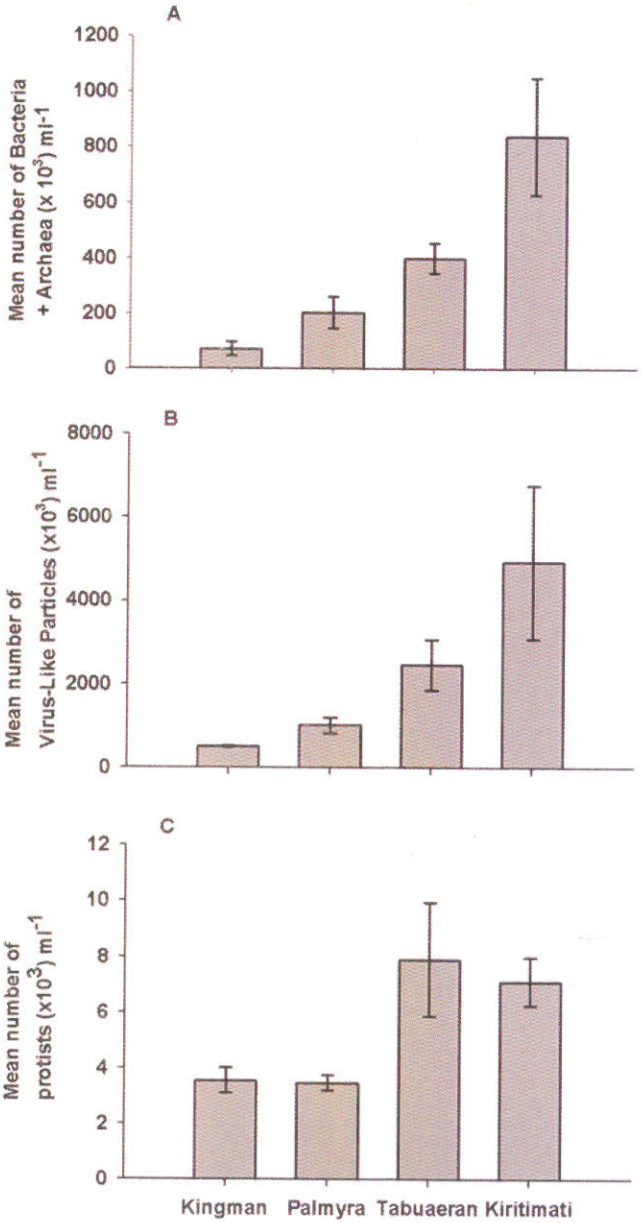


Figure 2. Direct counts were used to determine the mean abundance (±standard error) of A) microbial cells (Bacteria and Archaea), B) virus-like particles (VLPs), and C) protists on the four Northern Line Island atolls.
doi:10.1371/journal.pone.0001584.g002

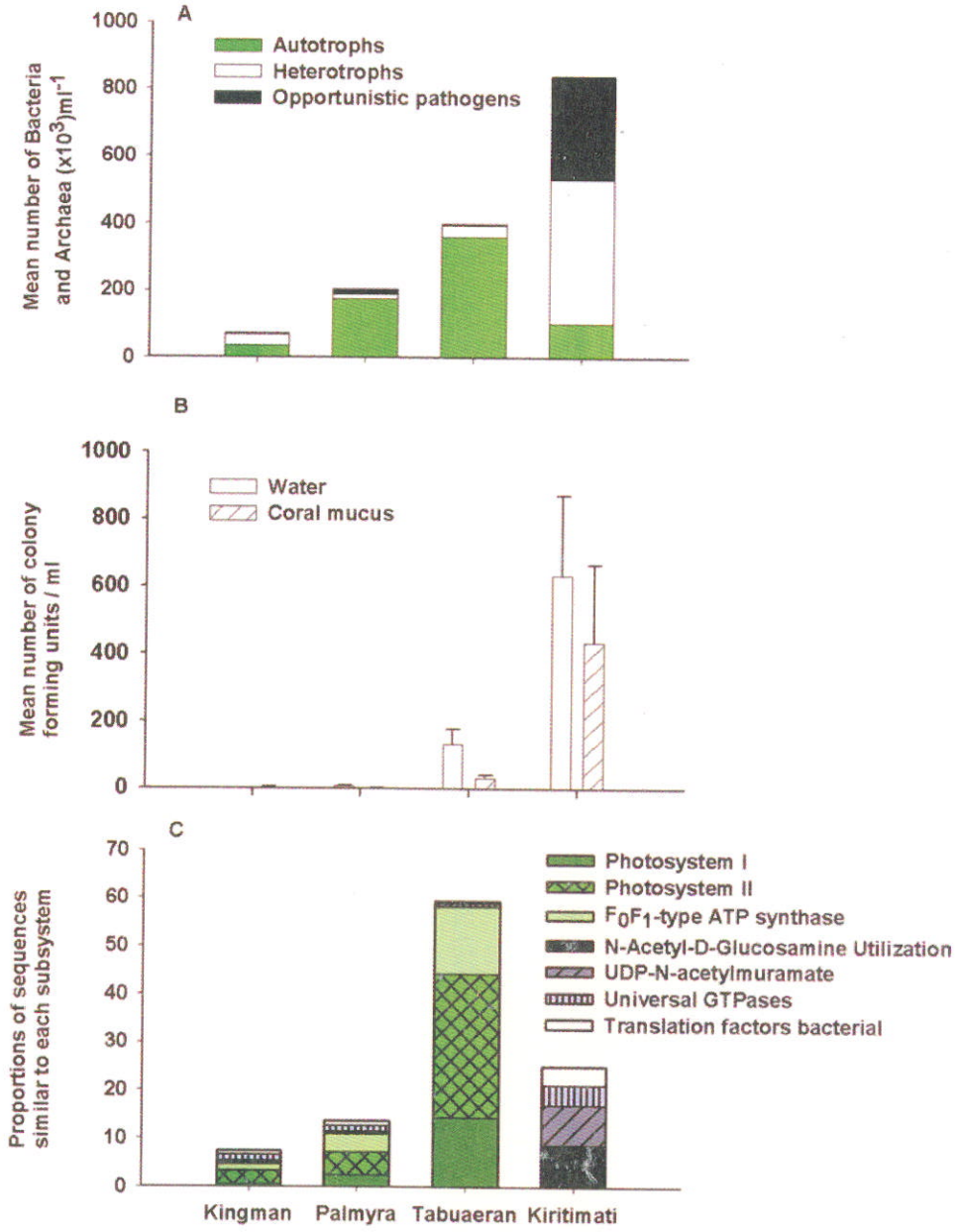


Figure 3. Taxonomic and metabolic potential of Bacteria and Archaea of the four atolls: A) Proportion of autotrophs, heterotrophs and potential pathogens identified by the 16S rDNA sequences in the microbial metagenomic fractions. B) Number of cultured *Vibrio* spp. (bar represents means±standard error) in the water column ($F_{3,58} = 5.697$, $P = 0.002$, Wilcoxon one-sided paired t-test showed significant differences for all atoll pairings at $P = 0.05$) and coral mucus ($F_{3,42} = 3.514$, $P = 0.023$, Wilcoxon one-sided paired t-test showed significant differences for all atoll pairings at $P = 0.05$, except between Kingman and Palmyra $P = 0.299$). C) The metabolic potential expressed by the seven most abundant subsystems, across the atolls. These subsystems varied significantly between Kingman and Kiritimati using both XIPE [37] and G-test (Supplementary data). Subsystems that are more closely associated with autotrophs are shown in green. The "potential pathogen" designation are known human pathogenic genera like *Staphylococcus*, *Vibrio*, and *Escherichia*, fish pathogens like *Aeromona*, and plant pathogens from the *Xylella* genera.
doi:10.1371/journal.pone.0001584.g003

across atolls paralleled the non-monotonic changes described by the taxonomic analyses (Figure. 3C and S3). On Kingman, Palmyra, and Tabuaeran, sequences similar to the Photosystem I and II comprised 3.4, 7.2, and 44.3% of the total identifiable subsystems, respectively, but only 0.3% on Kiritimati (Figure 3C). F_0F_1-type ATP synthase, a subsystem that is involved in oxidative phosphorylation, showed a qualitatively similar change as the photosynthetic subsystems; F_0F_1-type ATP synthase is often coupled with photosynthesis to produce ATP. The N-Acetyl-D-glucosamine utilization subsystem, which is used in the consumption of fixed carbon and thus associated with heterotrophic growth, was highly represented on Kiritimati (8.2% of the identifiable sequences). In comparison, this subsystem was less than 1% on the other three atolls. Universal Guanosine Triphosphatase (UTPase), Uridine diphosphate-N-acetylmuramate and various translation factors were also highly represented on Kiritimati. Variation in less abundant metabolic subsystems across these atolls is provided in Figure S3.

The types of bacterial autotrophs in the microbial fraction also changed on the atolls. The most common bacterial autotrophic

genus on Kingman and Palmyra was *Prochlorococcus* (75 and 91% of the cyanobacterial population, respectively), whereas on Tabuaeran and Kiritimati, *Synechococcus* was the most common genus (66 and 64% of the cyanobacterial population, respectively; Figure S4). This pattern may reflect variations observed in the water chemistry across the atolls, because *Prochlorococcus* is common in oligotrophic water, whereas *Synechococcus* becomes dominant in increasingly nutrient rich water [51,52].

Viromes

The viral metagenomic fraction was compared to a database of all known phage and prophage genome sequences (http://phage.sdsu.edu/phage). Significant similarities to this database (E-value≤0.001) were used to identify the types of phages on each atoll. Since phage are host specific the proportion of phage infecting autotrophic and heterotrophic microbes was calculated. In parallel with the microbial analysis, the analysis of the phage hosts showed the phage known to infect cyanobacteria increased from Kingman (44%) to Palmyra (73%) and Tabuaeran (61%), and then at Kiritimati the phage known to infect heterotrophic microbes became dominant (61%; Figure 4A). A further breakdown of the potential host range of the phage is provided in the Figure S5.

The virome sequences were also analyzed using a fragment recruitment method to known genomes (described in [29]), which maps sequences to their relevant position on the reference genome (Figure 4B). Sequences similar to *Escherichia coli Φ* CP4-6 prophage, which is found in highly virulent enterohemorrhagic *Escherichia coli* strains [53], were more common on Kiritimati. In contrast, sequences similar to the *Prochlorococcus marinus* SSMP4 phage were more common in Kingman, Palmyra, and Tabuaeran (Figure 4B). The differences between the sequence distributions also became apparent when the average number of sequences showing similarities to each section of the genome was compared. For example, the number of sequences similar to *Escherichia coli Φ* CP4-6 prophage steadily increased from Kingman (29 sequences per 5000 bp), to Palmyra (66 sequences per 5000 bp) to Tabuaeran (91 sequences per 5000 bp) to Kiritimati (147 sequences per 5000 bp).

Microbial predator-prey ratios

Virus-like particles (VLPs) and microbial numbers were positively correlated on Kingman, Tabuaeran, and Kiritimati, but not on Palmyra (Figure 5). The steepness of the slope of the VLPs:microbes increased from Kingman (0.909) to Tabuaeran (1.378) to Kiritimati (1.768). Microbes on Kiritimati were able to sustain approximately two times the number of VLPs than on Kingman, which suggests that the characteristics of the relationship are not static, but may be associated with conditions on each atoll.

The overall abundances of the protists increased from Kingman to Kiritimati, but the protists:microbe ratio declined. There were 0.0301 (±0.018) protists per microbial cell at Kingman, 0.013 (±0.005) at Palmyra, 0.015 (±0.004) at Tabuaeran, and 0.008 (±0.004) at Kiritimati. On Kingman, 66% of protists were strict heterotrophs (i.e., contained no chlorophyll) compared with 22% on Kiritimati.

Coral cover and disease prevalence

As shown in Figure 6, coral cover declined from Kingman (43.8%±5.4) to Palmyra (20.4%±2.3) to Tabuaeran (19.5%±1.0) to Kiritimati (14.9%±2.3), whereas prevalence of disease on hard corals was lowest on Kingman (2.5%±0.5) and highest on Kiritimati (6.3%±1.4) and Tabuaeran (6.2%±1.4). Palmyra showed medium prevalence of disease (4.8%±2.0) (Kruskal Wallis test; $H = 8.0$, $df = 3$, $p = 0.04$).

Water chemistry

Dissolved organic carbon (DOC) concentrations were highest on Palmyra (51.1±2.1 μmol l^{-1}) and Tabuaeran (49.5±2.4 μmol l^{-1}), lower on Kingman (42.5±0.9 μmol l^{-1}), and lowest on Kiritimati (32.3±0.6 μmol l^{-1}) (Figure 7A). Given the low numbers of measurements of DOC on coral reefs, a range of these values has been provided in Table S2 for comparison.

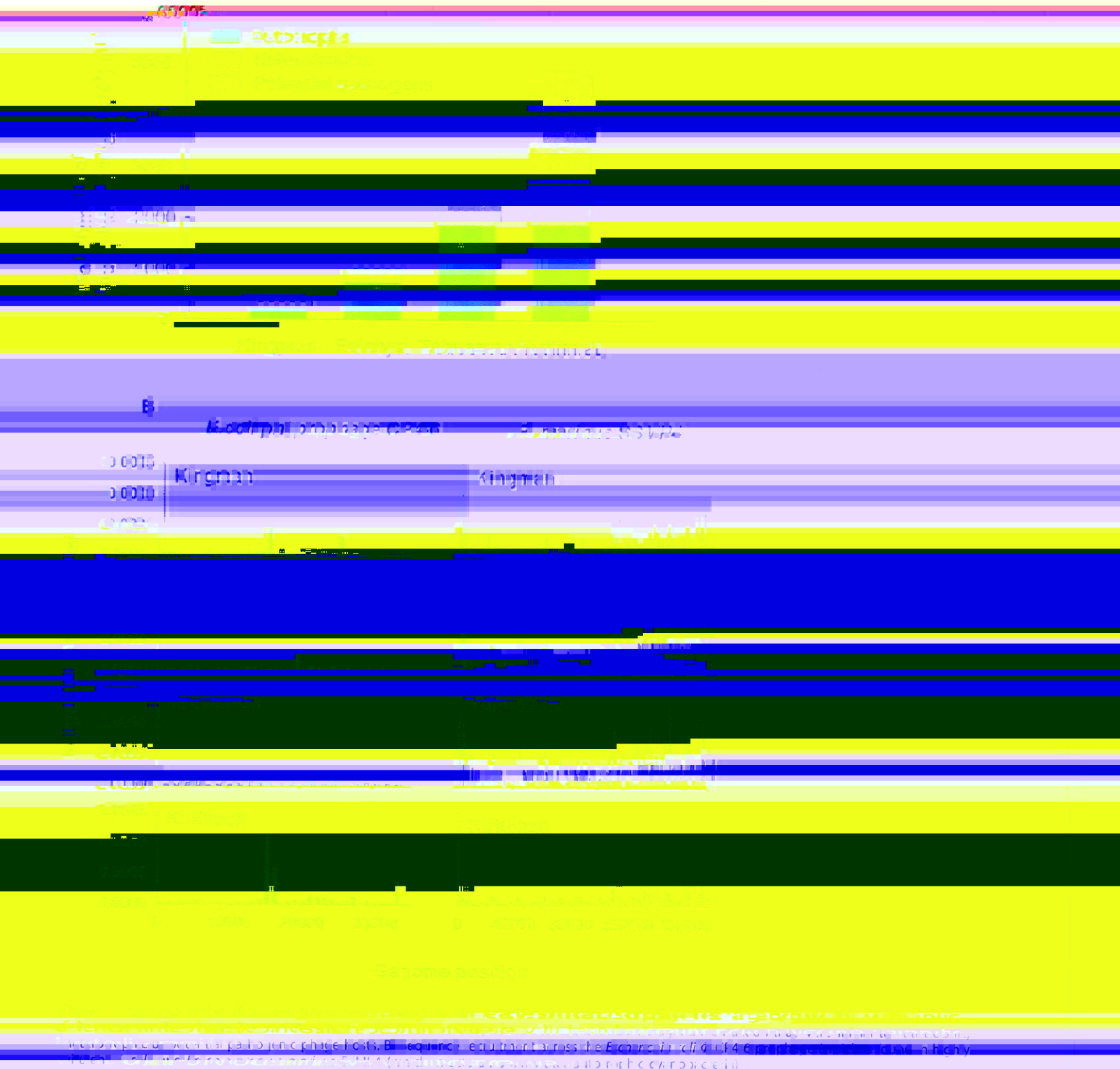
Total dissolved inorganic nitrogen (TDIN) increased almost four-fold from Kingman (1.3±0.08) to Kiritimati (3.6±0.1) (Figure 7B; $F_{3,12} = 38.735$, $P<0.001$), and similarly inorganic phosphate concentrations increased from Kingman (0.1±0.003) to Kiritimati (0.3±0.024) (Figure 7C; $F_{3,12} = 395.2$, $P<0.001$). No clear pattern was apparent in the concentrations of particulate organic carbon and particulate organic nitrogen (data not shown). No significant differences were found in the $\delta^{15}N_{Norm}$ values in the particulate organic matter from Kingman (4.2±0.78) and Kiritimati (5.7±1.5) (not measured on Palmyra or Tabuaeran).

These differences in water chemistry were also reflected in results of the assays of oxygen consumption rates of a standard microbial community grown in seawater from each of the atolls. Microbes grown in water from Kingman had the lowest respiration rates (0.058±0.012 nmol oxygen consumed per 1×10^6 microbes), whereas the same microbes grown in water from Kiritimati had much higher respiration rates (0.309±0.016 nmol oxygen consumed per 1×10^6 microbes) (Figure 7D; $P<0.001$).

Discussion

Microbial numbers in the water column overlying coral reefs usually range from $2–6\times10^5$ cells ml^{-1} [2,54,55]. Our mean values were roughly comparable, although the lowest and highest mean values observed exceeded this range: Kingman averaged 7.2×10^4 microbes ml^{-1}, Palmyra averaged 2.0×10^5 microbes ml^{-1}, Tabuaeran averaged 4.0×10^5microbes ml^{-1}, and Kiritimati averaged 8.4×10^5microbes ml^{-1}. Reports for viral like particles (VLPs) range from $0.3–1.25\times10^7$ VLPs ml^{-1} in the water column [56], densities that exceeded those were not observed: Kingman averaged 5.1×10^5 VLPs ml^{-1}, Palmyra averaged 1.0×10^6 VLPs ml^{-1}, Tabuaeran averaged 2.5×10^6 VLPs ml^{-1}, and Kiritimati averaged 4.9×10^6 VLPs ml^{-1}. For both microbes and VLPs, densities increased steadily across the four atolls; protists also increased, although in a stepwise fashion. There were also differences in community composition, most notably a sharp increase in heterotrophic Bacteria and Archaea and in potential pathogens in Kiritimati. Finally, we observed a steady increase in total dissolved inorganic nitrogen, which was 4-fold higher on Kiritimati than Kingman, and a similar pattern for inorganic phosphate, which increased 3-fold. In contrast, dissolved organic carbon (DOC) concentrations were highest on Palmyra and Tabuaeran and lowest on Kiritimati.

A study of the macrobiota conducted simultaneously with our microbial study documented equally striking changes. Fish biomass dropped steadily from 527 to 132 g m^{-1} from Kingman to Kiritimati, primarily due to the loss of top predators. In parallel with these differences, coverage of corals and coralline algae declined from 71% to 21%, and cover by fleshy and turf algae increased from ~20% to 68% from Kingman to Kiritimati [18]. For the macrobiota, historical data and data from nearby Pacific atolls [18] suggest that anthropogenic impacts are likely to be important factors in explaining these differences across the atolls. Historical records for Kiritimati indicate that sharks were once very abundant [57–60], and more recent surveys indicate a decline in fish biomass by 50% and coral cover by 30% in the last decade [61–63]; in contrast, uninhabited Kingman has not suffered such


A
B
Kingman
Kingman

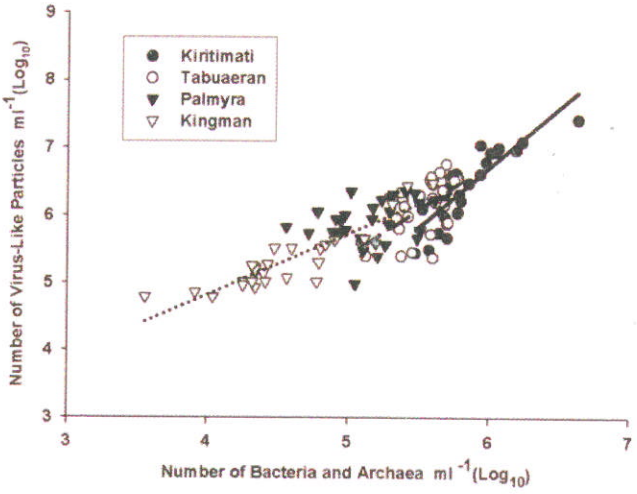


Figure 5. Relationships recorded between microbes and virus-like particle numbers on the Northern Line Islands. Kingman (dotted line) $r^2 = 0.807$, $P < 0.0001$; Palmyra $r^2 = 0.039$, $P = 0.414$; Tabuaeran (dashed line) $r^2 = 0.324$, $P = 0.006$; Kiritimati (solid line) $r^2 = 0.706$, $P < 0.0001$.
doi:10.1371/journal.pone.0001584.g005

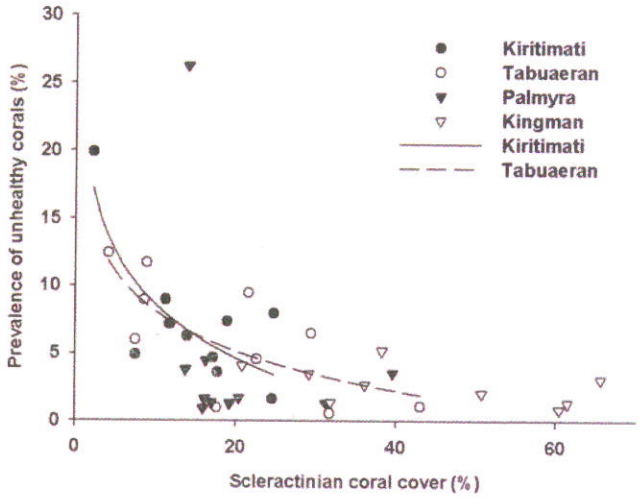


Figure 6. Prevalence of unhealthy scleractinian corals compared with scleractinian coral cover. The prevalence of unhealthy corals was negatively related to host density on both Tabuaeran ($r^2 = 0.477$, $P = 0.002$) and Kiritimati ($r^2 = 0.664$, $P = 0.003$). No relationship was found on Palmyra ($r^2 = 0.261$, $P = 0.141$) or Kingman ($r^2 = 0.251$, $P = 0.300$).
doi:10.1371/journal.pone.0001584.g006

as Kiritimati, resembles Kingman in fish and benthic community structure [61]. One anecdotal consideration that suggests the decline of corals on Kiritimati appears to be a relatively recent event (i.e., within the last decade) is shown in seascape photos in Figure 8. Large coral skeletons were still free-standing in the algal-dominated reef areas and many of the still-living coral colonies were relatively large, with high levels of partial mortality (circles in photoquadrates). Similarly, surveys conducted in 1997 for a proposed Japanese space site identified higher coral cover on Kiritimati than was recorded in 2007, suggesting that the loss of corals is a recent event [63]. In sum, the historic data and the comparisons with nearby atolls suggest that the benthic and fish communities were originally similar on Kiritimati and Kingman in recent time [18].

However, for the microbes, there have been no systematic surveys on these atolls, including Jarvis, so interpreting the patterns observed is more complex. Microbial communities respond to the characteristics of seawater, which are affected by regional oceanographic differences, including local upwelling, lagoonal influences, land run-off, and the benthic community structure (especially the amount of benthic algae). The last three of these can be affected by both the physical and oceanographic characteristics of the atolls, by the activities of people locally, and anthropogenic global change. There are thus two competing, but not mutually exclusive, hypotheses to explain the observed microbial and macrobiota patterns in the Northern Line Islands (outlined in Table 1). Since the four atolls are different sizes and are separated by ~750 kilometers along a north-south transect, regional differences and/or reef hydrology may be the primary driving factors for differences in the measured parameters. Alternatively, the varying levels of human disturbance associated with sewage (there is little industry or large-scale agriculture) and fishing that the atolls experience, or varying amounts of temperature stress associated with global warming may account for the observed differences.

Some of the differences among the atolls are probably long-standing and reflect oceanographic and hydrographic differences, with predictable consequences for microbial community composition. Moving south from Kingman, the atolls are progressively larger with consequently greater potential to induce upwelling, larger lagoons, and larger seabird populations. All of these trends could influence microbial communities. For example, on Kingman, the autotrophic and heterotrophic microbial communities in the water column were roughly balanced. In oligotrophic waters, photosynthetic cyanobacteria are the major energy producers [64] and compete with the heterotrophic bacterial communities for inorganic nutrients [52]. *Prochlorococcus* utilizes reduced forms of nitrogen and loses competitive dominance in seawater where the levels of nitrates are high [64,65]. On Tabuaeran, the photosynthetic microbes made up 80% of the community and photosynthetic subsystems comprised over 40% of the sequences identified within the metagenome. The dominance by *Synechococcus* correlated with the increase in nitrogen and phosphate concentrations in the water and is similar to the large scale distribution patterns of autotrophs in the ocean [64]. The increase in photosynthesis on Palmyra and Tabuaeran may have caused the increased concentration of DOC on these atolls (Figure 7A). Similarly, the metagenomes showed that the number of microbial autotrophs in the 0.45–100 micron fraction increased from Kingman (50%) to Palmyra (84%) to Tabuaeran (89%) (Figs. 3A and C). This trend correlated well with the increasing concentration of fixed nitrogen compounds (nitrate, nitrite, and ammonium) and phosphate in the water column (Figures. 7B and C) and may be due to increased upwelling on the progressively larger atolls. The concentrations of nitrate/nitrite and phosphate continue to increase on Kiritimati, but the microbial community became predominantly heterotrophic in nature (72%), suggesting an available carbon source. This observation is consistent with the hypothesis that nutrients from upwelling, and possibly runoff from the island, combined with a loss of herbivory are stimulating benthic macroalgae and phytoplankton. In turn, the algae produces dissolved organic carbon (DOC) which supports more heterotrophic bacterial growth. This is additionally supported by the observation that both the algal cover and the highest numbers of microbes were also observed on Kiritimati.

The apparent inconsistency with the hypothesis that high levels of DOC released by algae are increasing heterotrophic bacterial is that the lowest DOC concentrations were observed on Kiritimati. Similar phenomena have been observed on other coral reefs in the Caribbean and Sri Lanka (strong correlation between higher

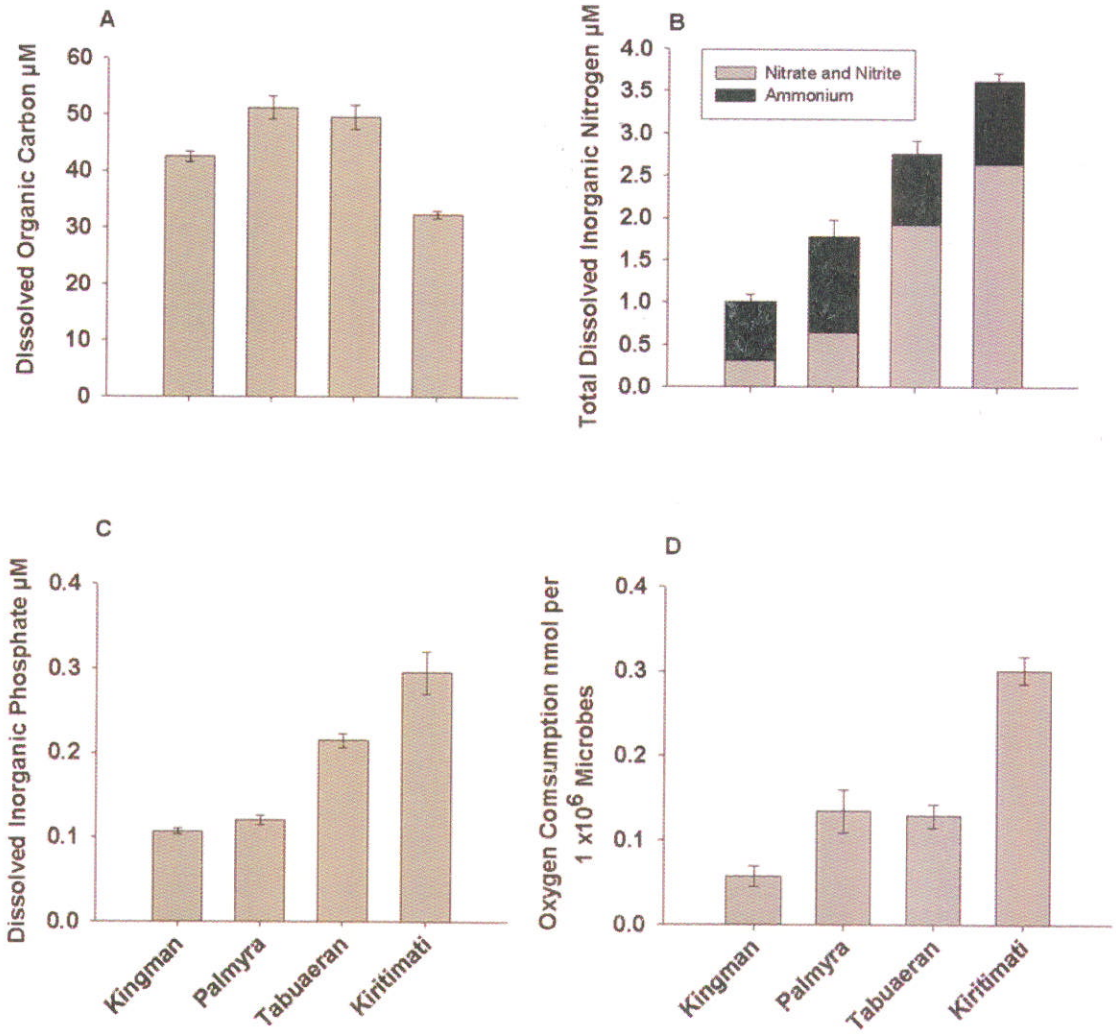


Figure 7. Water chemistry measured for the four Northern Line Island atolls. Concentrations of A) Dissolved organic carbon (DOC), B) Total dissolved inorganic nitrogen (TDIN: nitrite and nitrate, and ammonium), and C) Dissolved inorganic phosphate are presented as means (±standard errors). D) Microbial respiration rates as determined by adding the same microbial communities to samples of seawater collected from the four atolls.
doi:10.1371/journal.pone.0001584.g007

microbial numbers and lower DOC; Pantos, Fairoz, Rohwer; unpublished data). While this may seem counter-intuitive, the lower DOC concentrations are the result of co-metabolism of refractory carbon sources that occurs when microbes are given an excess labile carbon. Carlson et al. [66] showed that increases in inorganic nutrients alone were insufficient to enable bacterial communities to utilize refractory DOC, but required an addition of a bio-available source of DOC. Further, when the labile carbon was supplied, the taxonomic composition of the microbial communities changed (the study by Carlson et al, however, did not identify the microbes) [66], similar to the differences in taxonomic composition that were observed across the four coral atolls. Similarly, fresh carbon supplied to soil microbes enabled the mineralization of old carbon [67]. Consistent with this explanation, addition of the same laboratory microbial community to seawater samples from all four coral atolls showed that the lower DOC-containing water from Kiritimati supported more microbial respiration (Figure 7D).

Total nitrogen inputs associated with sewage were estimated to be 227 and 397 kg N^{-1} km^{-1} yr^{-1} for the inhabited coastline of Tabuaeran and Kiritimati, respectively [18]. Given the large volumes of water that moves passed these reefs, we expect that this extra nitrogen from sewage will be diluted out. While these nutrients may have influenced the microbial community to some extent, they are a fraction of the inputs estimated on highly populated reefs, such as Florida Bay [68]. Additionally, no evidence of human sewage was apparent in the isotopic signature of the particulate organic matter $\delta^{15}N_{Norm}$ values from Kiritimati (5.7 ± 1.5) compared with Kingman values (4.2 ± 0.78). Therefore, human-derived sewage does not seem to be the reason for the elevated nutrients on Tabuaeran or Kiritimati. Bird guano, however, is a potential influence that was not controlled for in this study and may explain some of the elevated nutrient concentrations on Kiritimati, Tabuaeran, and Palmyra.

Increasing atoll size and oceanographically more oligotrophic water were directly correlated with significant increases in protists, microbes, and VLPs. However, the decreasing percentage of heterotrophs from Kingman to Palmyra, followed by an abrupt shift to a heterotroph dominated-community on Kiritimati, does not directly match this pattern. The most straight-forward explanation, as presented above, is that an increase macroalgae, and possibly phytoplankton, is producing labile DOC that supports the change in the microbial community on Kiritimati.

Disease incidence on coral reefs are associated with human activities [69,70]. Changes in the chemical composition of

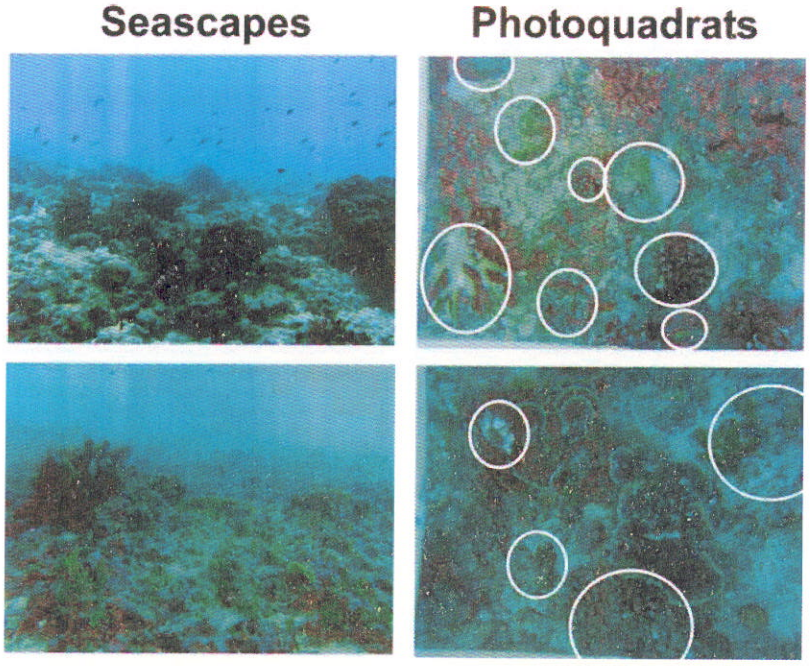


Figure 8. Seascape and photoquadrat photographs obtained from the metagenomic sampling site on Kiritimati. White circles indicate diseased, bleached, or recently dead corals.
doi:10.1371/journal.pone.0001584.g008

seawater may affect coral disease levels, either by favoring the growth of pathogens and/or decreasing the resistance of the coral animal to infection. Increases in inorganic nutrients are typical on coral reefs influenced by human activities and have been implicated in increasing severity of fungal infections of corals [71]. However, recent experiments suggest that dissolved organic carbon (DOC) may also be important. Experimental dosing of coral fragments with increased inorganic nutrients did not increase coral mortality, but the addition of DOC caused tissue necrosis and mortality [72,73] and increased microbial growth. Another common coral stressor, sedimentation, also causes coral tissue loss and mortality in the presence of high organic material [74,75]. Treatment of organic laden sediments with antibiotic stopped the coral mortality [76]. Smith et al. [77] showed that corals died when placed adjacent to macroalgae, even when separated by a 0.02 μm membrane that was impermeable to viruses and microbes, but not dissolved compounds like DOC. The algae increased microbial growth on the coral, which in turn caused hypoxia and presumably the coral mortality. Coral mortality did not occur in this experiment when antibiotics were added [77]. These results suggest that algal-derived DOC may be a primary driver of coral-microbial interactions. In addition, algae-associated microbial communities harbor pathogens that cause coral disease [78].

Potential pathogens were proportionately more abundant in the Kiritimati microbial metagenomic sample (36.3%; Figure 3A), including many bacterial genera and species that are known pathogens of eukaryotes (Figures. 3A 3C and S5) and human pathogens like *Staphylococcus*, *Vibrio*, and *Escherichia*. The culturable *Vibrio* spp. data support this observation (Figure 3B), as do the metagenomic analyses of the viromes (Figures 4 and S5). While it is not possible to absolutely prove (because of microbial genomic plasticity) that these cultured and uncultured data represent pathogens, the combined data is indicative of unhealthy waters. The increase in potential pathogens could be caused by changes in DOC, which stimulates heterotrophic microbial growth or by increased input of pathogens from the humans and animals living on Kiritimati. The human introduction of pathogens suggested for *Serratia* spp. infection of acroporid corals in the Florida Keys [79], but may be less likely on Kiritimati given the lack of sewage signature.

Whatever the source, increases in potential pathogens may contribute to the documented recent loss of corals and present patterns of prevalence of disease. Doubling the concentration of culturable *Vibrio* spp. or enteric-like microbes in the water column caused 100% coral mortality under experimental conditions [72]. Therefore, the observed ten-fold increase in abundance of microbes, in both the direct counts and by culturing, has the very real potential of killing corals in Kiritimati.

The hypothesis that the Kiritimati microbial community is detrimental to corals raises the important question: Is this type of microbial community something that should be expected on coral reefs? The sampling scheme used in this study did not find regions of high heterotrophic activity on Kingman, Palmyra, or Tabuaeran. The sampling was performed at defined distance intervals, which resulted in a more complete survey of the smaller islands. However, a possibility remains that we failed to find the right area on the other atolls that had the higher microbial communities. Regional differences are also a possible explanation for the observed data. Kiritimati may have bleached in the relatively recent pass (a good candidate is the 1998 warming event) [18]. If this event killed the corals, then algae could have colonized the area. In this case the microbial mechanisms discussed above could help prevent recolonization by corals.

The hypothesis we favor, however, is that a change in the food web structure explains the observed differences. On Kingman and Palmyra, there was no significant relationship between disease prevalence and host density, whereas disease prevalence was negatively related to host density on Tabuaeran and Kiritimati (Figure 6). Generally, a density dependent relationship exists between the hosts and pathogens, with the prevalence of disease increasing with host density [80]. The loss of the density dependent nature of the host-pathogen relationship suggests

Table 1. Summary of observations and possible interpretations of microbial and macro-organism data collected from the Northern Line Island survey.

Change as observer moves from Kingman to Kiritimati	Interpretation for hydrology/regional hypothesis	Interpretation for Human-driven food web shift hypothesis
Increased nutrients	a) Upwelling	a) Upwelling
	b) Terrestrial runoff (guano, sewage, agriculture, vegetation)	b) Terrestrial runoff
		c) Increase nitrogen fixation by cyanobacteria/turf algae*
Increased # of microbes and viruses	More microbes come from the larger lagoons	a) Overfishing of herbivores leads to more labile DOC
	Why do the herbivores not graze down the new algae?	b) Increased nutrients lead to more photosynthesis and DOC for microbes
Change from autotrophic to heterotrophic microbial communities	???	More labile DOC to support heterotrophs from unchecked macroalgae growth
More culturable *Vibrio* spp. and pathogen-like heterotrophs	???	Shift in types of *Vibrio* spp. due to DOC lability
Prochlorococcus to *Synechococcus* & autotrophic protists	Increased nutrients due to upwelling	Increased nutrients due to upwelling
Decreased coral cover	a) There were never corals in surveyed regions of Kiritimati	a) Overfishing increases labile DOC, increased coral-algal interaction zones, & pathogen reservoirs
	b) Coral bleaching killed corals	b) Coral bleaching leads to increased disease incidences
	Why do the Kiritimati corals look recently dead?	
Increased algal cover and shift from coralline to fleshy/turf algae	Nutrients favor fleshy and turf algae	a) Overfishing leads to decreased grazing
		b) Nutrients favor fleshy and turf algae
Increased coral disease	???	More pathogen-like microbes = more disease
Non-linear change in coral cover/disease prevalence	???	Same as above
Lower coral recruitment	Algae occupy substratum	a) Pathogens kill off recruits
		b) Algae occupy substratum
Losses of top predators in historical records	Bleaching destroys structure and fish leave	Overfishing
Inverted food pyramids for fish	Same as above	Same as above

Two hypotheses are considered: **Hydrology/regional hypothesis**-Larger islands are associated with more upwelling and algae. Different levels of bleaching on the various islands are the explanation of historical changes (i.e., loss of corals cause fish to leave). For example, the lagoons of Kiritimati and Tabuaeran may have served as sources of hot water during a warming period in the region. **Human-driven food web shift hypothesis**-Overfishing increases macroalgae, which increases amount of labile dissolved organic carbon (DOC). In turn the DOC increases heterotrophic/pathogenic microbes, which kill corals. These two hypotheses are not mutually exclusive. For example, algal-microbial dominated system may represent an alternate stable state initiated by a bleaching event. Where multiple interpretations are given, they are ranked in order of possible importance. Some questions for consideration are highlighted in red.

*Decreased grazing leads to higher concentrations of turf algae [18,94]. These turfs contain cyanobacteria that fix nitrogen.

doi:10.1371/journal.pone.0001584.t001

environmental factors are increasing opportunistic coral diseases. The proposed mechanism is that overfishing removes both predatory and herbivorous fish. Loss of the herbivorous fish results in more algae and microbial growth, which leads to an increased coral death via the microbial mechanisms described above. Removal of the top predators (i.e., top down control) slows down the rate at which energy turns over in the system. This extra energy, in the form of DOC, supports more heterotrophic microbes. Obviously, this is a complex feedback between fish, algae, microbes and coral health that requires further investigation.

Future studies to differentiate between regional/hydrological and food web hypotheses

Table 1 outlines a number of observations and their interpretation in the context of the two competing hypotheses. The main differences revolve around the ultimate cause of coral reef decline. Global and regional phenomena are the major factors structuring coral reefs and their geotemporal rise and decline. The current global decline in coral reefs, however, is almost certainly human-driven. Coral bleaching, caused by rising sea surface temperatures, can devastate coral reefs. Microbes are assuredly important components of this stress, either as primary causes [81–84] or as opportunistic pathogens that kill the weakened corals. Bleaching and other perturbations that destroy the structure of the reef appear to drive coral reefs into another stable state and yield observations similar to what was observed on Kiritimati. Cores will be able to determine if the areas outside of the lagoon have always had low coral cover, or if this is a relatively recent event as suggested by Figure 8. A complete survey of Kiritimati will be able to determine if the rest of the atoll (which includes areas that are not fished or adjacent to villages) has lost its coral cover and subsequent fish populations. If the coral communities are still in place, this would argue against a large scale bleaching event as the triggering event. One caveat is that local hydrology could protect one part of the island, while another area bleaches. Again, cores should help differentiate between these possibilities. Surveys of additional coral reefs would help establish whether there are correlations between coral condition and changes in the microbial communities. The most straight-forward study to test the hypothesis that microbial numbers are driven by increased

macroalgae growth and release of DOC, would be a caging experiment where grazers are added back to a degraded reef to determine if the microbial communities respond. While many caging experiments have been conducted (normally excluding herbivores), none have measured DOC and microbial numbers. Obviously understanding coral reef decline is an active area of research, and the survey presented here provides some insights into microbial involvement in that process. It is important to establish the mechanism driving changes in microbial growth and coral condition because of their importance for management actions.

Conclusions

In the last thirty years, coral reefs worldwide have suffered an unprecedented loss of coral cover [85]. The positive correlation between human-associated disturbance and coral reef decline is now clear, but there is considerable debate about the precise mechanisms of coral loss. Research to identify these mechanisms has focused on the effects of overfishing, habitat destruction, tourism, global warming, and increases in nutrients from terrestrial run-off [86–88]. With the exception of direct destruction (cyanide, blasting, construction), it is not clear why corals actually die. Bleaching, while important does not always lead to coral mortality [89], direct overgrowth by algae is insufficient to explain the widespread loss of corals. An obvious common denominator in the major scenarios of coral death is disease caused by microbes, either as epidemics causes by specific microbes, such as white band disease which devastated acroporid corals in the Caribbean [90] or opportunistic pathogens as suggested on Kiritimati and Tabuaeran. Specific pathogens can also cause food web to shifts, such as the phase shift triggered by the disease of the sea urchin *Diadema* spp. in the Caribbean [91–93]. As in the overfishing food web shift proposed above, opportunistic pathogens were probably the ultimate cause of coral death after the sea urchin die-off. Ecosystem-based management of coral reefs has traditionally focused on animals and plants. Our findings highlight the need to explicitly include microbial processes and their influence on coral reef ecosystem function. Such a framework is also needed to elucidate factors that sustain coral health.

Supporting Information

Figure S1 Underwater sampling equipment used to obtain the 150-liter water sample for the metagenomic analysis. The water was taken from the surfaces and crevices of the reef structure.
Found at: doi:10.1371/journal.pone.0001584.s001 (1.01 MB TIF)

Figure S2 The taxonomic components of the large metagenomic fraction analyzed via sequence similarities to the A) whole genome within the SEED platform, and B) Pfam database.
Found at: doi:10.1371/journal.pone.0001584.s002 (2.18 MB TIF)

Figure S3 The subsystems that showed differences between Kingman and Kiritimati.
Found at: doi:10.1371/journal.pone.0001584.s003 (2.18 MB TIF)

Figure S4 Proportions of Prochlorococcus and Synechococcus present in the large metagenomic fraction.
Found at: doi:10.1371/journal.pone.0001584.s004 (2.11 MB TIF)

Figure S5 The percentage of the predicted host range of phage in the small metagenomic libraries.
Found at: doi:10.1371/journal.pone.0001584.s005 (2.18 MB DOC)

Table S1 Total number of sequences retrieved in each metagenomic library and the number that showed similarities to those stored in the SEED platform.
Found at: doi:10.1371/journal.pone.0001584.s006 (0.03 MB DOC)

Table S2 Nutrient and organic carbon concentrations measured on coral reefs.
Found at: doi:10.1371/journal.pone.0001584.s007 (0.10 MB DOC)

Acknowledgments

All metagenomic data is held at http://scums.sdsu.edu.au, an open access website. Data are being released through SEED platform (http://:www.theseed.org) and GenBank short read database. SEED accession numbers: Kingman microbial-4440037.3, Palmyra microbial-4440039.3, Tabuaeran microbial–4440279.3, Kiritimati microbial–4440041.3, Kingman viral-4440036.3, Palmyra viral-4440040.3, Tabuaeran viral-4440280.3 and Kiritimati viral -4440038.3. Genbank accession numbers: Kingman microbial-28343, Palmyra microbial-28363, Tabuaeran microbial–28367, Kiritimati microbial–28347, Kingman viral-28345, Palmyra viral-28365, Tabuaeran viral-28369 and Kiritimati viral-28349. Direct access to data from these metagenomes is available at http://www.theseed.org/DinsdaleSupplementalMaterial/.

Author Contributions

Conceived and designed the experiments: FR ED OP ES SS. Performed the experiments: SS MH FR OP RE EB RV MH. Analyzed the data: ED RE FA DH LK. Contributed reagents/materials/analysis tools: FR LW. Wrote the paper: FR ED. Other: Expedition organizer: SS. Commented on paper: NK. Contributed to design: FA. Supported field work for ED: BW. Organized expedition: ES.

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Dear Sir,

As a productive and participating citizen of this great nation, who whole-heartedly believes in the justice and fairness of the ways of democracy, I strongly urge the President of the United States of America not to circumvent due process by invoking The Antiquities Act to establish a Marine National Monument in any part of the Pacific, including the U.S. Exclusive Economic Zone of the Marianas Islands, regardless of whether he is being strongly urged to do so by the Pew Environmental Group, or not.

I am sure that you know the President issued an Executive Memo recognizing the views of territorial governments, local governments and interested parties, which have demonstrated strong opposition to any form of arbitrary Presidential designation. May I humbly remind the President that he himself stated *"The White House will not consider any proposed project that hints of controversy"* (letter dated 30 April 2008)? The use of an act, which was once used to protect artifacts of a Native American group, for the purposes of establishing a "no use" zone in the ancestral waters of a Native Pacific Island group can be easily construed as a conscious decision to repeat the historic injustices (e.g., genocide) that we as a Nation have yet to find peace with. I use the term genocide because stripping fishing rights from the Chamorro people is the last step in the wholesale destruction of our culture. Therefore, the use of the Antiquities Act for the creation of this monument reeks not only of controversy, but also of cultural injustices that the world will recognize as such.

As a scientist, what is even more concerning is that there seems to be a paucity of data to suggest that this area truly would be the most suitable place for such a monument to be established. Will the protection of this part of the Marianas Islands help save the delicate biological resources within this unique archipelago, or will it turn out to be another huge waste of effort because none of the reefs found on these northern islands contribute to the health of the rest? Maybe the President knows more about the interconnectedness of our reefs and the subsurface circulation patterns of our surrounding waters than do our scientists who are actually conducting these types of research? I trust that the President would be more concerned about what is good for Americans, but what if all he accomplishes is the further degradation of our cultural heritage? And even worse, what if this monument acted only by helping foreign countries in the Pacific by providing them with "seed" for their reefs? Will these foreign countries interpret their reefs' resiliencies as direct indicators that they are not contributors to the globally-relevant issues of environmental degradation?

Please, Sir, I implore you to urge the President to reconsider using the Antiquities Act to create a national monument in haste. **Remind him that the United States Declaration of Independence states that:**

> "…**We hold these truths to be self-evident:**
>
> That all men are created equal; that they are endowed by their Creator with certain unalienable rights; that among these are life, liberty, and the pursuit of happiness; that, to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed; that

> whenever any form of government becomes destructive of these ends, it is the right of the people to alter or to abolish it, and to institute new government, laying its foundation on such principles, and organizing its powers in such form, as to them shall seem most likely to effect their safety and happiness. Prudence, indeed, will dictate that governments long established should not be changed for light and transient causes; and accordingly all experience hath shown that mankind are more disposed to suffer, while evils are sufferable than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same object, evinces a design to reduce them under absolute despotism, it is their right, it is their duty, to throw off such government, and to provide new guards for their future security. Such has been the patient sufferance of these colonies; and such is now the necessity which constrains them to alter their former systems of government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute tyranny over these states. To prove this, let facts be submitted to a candid world…"

I trust these words with my heart and my soul, as all true Americans should. My grandfather, Pedro G. Cruz, was the first Chamorro in the Insular Guard to fire a shot against the Japanese invasion during WWII. I myself am the first in my family to earn a Ph.D., with which I have returned to Guam to give something. My family believes in the majesty of our great country and in the wisdom of its leader. So please do not betray this trust, as it will take years to rekindle its strength.

Sincerely,

Jason S. Biggs, Ph.D.
227 Inalado Rd. Pago Bay
Chalan Pago, Guam 96910

Honorable George W. Bush, President
United States of America
1600 Pennsylvania Ave., NW
Washington, DC 20500

10/24/2008

Attention: James L. Connaughton
Chairman, Council on Environmental Quality

Dear President Bush:

Assertively as recognized and guaranteed in the creation of the Covenant as codified at 48 U.S.C. § 1801 that we (CNMI Descent) are the rightful owner of lands and waters (ocean resources) as boundaries were established throughout this great Commonwealth as provided in any CNMI laws.

The issues on traditional rights and belief should never be left un-viewed, but rather as points to facilitate further discussion for authenticities of any other issues that may be of concerns to CNMI Descent regarding traditional land and ocean (water) rights.

This report outlines a great concern that includes criteria of requirements for establishing principles relatives to the traditional rights of the CNMI Descent on land and ocean ownership. The major issues covered in these principles include(s):

1. CNMI Descent ownership of Land and ocean or Marine Monument and protected areas as identified by the US Federal Government or recognized by any foreign government on identified land or ocean within the Commonwealth, and
2. The establishment of local management structures and the protection of intellectual property and cultural heritage.

It is considered vital that a united Indigenous (CNMI Descent) position, outlining the concerns of CNMI Carolinian and Chamorro Descent, is presented to the Honorable President George Bush.

This will allow CNMI Descent indigenous interests to be protected and negotiations to be undertaken from a position of strength, respect, and compassionate understanding to the CNMI Descent traditional ownership rights on lands and oceans boundaries established in the CNMI Public Law 2-7 and other CNMI statutes; in the Covenant Article VIII; and the federal law (Magnuson-Stevenson Act).

Recalling that CNMI people have traditionally owned the lands and ocean on which conservation and monument designation are to be located on since time immemorial and continue to so own; Recognizing that since the federal government is pursuing its intents on creation of monument designation without recognition of native indigenous titles (CNMI Descent) is an un-remedied appropriation of Traditional NMI Descent land and ocean ownership rights; Noting that the Honorable President George Bush desires to reform existing arrangements for accommodating conservation and to leave a blue legacy in the White House without consultative discussion on just compensation and access for the CNMI Descent traditional rights and beliefs on the ownership and stewardship of land including the ocean is a breach on the Covenant, which is an agreement entered into between the United States government and the government and people of the Northern Mariana Islands. The parties entered into

agreement as two separate but equal sovereign entities. The Covenant governs the relationship between the parties; Moreover, calling on the US Federal Government to recognize, in negotiation, the position of CNMI Descent traditional rights as land and ocean owners and parties of equal status rather than relegating Commonwealth people (CNMI Descent) to the position of 'stakeholders' or 'interest groups' and the imperative for a lasting commitment by Honorable President George Bush or the US Federal Government to engaging CNM Descent or Commonwealth people on this basis.

It is imperative that the issues contained herein are principles with regards to CNMI Descent Traditional Rights on Land and Ocean (Water) ownership in the Commonwealth is as follows:

1. **Process including adequate timetable and provision of resources:**

    a. That we (CNMI Carolinian Descents) call on the US Federal Government to implement a fair and equitable process including a reasonable timetable to enable adequate CNMI Descent wide approval of new policy for Indigenous (CNMI Descent) rights in, and ownership of, land and ocean and to provide adequate resources for the process;

    b. Furthermore, that in negotiating a fair processes the CNMI Descent calls' on the US Federal Government to recognize and fulfill obligations on the traditional rights of indigenous (CNMI Descent) people and the environment.

2. **Land/Water (Ocean) Tenures and Lease Arrangements:**

    a. That the US Federal Government recognize and accept CNMI Descent ownership of lands and ocean including all cultural and intellectual properties throughout CNMI lands and ocean boundaries established in CNMI Public Law 2-7, to further enable the existing CNMI management and conservation control;

    b. In addition, those federally identified areas in the Commonwealth land or ocean for the sole purpose of monument designation and protected conservation areas or for other purposes will not diminish or extinguish any rights from CNMI Descent ownership, nor prevent the exercise of such rights;

    c. Furthermore, that the CNMI Descent will never accept additional leases, of our land and ocean other than what is stipulated in Section 802 of the Covenant Article VIII;

    d. Moreover, that any negotiations between the CNMI Government and the US Federal Government which may have determined that Commonwealth land and or ocean is to be used for conservation and or monument designation purposes, the US Federal Government will compensate CNMI Descent owners for the loss of full use and enjoyment of indigenous (CNMI Descent) land in the form of a negotiated annual rental payment or package in the amount not less than its market value but not in form of grant assistance or technical assistance agreement.

3. **CNMI Management**:

    a. That sole CNMI management, through a management structure acceptable to CNMI Government and the traditional owners (CNMI Descent) for land and ocean (water) identified as conservation area or monument designation is the primary goal and obligation of federal government to provide flexibility of land and ocean management models as an outcome on the care, control and management of conservation and monument designations on land or in ocean of the Commonwealth without restriction

to the CNMI Government and the NMI People in accessibility and practices of the traditional cultural values;

a. In addition, that the management of permits shall be integral part of CNMI Descent and the CNMI Government for the care, control and management of any identified conservation area or monument designation on lands or in/on the ocean in the Northern Mariana islands (Commonwealth);

b. Furthermore, that in the setting of standards of CNMI management arrangements that no one models can diminish the opportunity for stronger arrangements as to be decided by the CNMI Descent as represented by the CNMI Government;

c. Moreover, that culturally appropriate management plans for CNMI Descent conservation area, monument designation and or national park on land or ocean is developed by Indigenous (CNMI Descent) owners detailing how care, control and management will be implemented with appropriate resources from Federal Government for development and implementation of the management plan.

4. **Federal Government commitment to any conservation or propose monument designation management and to provide funding for CNMI Descent ownership rights on all lands or ocean (water) designation in the Commonwealth**:

   a. That the Federal Government past and current commitment to, and coordination of any federal agencies for, conservation area and propose monument designation management must not be deplorable and that adequate recurrent funding to the CNMI government is provided as part of Covenant Agreement and efficient coordination of all federal agencies be ensured. Currently there exist in the CNMI Government agencies such as Coastal Resource Management Office, Division of Fish and Wildlife, and Division of Environmental Qualities which oversees the conservation and management of environmental surroundings of the Commonwealth.

5. **Access, living areas and exclusive use areas**:

   a. That any new negotiated management arrangements between the CNMI and the US Federal Government shall provide unlimited access to CNMI lands and ocean for traditional owners, living areas for indigenous (CNMI Descent) owners and powers being vested in CNMI Descent owners (CNMI Government) to control and police public access to areas of cultural and historical sensitivity;

   b. Furthermore, that access for other commercial and research purposes shall be determined and controlled by the CNMI government management structure as provided in the Covenant in and for the CNMI Descent.

6. **Harvesting and use of natural resources**:

   a. That any negotiated mutual consent between the CNMI Government and the US Federal Government shall include management arrangement on any conservation area and monument designation on lands and the ocean in the Commonwealth the right to hunt, harvest, and use other natural resources, in accordance with CNMI Descent traditions and existing CNMI Government management plans.

7. **Existing designation and administration of designation by US Federal Government agencies**:

    a. That existing federal government proposal on administration of conservation and monument designations is inadequate and requires amendment, replacement and reform to reflect that the CNMI Government currently controls the waters (Ocean/Seas) as provided in the Covenant.

8. **Intellectual and cultural property rights**:

    a. That the US Federal Government accept and recognize that CNMI Descent people hold traditional knowledge and own intellectual and cultural property concerning land, air, water and cultural resources;

    b. In addition, the traditional owners (CNMI Descents) are the holders of true knowledge of Commonwealth lands and ocean resources and that their knowledge is of superior status to Western academic systems of knowledge;

    c. In addition, that any bio-prospecting using any form of CNMI Descent traditional knowledge should only occur with the prior informed consent of the traditional owners of that knowledge;

    d. Furthermore, that CNMI Descent intellectual property rights are protected by formal agreement in every CNMI Descent management arrangement;

    e. Furthermore, that the Federal Government has no role in the resolution of internal disputes among CNMI Descent people relative to lands or ocean ownership rights other than the lands and water (ocean) as provided in the Covenant [Article VIII, Section 802, subsection (a) and (b)].

    f. Moreover, those identified traditional owners (CNMI Descent) have the exclusive right to control the use of cultural knowledge in the interpretation and presentation of conservation and monument designations on land or water (ocean) of the Commonwealth.

9. **Cultural integrity**:

    a. That the US Federal Government recognizes the landscape and ocean resources are integral to CNMI Descent cultural values and it authenticities;

10. **Commercial rights in conservation and monument designations**:

    a. Given that the US Federal Government's promotion of the commercial use of conservation and monument designations, the traditional owners (CNMI Descent) and the CNMI Government be guaranteed access to commercial opportunities, a first right of refusal and benefits.

11. **A conflict resolution process including CNMI Descent process and independent arbitration**:

    a. That the procedure accorded in the Covenant is the appropriate conflict resolution process for disputes between US Federal Government and traditional owners/CNMI Government concerning conservation and monument designations management.

12. **Cultural Heritage**:

    a. That all cultural heritage control and management is the exclusive right of CNMI Descent owners/CNMI Government and that ownership and management arrangements in relation to Indigenous cultural heritage be implemented in accordance to the CNMI Descent traditional values and its authenticities.

13. **Audit of existing condition of conservation and monument designations land or ocean**:

    a. That the US Federal Government shall provide an audit of the condition of natural values, fixed assets, propose conservation and monument designations, regional administration, recurrent budgets and projected revenue generation from any identified lands and ocean resources that are in the propose conservation and monument designations in the boundaries established by CNMI Public Law 2-7 in order for CNMI Descent owners to be able to make adequate arrangements for the protection of these values and other assets.

14. **Process for new conservation and monument designation on land or ocean**:

    a. That no new conservation and monument designations be created without the informed consent of traditional owners (CNMI Descents) and the CNMI Government;

    b. Moreover, where new areas are created or identified through a mutual consent between the US Federal Government and the traditional owners/CNMI Government, the identified area becomes a new category of CNMI Descent Conservation management control.

15. **Strategic Actions**:

    a. To identify and prioritize information needs and the co-operative mechanisms for acquiring, accessing and disseminating information.

    b. To strengthen national and regional capacity, encourage partnerships between regional and international organizations, and the public and private sectors, to improve their understanding of the CNMI Descent ownership on (water) ocean in this great Commonwealth.

    c. To have regard for traditional knowledge and it's potential to contribute to better understanding the ocean and to the effective management of resources.

    d. To promote further formal education and training of local people in marine science and marine affairs disciplines.

Furthermore, International law and instruments confers rights on Pacific Island communities [which includes the CNMI Descents and the Commonwealth] relating to the use of the oceans and its resources. With these rights come responsibilities, especially for sustainable development, conservation and management of the ocean's living resources and for the protection of the ocean environment and its biodiversity.

Clearly put the CNMI Descent (Chamorro and Carolinian) have established statutes, based on international principles and customary practice, which provide for responsible management and use of the ocean/sea (Water) in the Commonwealth and its resources within their areas of jurisdiction.

The Covenant when it was negotiated it did not diminish nor un-recognized that the Northern Marianas People do not have the rights as owners of Ocean/Sea (Waters) and lands in the Northern Mariana Islands. As stipulated in Article VIII Section 802 the US Federal Government and the Northern Mariana Island People negotiated the lease terms of land and water that the US Federal Government shall utilize for defense purpose.

And the CNMI Descents believes in contemporary and traditional understanding of the ocean provides the basis for sustainable use of the ocean and its resources, as to curb vulnerabilities from environmental and ecological disturbances, economic disadvantages, and social factors.

"The CNMI Carolinian and Chamorro Descents own the sea. We own it because we live in it. We own it because until this century we have been the only people to use it for purposes other than transit. We own it because we have sailed it for thousands of years. We own it because we learned how to tame it and cope with its awe inspiring power before anyone else did. We own it because we are totally dependent upon it for survival - both the subsistence form of survival of days past and the more materialistic form of the uncertain future. We own it because over the past centuries we have devised a system for defining and allocating the rights in the sea and for passing those rights on from one generation to the next...."

Melvin LO Faisao

David R. Omar

Dear Sir,

As a U.S. citizen who buys fish to provide for the nutritional needs of my family, as well as, my island community, *I strongly oppose any efforts to try to persuade the President or federal entities to establish Marine Protected Areas, Marine Conservation Areas or a Marine National Monuments in the U.S. Exclusive Economic Zone of the Marianas to include islands under existing CNMI Government protection, as being strongly urged by the Pew Environmental Group.*
As you know the President issued an Executive Memo that recognizes the views of territorial governments, local governments and interested parties which have all demonstrated strong opposition to any form arbitrary Presidential designation. Further, *"The White House will not consider any proposed project that hints of controversy"* (letter dated 30 April 2008). *The fishing constituency and the people of the Marianas are comprised of a number of Pacific Islander cultures living side by side with other mainstream Americans who collectively practice sustainable fishing.*

The Marianas Fishing Community is not the cause of the degradation of high seas fish stocks or the destruction of critical marine habitat;

The Marianas Fishing Community has historically (nearly 4,000 years) proven to be excellent stewards of the ocean whereby the harvest is primarily consumed by the community;

The Marianas Fishing Community continues to provide sustenance to residents of our islands without the need to implement industrialized harvesting methods.

The Marianas Fishing Community should be allowed to continue fish in the waters of the Marianas with traditional or modern effective fisheries management tools.

The Marianas Fishing Community wholeheartedly supports the existing management regime as established by the U.S. Congress under the **Magnuson-Stevens Fishery Conservation and Management Act.**

The Marianas Fishing Community recognizes that **the Western Pacific Regional Fishery Management Council** for several decades has banned the use of the Trawl Nets, Gill Nets and most recently Purse Seine. **The WPRFMC** also established large closed areas whereby larger (50') scale fishing vessels are prohibited from entering; thus protecting seamounts from industrialize resource extraction to include anchoring which adversely impacts the marine habitat.

In closing, **the Marianas Fishing Community** *is not responsible* for over-fishing and should not be penalized for the acts in other jurisdictions that utilize gear and practices that do not support sustainable use, or responsible conservation and management regimes.

Sincerely,

Michael D. Flynn, Jr.

WILLIAMS & JENSEN, PLLC
Attorneys at Law

October 21, 2008

James Laurence Connaughton, Chairman
Council on Environmental Quality
722 Jackson Place, N.W.
Washington, D.C. 20503

Dear Chairman Connaughton:

Attached please find the Comments of Harbor Branch Oceanographic Institution, Woods Hole Oceanographic Institution, Ocean Research and Conservation Association, Waitt Institute for Discovery, Virginia Institute of Marine Science, Monterey Bay Aquarium Research Institute, and University of Queensland, Australia regarding the Pacific Marine Conservation Assessment.

Respectfully submitted,

Bert Carp

BWC:eao

Enclosure

cc: James A. Goold, Esq.

1155 21st Street, N.W., Suite 300 • Washington, D.C. 20036 • TELEPHONE 202.659.8201 • FACSIMILE 202.659.5249

October 21, 2008

COMMENTS OF:

Harbor Branch Oceanographic Institution; Woods Hole Oceanographic Institution; Ocean Research and Conservation Association; Waitt Institute for Discovery; Virginia Institute of Marine Science; Monterey Bay Aquarium Research Institute; University of Queensland, Australia

IN SUPPORT FOR IMMINENT SCIENTIFIC RESEARCH IN MARINE AREAS DESIGNATED FOR POTENTIAL REGULATION

President Bush has signaled his intention to issue an Executive Order which would protect parts of the Mariana Trench, as well as waters around Rose Atoll in American Samoa and various islands and reefs in the central Pacific that are under U.S. jurisdiction. The proposed order would establish marine sanctuaries or national monuments extending as far as 200 miles from each island or emergent reef that breaks the surface of the water in these designated areas.

As members of the oceanographic community we strongly concur with the President that these marine environments are worthy of increased protection. However, many non-profit and academic research organizations are concerned that the process of designating these ocean areas and determining how to protect them through rules, regulations, and permits once designated will delay or prevent the legitimate scientific research we are about to commence. Federal regulations – particularly with respect to defining prohibited activities and permitting procedures will likely take many months if not years to be enacted. Several of the organizations who are party to this letter have already committed significant resources towards commencing ***near term,*** non-invasive scientific research in one of these areas that will contribute to the President's goal of marine conservation and management. We raise this issue to ensure the President's planned declaration does not have the inadvertent adverse effect of delaying the very types of scientific and historical research he has called for in his Ocean Action Plan of 2004.

Specifically, our non-profit research organizations are preparing to undertake a multidisciplinary expedition to the central Pacific region which is slated to commence in early 2009 with operations to occur within the EEZ of US insular areas. This collaborative scientific endeavor will involve a range of physical, biological and archaeological oceanographic projects conducted in tandem with a wide-area, AUV-based side-scan sonar and multi-beam survey. Additionally, onboard sensors such as CTD, ADCP, sub-bottom profiler, and an optical backscatter sensor will complement shipboard surface, mid-water, and benthic recording instruments. A collective goal of

the expedition is to expand our knowledge of remote and largely unstudied environments and cultural resources in the Pacific.

The parties to these comments fully support the position of the Consortium for Ocean Leadership, a group whose members have likewise indicated their support for open access, with due precautions to avoid negative impacts, to these areas for the purposes of scientific research and monitoring. Indeed, many of the parties to this letter are members of the Consortium for Ocean Leadership. The purpose of this letter is both to lend support to their position, but also to highlight that the organizations that are party to these comments have near term plans for research in the area slated for regulation. The near term research includes projects intended to collect data related to sea-surface temperatures, which has implications for the coral reefs (specifically NOAA's Coral Reef Watch); quantification of biodiversity for the Census of Marine Life Database and the Census of Marine Zooplankton project; map the location of hydrothermal vents and other significant bottom features; unobtrusive deep water observation of seamount communities; and water analysis to examine impacts of carbon loading and ocean acidification.

We urge that the Executive Order under consideration explicitly ensure that the oceanographic research projects, including those highlighted above which are already planned within the proposed regulated area, be allowed to commence and continue while management plans and permitting processes are drafted. Failure to allow this research to continue on schedule would result in the loss of substantial nonprofit resources, research and time, and jeopardize our expedition. We are certain this outcome would produce exactly the opposite of the intent of the President's plan for marine protection, and we ask that you take this into consideration during your deliberations.

SUPPORTING INSTITUTIONS:

Harbor Branch Oceanographic Institution
Woods Hole Oceanographic Institution
Ocean Research and Conservation Association
Waitt Institute for Discovery
Monterey Bay Aquarium Research Institute
Virginia Institute of Marine Science
University of Queensland, Australia

Counsel:
Bert Carp, Williams and Jensen, PLLC
1155 21st Street, N.W.
Washington, D.C. 20036
(Tel: 202-659-8201)

James A. Goold, Covington & Burling, LLP
1201 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
(Tel: 202-662-5507)

AMERICAN BIRD CONSERVANCY

Shaping the future for birds

October 23, 2008

Mr. James Connaughton
Chairman of the Council on Environmental Quality
722 Jackson Place, N.W.
Washington D.C. 20503

Dear Mr. Connaughton:

It has been brought to our attention that the Administration is currently evaluating proposals which provide additional protection to the central pacific islands, reefs and atolls of Baker, Howland, Jarvis, Johnston, Kingman, Palmyra, Rose and Wake. We were very pleased to hear of this development and hope that as a result of these evaluations, the US will decide to show its commitment to protecting our oceans by extending the protection of these important areas.

The American Bird Conservancy feels that full protection for the islands would demonstrate a historic vision and sense of stewardship. We at the American Bird Conservancy are especially aware of the import of such action for seabirds. The central Pacific Islands are nesting and breeding habitats for millions of birds, and serve as important stopover points for migrating seabirds. In addition to a simply staggering density of birds, the proposed monument would affect several birds of conservation concern which breed on the islands. The Polynesian Storm-petrel, Audubon's Shearwater, and Black-footed Albatross are listed as highly imperiled on the North American Waterbird Conservation Plan, as are 7 other species of high conservation concern. These birds leave their nests to forage at sea, leaving their chicks in a vulnerable position. Protecting the waters near the islands may allow for shorter foraging trips and less risk to the young.

Furthermore, warm waters like those of the central pacific are generally less productive, and provide fewer foraging opportunities than cooler waters. However, NOAA cruises have documented an important factor that makes the waters around these islands important to the seascape. An equatorial undercurrent of cooler, productive waters travels west to east across the ocean, and is lifted to the surface when it collides with the atolls. This forms a nutrient-rich upwelling of cool water, which is important to the zooplankton of the area, as well as the birds that rely upon zooplankton directly for food. The Polynesian storm-petrel, which is one of the most threatened tropical seabirds, is only one example.

In summary, we applaud the administration for its interest in designating the new Monument, and encourage it to include the full territorial waters of the US Exclusive Economic Zone, where feasible.

Sincerely,

Jessica Hardesty
Seabird Program Director
American Bird Conservancy

4249 Loudoun Ave. • P.O. Box 249 • The Plains, VA 20198

Tel: 540-253-5780 • Fax: 540-253-57822 • abc@abcbirds.org • www.abcbirds.org

AMERICAN BIRD CONSERVANCY

Shaping the future for birds

American Bird Conservancy is the only 501(c)(3) organization that works solely to conserve native wild Birds and their habitats throughout the Americas. ABC acts to safeguard the rarest bird species, restore habitats, and reduce threats, while building capacity in the conservation movement. ABC is the voice for birds, ensuring that they are adequately protected; that sufficient funding is available for bird conservation; and that land is protected and properly managed to maintain viable habitat. ABC sets the bird conservation agenda by using the best science available to determine the highest priorities and the best solutions, and then communicating these priorities to the conservation community and the public through alliances, partnerships, and networks. ABC counts among its staff some of the foremost experts in bird conservation in the United States, and partners with many others throughout the Americas. ABC is a membership organization that is consistently awarded a top, four-star rating by the independent group, Charity Navigator.

4249 Loudoun Ave. ● P.O. Box 249 ● The Plains, VA 20198

Tel: 540-253-5780 ● Fax: 540-253-57822 ● abc@abcbirds.org ● www.abcbirds.org

Dear Sir/Madame,

I vehemently oppose any efforts to try to persuade the President or federal entities to establish Marine Protected Areas, Marine Conservation Areas or a Marine National Monuments in the U.S. Exclusive Economic Zone of the Marianas to include islands under existing CNMI Government protection, as being strongly urged by the Pew Environmental Group.

As a citizen of the United States, I support fishermen in the Marianas, to include Guam and the CNMI. They continually promote sustainable fishing practices that provide for the nutritional needs of their families, as well the rest in the island community,

The President in the past issued an Executive Memo that recognizes the views of territorial governments, local governments and interested parties which have all demonstrated strong opposition to any form arbitrary Presidential designation.

…Further, *"The White House will not consider any proposed project that hints of controversy"* (letter dated 30 April 2008). *The fishing constituency and the people of the Marianas are comprised of a number of Pacific Islander cultures living side by side with other mainstream Americans who collectively practice sustainable fishing.*

Let it be known to the President that:

The Marianas Fishing Community is not the cause of the degradation of high seas fish stocks or the destruction of critical marine habitat;

The Marianas Fishing Community has historically (nearly 4,000 years) proven to be excellent stewards of the ocean whereby the harvest is primarily consumed by the community;

The Marianas Fishing Community continues to provide sustenance to residents of our islands without the need to implement industrialized harvesting methods.

The Marianas Fishing Community should be allowed to continue to fish in the waters of the Marianas with traditional or modern effective fisheries management tools.

The Marianas Fishing Community wholeheartedly supports the existing management regime as established by the U.S. Congress under the **Magnuson-Stevens Fishery Conservation and Management Act.**

The Marianas Fishing Community recognizes that **the Western Pacific Regional Fishery Management Council** for several decades has banned the use of the Trawl Nets, Gill Nets and most recently Purse Seine.

The WPRFMC also established large closed areas whereby larger (50') scale fishing vessels are prohibited from entering; thus protecting seamounts from industrialize resource extraction to include anchoring which adversely impacts the marine habitat.

In closing, **the Marianas Fishing Community** *is not responsible* for over-fishing and should not be penalized for the acts in other jurisdictions that utilize gear and practices that do not support sustainable use, or responsible conservation and management regimes.

Sincerely,

_____

Francisco C. Roberto
Merizo, Guam

CAROLINIAN AFFAIRS OFFICE
Office of the Governor
Caller Box 10007, Saipan, MP 96950
Tel. 234-6385 * Fax. 235-5088
Email Address: admincao@saipan.com

The Carolinian Affairs Office (CAO) is constitutionally mandated to advocate matters that benefit persons of CNMI Carolinian descent. It is charged to uphold the constitutional rights of persons of CNMI Carolinian descent in matters relating to government services or areas affecting them.

September 17, 2008

Honorable George W. Bush, President
United States of America
1600 Pennsylvania Ave., NW
Washington, DC 20500

Attention: James L. Connaughton
Chairman, Council on Environmental Quality

Dear President Bush:

The Carolinian and Chamorro people or more refer to as CNMI Descents have recognized among themselves as holding native title rights to Lands situated in the Commonwealth of the Northern Mariana Islands, including rights over the sea, which co-exist alongside the rights for commercial and recreational fishers . These determinations' of traditional rights have been handed down from generations to generations.

The CNMI Descents, represented through their own effort in local sovereignty to diligently scheme enactment of the Marine Sovereignty Act of 1980 or CNMI Public Law 2-7, first lodged their claim on Marine boundaries in December 11, 1980. These include the rights to hunt, fish, gather and use resources within the area for personal, domestic or non-commercial exchange or communal consumption for the purposes allowed by and under their traditional beliefs and customs.

Furthermore, the CNMI Descent have been enjoying their traditional fishing conservation practices in co-existence of the MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT which became ideally a stepping stone as an inclusion of recognizing the traditional CNMI Descents claims that all Pacific Insular Areas contain unique historical, cultural, legal, political, and geographical circumstances which make fisheries resources important in sustaining their economic growth and the Informal Composite Negotiating Text of the United Nations Conference on the Law of the Sea (ICNT).

The ICNT provides that the rights recognized or established therein to the resources of a territory such as the Commonwealth shall be vested in the inhabitants of that territory, to be exercised for their own benefit and in accordance with their own needs and requirements. Moreover, these mandates do not encroach on nor violates the CNMI Descent rights but allow provisions such as to preserve and protect the traditional rights and interests of the people of the Northern Mariana Islands in the surrounding sea and the resources thereof; In addition, it ensures the continued availability of such resources for future generations by establishing jurisdiction over such resources.

With that said the CNMI Descents practices' traditional values of the surrounding water, lands, and each variety of living species. These values are of significant traditional respect for protection and preservation of the marine and land environment, including prevention of pollution from outside the zone which threatens or risk to harm these resources.

The CNMI Descents have relied heavily on traditional seasonal hunting of fishes and other native species, which have passed down from our forefathers as way of conservation practices and curbing exploitation on the ecological surroundings.

In essence we, the Undersigned members of the Carolinian Affairs Office Advisory Committee invite you to have a round table discussion with our Paramount High Chief Governor Benigno R. Fitial on the issues surrounding our traditional rights to the resources found in our oceans and lands through a mutual consent as stipulated in the Covenant ([ref: 48 U.S.C. § 1801] To Establish a Commonwealth of the Northern Mariana Islands in Political Union with the United States of America) **that the Covenant is not a unilateral enactment by the U.S. Congress. It is not an organic act, which Congress may unilaterally change at its pleasure. Because the Covenant is a binding bilateral agreement between the U.S. and the people of the NMI, neither party may unilaterally amend Covenant's fundamentals' provisions without the consent of the other. To do so would constitute a material breach of the Covenant**.

Angelica Iginoef-Mangarero, CAO Executive Assistant

Concurred By_____
Melvin Faisao, Chairman CAO Advisory Committee

David R. Omar, Member

Jesus M. Elameto, Member

Frank M. Rabauliman, Member

Isidro K. Seman, Member

Felicidad T. Ogumoro, Member

Carmelita Rabauliman Faisao, Member

Vincent R.M. Rabauliman, Member

Patricia O. Rabauliman, Member

Vivian W. Odoshi, Member

Rosa L. Ayuyu, Member

Victoria S. Magofna, Member

Henry K. Magofna, Member

Rosa T. Castro, Member

Catherine P. Anderson, Member

Felix R. Fitial, Member

cc: **Hon. Benigno R. Fitial, Governor, CNMI**
Mr. Allen T. Tom, Director Pacific Islands Region Program
Attachments (Petitioners Against any monument establishment)

Potential Marine Conservation Management Areas:

Comments of Marine Conservation Biology Institute and Environmental Defense Fund

Submitted to
James L. Connaughton, Chairman
Council on Environmental Quality
Washington, DC
October 25, 2008

By
Marine Conservation Biology Institute
Environmental Defense Fund

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Potential Marine Conservation Management Areas: Comments of Marine Conservation Biology Institute and Environmental Defense Fund

EXECUTIVE SUMMARY

Conservation Opportunity

President Bush has the authority and opportunity to leave a meaningful and lasting ocean legacy by protecting rare natural gems in the Pacific Ocean. He has asked federal officials to assess the potential for conservation action in three areas: 1) US possessions in the central Pacific (Wake, Baker, Howland, Jarvis and Johnston islands, Palmyra Atoll and Kingman Reef) and their surrounding waters, 2) Rose Atoll in the territory of American Samoa, and 3) the federal waters surrounding Asuncion, Maug and Uracas islands in the Commonwealth of the Northern Mariana Islands (CNMI). They include the some of the world's most pristine coral reefs and the ocean's deepest canyon, with important scientific, cultural, and historic value. The President's action to safeguard these areas would create the largest protected area on Earth —891,000 square miles of relatively healthy coral reef islands and linked pelagic and deep water marine ecosystems.

Marine Conservation Biology Institute (MCBI) and Environmental Defense Fund (EDF) recommend providing these unique national treasures full protection as marine national monuments, meaning no extractive activities such as mining, drilling, and fishing would be allowed. While we support protection for the area being assessed in CNMI, we focus our specific comments to the US possessions in the central Pacific and Rose Atoll in American Samoa.

Areas of Scientific Interest

The pelagic and abyssal marine realms are the least protected ecosystems on Earth. Much of the ocean is still treated as a frontier zone where anything goes; human management, such as it is, has not been effective in stopping the decline of fish and shark populations, sea turtles, seabirds, marine mammals or food webs vital to our planet. Moreover, the decline of ocean life has outpaced scientific exploration and research, leaving us unaware and uneducated about marine life and ecosystems that could benefit mankind. Although we have recognized the importance of coral reefs, both ecologically and economically, there are precious few coral reef islands left in the Pacific – or anywhere on the planet -- that remain in a relatively healthy state,

and more of them are being degraded with each passing year. The relatively pristine ecosystems currently being assessed for conservation action are valuable in their own right, and are among the last places on earth where we can conduct scientific research to better understand baseline ecosystem structure and function. For example, research in the central Pacific "Line Islands" is beginning to show the importance of alleviating human-induced stresses like fishing and pollution around coral reefs to enable them to recover from disease brought on by climate change.

The eight low reef islets and atolls and their surrounding waters (including both the possessions in the central Pacific and Rose Atoll in American Samoa, and referred to herein as 'the islands' or the 'eight islands' or 'assessment areas') are of scientific interest for several reasons. To begin with, the islands and their near shore waters and submerged lands provide habitat for hundreds of species of fish, corals and other invertebrates, endangered sea turtles, and marine mammals; moreover, new species are being documented with each new research expedition. The surrounding waters provide dynamic and heterogeneous pelagic habitats that are shaped by the interplay of various physical, chemical and biological processes. Large pelagic fishes, such as tuna, swordfish, marlin, and oceanic sharks are still found in these waters, even though their populations have been significantly depleted in the past 50 years; an estimated 90% of all large predatory fish worldwide have been wiped out, though the exact status of commercially exploited populations in the Pacific varies. An estimated 14 million seabirds of 19 species congregate around or breed on the eight islands. These birds forage in the surrounding pelagic waters out to 200 nm and farther, feeding themselves and their chicks. The seafloor of the pelagic zone, virtually unexplored, is dotted with an estimated 200 seamounts and other unexplored geological features. These underwater mountains typically harbor large numbers of endemic species, just as archipelagos like the Galapagos and Hawaiian Islands do, and appear to function as feeding stations and engines of ocean productivity.

If fully protected as marine national monuments with no extractive uses, the eight islands would be havens for all kinds of marine wildlife, and a precautionary bulwark against the degradation and decline of marine ecosystems in the Pacific which continues to unfold at an alarming rate. In addition, the areas would provide restoration benchmarks for other Pacific nations which are increasingly working to restore their own degraded coral island and pelagic ecosystems. This guards against the "shifting baseline" phenomena, whereby our expectations of ecosystem health diminish over time because we cannot remember what healthy systems are supposed to look like; consequently, we pass on a poorer natural legacy to future generations. Finally, the islands would be ideal places to monitor the ocean impacts of global climate change, such as coral bleaching and ocean acidification.

Presidential Leadership

Action by President Bush to conserve the areas is appropriate and timely for a number of reasons. First, President Bush already has demonstrated his personal interest in the oceans through implementation of his Ocean Action Plan, including a call to end overfishing. Furthermore, in 2006, the President employed his authority under the Antiquities Act to proclaim the Papahānaumokuākea Marine National Monument in the Northwestern Hawaiian Islands (NWHI), a 140,000 square mile pelagic marine and islands ecosystem with scientific and ecological values comparable to those in the central and western Pacific. Protecting the rest of our Pacific island ecosystems would be a natural and culminating step on the President's part.

Second, the President has clear authority under the Antiquities Act to establish national monuments to protect lands, submerged lands and marine waters of scientific interest that are controlled by the US Presidents have repeatedly used the Antiquities Act to permanently protect lands and waters of unique importance interest to America's natural and cultural heritage because of their scientific values. In fact, since first used by Theodore Roosevelt, all but two succeeding presidents have used the Act to establish one or more national monuments.

Third, protection is politically feasible because the islands are under US control, mostly uninhabited, and principally used for conservation; yet without formal protections extending to the exclusive economic zone, ecosystem degradation is likely. Six of the eight islands are federal national wildlife refuges in their entirety, managed by the US Fish and Wildlife Service (FWS). Part of Johnston also is a refuge. Although Wake and Johnston are under Department of Defense (DOD) management, their nearshore waters are closed to a distance of 3 nautical miles (nm) for defense purposes, thereby providing de facto conservation zones. All of the islands are uninhabited except for a handful of scientific researchers and government staff at Palmyra, and about 125 personnel who maintain the Air Force base at Wake. FWS allows limited recreational fishing at Palmyra, but has closed all the other refuges to recreational fishing and all island refuge waters to commercial fishing. Commercial fishing, mainly for four species of tuna, occurs episodically in the US exclusive economic zones (EEZ) of Howland, Baker, Johnston, Palmyra, Kingman, Jarvis and Johnston. The status of yellowfin and bigeye tuna is a cause for concern; both species are likely being overfished and are now fully exploited. The fish caught in these pelagic waters make up about 7% of the Honolulu-based longline fleet's annual catch, and about 3% of the purse seine fleet catch. Both of these fleets obtain the vast majority of their catch from regions outside of the waters being considered for protection. Because the health of the nearshore systems is linked to the health of the pelagic systems, for example

through the ecosystem-structuring roles played by large pelagic predatory fish, it is necessary to extend protections to cover the entire linked system.

Fourth, full protection of the eight islands will be well received by other Pacific nations and by the public at large. President Bush's permanent protection of the Northwestern Hawaiian Islands generated an outpouring of praise from scientists, conservationists and the public at large. Why? Because there is widespread recognition that the oceans need more protection, especially no-take reserves, to protect and restore marine life. One hundred ninety-four US scientists have signed a letter to President Bush calling for the islands protection (see Appendix 1). Furthurmore, there is a growing movement among Pacific states, large and small, to protect and recover their pelagic and coral reef ecosystems and manage their fisheries more sustainably. Soon after President Bush proclaimed Papahānaumokuākea Marine National Monument, the island state of Kiribati established a marine protected area approximately 158,000 square miles in size. Other nations like Australia and New Zealand have been developing national systems of marine reserves for a number of years. Protecting our own unique islands and their surrounding pelagic areas would make the US a world leader in ocean conservation.

Recommendations for Protection

General recommendations and use

In general, we recommend that the eight islands be fully protected to the outer boundary of the US EEZ as marine national monuments in order to safeguard these rare, relatively pristine and intact ecosystems. Rose is the only exception due the Governor's recommendation that a monument extend to 12 nm. Resource extraction should be prohibited on all of the islands, in the waters of the EEZ and on the seafloor, with certain limited exceptions. The purposes of the monument should be to protect and restore the scientific and historic resources therein, and to maintain natural biodiversity and ecological processes. Uses of the monument would be limited to scientific research, education, and wildlife viewing by permit.

Management

Because of the existing FWS presence on the ground and its extensive management knowledge and experience in the islands, we recommend FWS retain its full and exclusive authority over the islands and nearshore waters to a distance of 12nm, where it has such jurisdiction now, and that is jurisdiction be expanded to 12 nm at the rest of the islands where it currently has a 3 nm boundary. With the exception of Rose Atoll, NOAA should manage the 12 to 200 nm zone

around the islands as a pelagic biological reserve under its authorities. The President should direct NOAA and FWS to coordinate their research and law enforcement activities in their respective zones of management. The area around Rose should be cooperatively managed with the Government of American Samoa. Furthermore, adequate funds must be provided to NOAA and FWS for effective outreach and education to increase understanding of these rare natural gems, as well as for monitoring and enforcement of the areas with the assistance of the Coast Guard, which also needs additional funds.

The following principles should apply to the areas under consideration:

- Commercial extractive activities are prohibited, including mining and drilling.
- Ships waste discharges and other discharges are prohibited unless relevant national and international treatment standards are met.
- Commercial fishing is prohibited in the 12 nm zone.
- Commercial fishing in the 12 to 200 nm zone is capped at the average catch level for the last five years, and terminated within three years.
- Recreational fishing is prohibited in the 0- 12 nm zone and the 12- 200 nm zone. Exceptions are that fishing in the 0-12nm zone around Palmyra Island is capped at the average catch level for the last five years. FWS is authorized to manage recreational under the Refuge Administration Act and consistent with the management goals of the monument.

The special circumstances of the two military-managed islands call for special measures:

- Johnston Island and surrounding waters to 12 nm is transferred to the Department of the Interior immediately and managed by FWS as a refuge, with funding provided for staff to be based on the island.
- Wake Island remains under DOD management until such time as the DOD declares the island surplus to its needs, at which time it would revert to the Department of the Interior.
- Interior and DOD are directed to negotiate a cooperative wildlife management agreement for Wake Island's emergent lands. FWS and DOD are directed to co-manage the land areas and wildlife as mutually agreed upon. Funding is provided to place FWS staff on the island for wildlife law enforcement and management purposes.
- The marine waters of Wake to a distance of 12 nm are designated as an overlay national wildlife refuge with primary management authority granted to FWS. Recreational fishing in the 0-12nm zone around Wake Island is capped at the average catch level for the last five years; or if such statistics are not available, appropriate regulations should

be issued by FWS. FWS is authorized to manage recreational fishing under the Refuge Administration Act, consistent with the management goals of the monument.

- The waters from 12 to 200 nm at Wake are managed by NOAA as a fully protected area.

Military activities

As per the President's memo of August 26, 2008, DOD should be permitted to continue any activities it deems necessary for national defense in the waters surrounding Wake and the other islands.

Conclusion

In sum, the natural resource values of our eight Pacific islands are superb, the need for their conservation is clear, and the timing is right for bold leadership by President Bush who is the only one with the ability and authority to act swiftly and decisively to protect these national treasures. Should the President protect these places, he would make conservation history by establishing the world's largest protected area and laying the foundation for a national system of ocean reserves. Theodore Roosevelt laid the seeds for the national park system through his proclamation of 18 national monuments. President Bush can leave a comparable ocean legacy by protecting our unique Pacific island ecosystems.

LANDS, WATERS AND ECOSYSTEMS OF NATIONAL HISTORICAL AND SCIENTIFIC INTEREST

The eight assessment areas in the central Pacific include a number of small coral reef islands and atolls and surrounding waters that lie within the United States Exclusive Economic Zone (EEZ). The collective size of the eight areas being assessed is approximately **779,430 square miles**, an area three times the size of Texas. Although these ecosystems share many of the same flora and fauna, there are important distinctions between them due to geographic location, biological assemblages, stage of geologic evolution, and historic and current use.

The islands are of national significance, both historically and scientifically. This document focuses on the scientific and biological value of the areas, the writers' area of expertise. However, it is generally known that these islands have played a significant role in the pageant of human history.

Historical themes

Here we briefly highlight some of the well known historical themes. Detailed documentation may be obtained from the managing government agencies—the Department of Defense, Department of the Interior, Department of Commerce, and the Government of American Samoa; from the National Park Service, which maintains the National Register of Historic Places and other historical data bases; and from cultural and historical organizations and individual historians.

Exploration and Discovery. The islands were discovered, explored and claimed at different times by several European powers in the race to find riches and desirable lands to claim. Pre-European exploration by early Polynesians and Micronesians also is likely to have occurred on many of the islands although little evidence as of yet has been discovered. Rose Atoll was discovered in the 19th century. An attempt to establish a fishing station and coconut plantation by Germans failed, and the island has been unpopulated ever since.

Human settlement and development. Because of their remoteness, small size and lack of fresh water and other resources, none of the islands were settled at the time of discovery. Small US civilian settlements were made on Howland, Baker and Jarvis in the 1930s to solidify US claims, but these occupants were withdrawn after WWII. Palmyra Atoll was inhabited by the military during WWII, and by its private owner. The Nature Conservancy now oversees a small research facility on Palmyra capable of housing approximately 20 scientists and staff. Johnston Island was claimed by the US in the mid-19th century and occupied during WWII and the Korean War.

The base on Johnston was closed in 2004. Rose Atoll was visited by Samoans for harvest of several species including the giant clam used for cultural celebrations, but was too small for settlement. Wake Island has been occupied by the US military since the 1930s.

Military Use. The islands played a key role in the run up to World War II and during the conflict. The US occupied Wake, Johnston, Howland, Baker, Jarvis, Kingman and Palmyra with US troops and airbases during the war, and extensive changes were made to the landscapes. Wake was the site of two battles with the Japanese in 1941, and was the first US territory conquered by Japan. Several of the larger islands continued to be used for defense purposes after WWII until they were decommissioned. Wake is a National Historic Landmark and is the only island still in active military use.

Aviation. The islands also played an interesting role in US aviation history. Kingman and Wake were once used as commercial seaplane landing spots in the 1930s. An airstrip on Howland was the intended destination of Amelia Earhart before her airplane disappeared.

Resource Use and Conservation. The islands were exploited for their fish and wildlife by early Micronesian and Polynesian peoples, and Western explorers, whalers and other ship's crews. Five islands were claimed under the Guano Act, and three of them mined for guano until deposits ran out[1] After WWII most the islands were converted to conservation status as FWS-managed wildlife refuges. They are now sites for biodiversity conservation and ongoing scientific research. Commercial fishing for tuna is the main extractive use in the pelagic zone; fish taken from the islands' EEZs make up approximately 5% of the US tuna fleet's annual catch.

Scientific Values

The scientific values of the islands and their surrounding EEZs are superlative, as has been documented by successive research expeditions over the last 100 years, and the Palmyra field station. Given the increasing degradation of the Pacific region due to hundreds of years of human settlement and resource exploitation, the eight US islands' highest and best use is for conservation, restoration, and research and exploration of Pacific marine ecosystems. The overarching scientific values of the areas are summarized and discussed below. More detailed fact sheets on each island are found in Appendix 2.

The eight US Pacific islands are home to some of the healthiest marine ecosystems remaining in the world; compared to other areas, they are relatively intact and rich in natural resources. The

[1] Maragos, J. et al. 2008. US Coral Reefs in the Line and Phoenix Islands: Chapter 15 and 16, in Riegl, B. M. and R. E. Dodge, editors. 2008. Coral Reefs of the USA.

islands have nearly four times as many shallow-water, reef-building coral species as the Florida Keys, and are home to hundreds of fish species, dozens of seabird species, and an untold number of invertebrate species, including many found nowhere else. Seldom visited, and mostly uninhabited, the islands' surrounding marine waters are relatively free from the problems of other marine ecosystems, such as over-exploitation, disturbance, introduction of exotic species, and pollution.

It is within this context that the great scientific value of these island areas must be understood – they offer a unique window into the past. Nowhere else do we have such a remarkably intact tropical ecosystem from which to develop baselines for scientific study. Large sharks still inhabit the coral reefs keeping the ecological balance intact. The abundance of other larger predatory fish is also quite high, including endemic and rare species. These systems need to be protected lest we forget what a healthy ocean looks like, and how an intact ecosystem functions. This latter point is even more significant given future uncertainty due to rising levels of atmospheric CO_2 and its impacts.

The islands are significant for their intact coral reef ecosystems, their diverse fish and invertebrate communities, the habitat they provide for millions of seabirds, and the sanctuary they offer many threatened and endangered species. Dozens of marine and terrestrial threatened, endangered, depleted and endemic species still thrive here, but are missing or rapidly vanishing elsewhere in the world. Oceanic sharks and tunas hunted throughout the Pacific have nowhere to hide from fishermen, but around the islands fishing impacts are thought to be relatively minor. The eight islands serve as critical components of flyways for seabirds and migratory shorebirds, and as stepping stones for many coral reef species and marine mammal colonizers that are now established throughout the Pacific. They may also play an important role in the life cycles of tunas and other large pelagic fish.

An estimated 14 million seabirds representing 19 species use the islands as critical stopover points, as well as breeding areas and feeding grounds. These species include tropicbirds, boobies, frigatebirds, terns, noddies, petrels, shearwaters and albatrosses. Large tunas are still providing an important ecological function to foraging seabirds at these remote islets and atolls. Tunas drive prey, such as squid, towards surface waters where they are easily caught by seabirds. In short, seabirds rely on the tunas to help them feed their chicks. Protecting the waters around the islands from fishing is critically important to maintaining seabird populations.

But not everything is without concern. Historical uses, primarily military ones, have left the islands with lingering problems, some of them serious, including alien species and rodent

infestations, altered landscapes, leaking waste dumps, and discarded equipment and materials. Some of these problems are being addressed, but much remains to be done. Commercial fishing may have removed as much as 90% of the ocean's top predators, and the islands' surrounding waters may also have been affected, though little has been documented on a site-specific basis. Illegal fishing also occurs in US waters, though its extent is not known. In an ocean where impacts from so many different activities weigh heavily on the ecosystems, these eight islands offer unparalleled opportunities for the study of natural and intact ecosystems, and new discoveries.

GEOLOGY OF ISLANDS AND SUBMERGED LANDS

FWS biologist James Maragos has succinctly summarized the central Pacific islands' geology and biological value:

> The Ancient U.S. Reef Islets and Atolls in the Central Pacific are among the World's oldest living biogenic formations, in the World's oldest and largest ocean, forming first as volcanoes and then subsiding and evolving into reefs while moving slowly northwest…to their present central Pacific locale over the past 70 million years or more. They serve as the last of the reef frontiers in the central Pacific, never permanently inhabited throughout their entire history and within the remotest part of the tropical Pacific Ocean. They were the last to be visited and occupied over the past several centuries and the first of their kind to be afforded full protection. Consequently, they are among the most pristine coral reef ecosystems of Pacific, serving as critical components of flyways for seabirds and migratory shorebirds, and marine highways and stepping stones for many coral reef species and marine mammal colonizers that are now established in the southeastern Pacific. Dozens of marine and terrestrial threatened, endangered, depleted and endemic species thrive on the islets and reefs that are missing or rapidly vanishing elsewhere in the World. All major oceanic boundary currents in the tropical Pacific drift by these islands and reefs, subsidizing unique upwelling zones at some of the reefs….Their ancient reef rock formations of thousands of feet thickness and laid down over millions of years, cap the tops of drowned volcanoes and have preserved the ancient climatic and oceanic history of the Pacific Ocean and World to this day, including the evolution of the marine species that now construct these features."[2]

[2] Maragos, J., A. Friedlander, S. Godwin, C. Musburger, R. Tsuda, E. Flint, O. Pantos, P. Ayotte, E. Sala, S. Sandin, S. McTee, D. Siciliano, and D. Obura. 2008. U.S. coral reefs in the Line and Phoenix Islands, Central Pacific Ocean: status, threats and significance. In: Riegl, B. and Dodge R.E., editors. Coral reefs of the USA. Coral reefs of the world, Vol. 1, Springer–Verlag, p. 1-73.

These Darwinian atolls of the central Pacific are outstanding examples of how healthy coral reefs should look. Similarly, undersea geological features, including seamounts, are little disturbed and almost completely unexplored by scientists. They offer a rare glimpse into untrammeled deep ocean ecosystems.

Seamounts

In addition to the shallow water coral ecosystems, there are likely dozens of undescribed seamounts found in the EEZs of these eight areas. Only a very small number (~300) of the estimated 14,000-100,000 seamounts worldwide have been visited and sampled by scientists. Consequently, the deep water species and ecosystems of these seamounts remain undiscovered.

Assessment Island Area	**Documented Seamounts in EEZ[3]**	**Predicted Seamounts in EEZ[4]**
Wake	2	39
Johnston	18	95
Howland and Baker	5	13
Kingman and Palmyra	6	58
Jarvis	1	22

A seamount is a mountain rising from the seabed, but which does not reach the sea surface of the ocean. Seamounts are widespread throughout the world's oceans, and can arise along the mid-ocean ridges or as isolated features on the seafloor. Most often they occur in chains or clusters. Nearly all seamounts are volcanoes. Some are still erupting actively, such as Loihi seamount, southeast of Hawaii which will become a new Hawaiian island many thousands of years from now. Others, such as the Emperor Seamounts northwest of the Hawaiian Islands, stopped erupting tens of millions of years ago.

Most of the world's ocean basins are flat, muddy abyssal plains, but seamounts are solid rocky mountains that tower above the plains. Because the nature of the substrate is one of the most important factors affecting the kinds and abundance of seafloor life, seamount species and ecosystems are very different than those of the surrounding abyss. Furthermore, seamounts protrude into the water column and have dramatic effects on the water currents around them. These currents both remove fine sediments from seamounts and bring them an unending

[3] http://seamounts.sdsc.edu
[4] Kitchingman, A. and S. Lai. 2004. Global seamount location database, Sea Around Us Project, University of British Columbia.

supply of nutrients. Therefore, seamounts often attract a remarkable diversity of fishes and other open ocean animals.

Because food availability above and on seamounts is often higher than in surrounding waters and seafloors, seamounts are biological hotspots that attract a diverse fauna. Pelagic predators such as sharks, tunas, billfishes, sea turtles, seabirds and marine mammals often congregate above seamounts. Deep-sea fish species such as orange roughy and eels gather on seamounts to spawn. Animals that live on the rocky crests and slopes of seamounts can also be very diverse and abundant. These include many suspension-feeding animals, such as deep-sea corals and sponges. Corals are especially important in seamount ecosystems because they can form extensive, complex but fragile three-dimensional structures that provide habitat for many other kinds of animals. On some seamounts, scientists have found many new species.

One of the most exciting findings in biological oceanography in the last decade has been the discovery that some seamounts have high levels of endemic species, that is, species found on only one seamount or seamount chain. Some of this endemism may be due to the fact that so few seamounts have been explored by biologists that we lack adequate data to know which species are truly unique. Nonetheless, studies of some seamounts have found a high percentage of endemic species, as high as 35% or more[5]. On one seamount, half of the invertebrate species found were new to science. Some seamounts are "lost worlds" having enormous pools of undiscovered new species.

Given the numbers of seamounts and high levels of endemism, seamounts may well harbor the largest number of undiscovered large marine species left on Earth. Unique and undiscovered seamount species hold tremendous potential as medicines and for biomedical research. Many deep-sea species contain compounds that are currently in clinical trials to treat diseases such as cancer and AIDS. There is strong scientific evidence that deep sea biodiversity holds major promise for the treatment of ills that plague mankind.

BIOLOGY OF ISLANDS AND SURROUNDING WATERS

Coral Reefs

Coral reefs represent one of the most diverse ecosystems on Earth, but are among the most threatened. Reef ecosystems are highly sensitive to human induced stressors including:

[5] Parin, N. V., A.N Mironov, and K.N. Nesis. 1997. The Nazca and Sala y Gomez submarine ridges: an outpost of the indo-west Pacific fauna in the eastern Pacific. p. 145-242 *In;* Gebruk, A. V., Southward, E. C. and Tyler, P. A. (eds). Biogeography of the oceans. advances in marine biology 32. Richer de Forges, B. R., J.A. Koslow, and G.C.B. Poore. 2000. Diversity and endemism of the benthic seamount fauna in the southwest Pacific. Nature 405: 944-947.

overfishing, pollution, sediment runoff, and climate change (increasing sea surface temperatures and ocean acidification). The majority of coral reefs globally, many of which were in pristine condition only a few decades ago, are threatened from the combination of human impacts listed above[6]. It is believed that undisturbed coral areas that are located in isolated regions far from the direct impacts of human activity are more resilient and will have the best chances of survival over the long term.

The uninhabited islands and coral atolls under US jurisdiction in the central Pacific are a prime example of isolated coral areas that have an excellent chance for survival. This region is one of the only known areas that still possess healthy coral reefs with very high coral cover (> 50%) and intact trophic structure[7]. The coral ecosystems of the central Pacific are unspoiled; Kingman Reef in particular has been described as one of the most pristine coral reefs on the planet[8]. These areas have not been overfished and have largely escaped the devastating bleaching events that have affected coral reefs in other regions of the world. Healthy reef communities with relatively intact food webs like those found around Kingman, Jarvis, Howland, and Baker islands are the best representative baseline reefs in the Pacific. They have top predator biomasses greater than other well protected areas like the Great Barrier Reef in Australia or the Northwest Hawaiian Islands. Palmyra Atoll and Kingman Reef lie within the inter-tropical convergence zone and the eastward moving Equatorial Countercurrent. These currents bring larvae from the biologically diverse western Pacific Ocean and deposit them in the waters of these islands. Johnston Island is thought to be an important source of coral, fish, and gastropod larvae for the Papahānaumokuākea Marine National Monument and other neighboring reefs and islands within the Line Islands group[9].

The central Pacific areas collectively contain nearly four times the number of shallow-water reef-building coral species as the Florida Keys,[10,11] Palmyra atoll alone is estimated to harbor three times the number of coral species found in Hawaiian waters, and five times the number of species found in the waters off the Florida Keys[12]. Approximately 200 species of stony corals and two dozen other prominent cnidarians such as anemones, black corals, corallimorphs, and

[6] Jackson. J. 2008. Ecological extinction and evolution in the brave new ocean. PNAS:11458-11465.
[7] ibid.
[8] Sandin, S.A., J.E. Smith, E.E. DeMartini, E.A. Dinsdale, S.D. Donner, et al. 2008. Baselines and degradation of coral reefs in the northern line islands. PLoS ONE: 1-11.
[9] Maragos, J. et al. 2008. US Coral Reefs in the Line and Phoenix Islands: Chapter 15 and 16, in Riegl, B. M. and R. E. Dodge, editors. 2008. Coral Reefs of the USA.
[10] http://floridakeys.noaa.gov/sanctuary_resources/specieslist.pdf
[11] Maragos, J. et al. 2008. US Coral Reefs in the Line and Phoenix Islands: Chapter 15 and 16, in Riegl, B. M. and R. E. Dodge, editors. 2008. Coral Reefs of the USA.
[12] Federal Register. 2007. Palmyra Atoll National Wildlife Refuge and Kingman Reef National Wildlife Refuge. Federal Register. 287771-25773.

hydrozoans have been reported around the central Pacific islands. For instance, Kingman Reef and Palmyra Atoll have over 180 coral and other cnidarian species, the highest in the central Pacific[13]; some of the deepest reef building corals have been documented in Johnston Island waters[14]. Rose Atoll supports 113 species of stony corals and supports one of the largest remaining populations of the globally depleted Giant clam (*Tridacna maxima*) in Samoa[15]. Recent expeditions photographed many deep water species yet to be identified, including stalked crinoids and several deepwater fish in these waters around Rose Atoll[16].

The reefs of the central Pacific Islands also provide safe harbor for a number of reef building corals with an "elevated risk of extinction"[17] and have proven themselves to be remarkably resilient in the face of climate change. Currently there are a number of threatened hard coral species around the central Pacific islands.

Number of Threatened Hard Coral Species in Proposed Areas in the Central Pacific[18]

Proposed Area in Central Pacific	Number of Species
Kingman Reef & Palmyra Atoll	12
Baker & Howland Islands	27
Johnston Atoll	7
Rose Atoll	58

The assessment islands and atolls are more resilient to stress and have demonstrated a greater capacity to survive and/or recover from major disturbances including bleaching events and outbreaks of coral disease. Other reefs in the Pacific, some of which have the highest biodiversity in the world, have been unable to recover from similar events because they are not located in remote areas, and are compromised by pollution, sedimentation, overfishing and runoff[19]. The coral reefs of the assessment islands are relatively unthreatened by these factors and are therefore likely to be much more resilient to future changes resulting from climate change.

[13] ibid.
[14] Lobel, P.S. and L.K. Lobel. 2008. Chapter 17: aspects of the biology and geomorphology of Johnston and Wake Atolls, Pacific Ocean. In: Coral Reefs of the USA I (eds BM Riegl and RE Dodge) Springer p. 806
[15] http://ccma.nost.noaa.gov/stateofthereefs
[16] Green, A and P. Craig. 1999. Population size and structure of giant clams at Rose Atoll, an important refuge in the American Samoan Archipelago. Coral Reefs 18:205-211.
[17] Elevated risk of extinction means they are either 'vulnerable', 'endangered', or 'critically endangered' according to the IUCN.
[18] Carpenter, K. et al. (2008). One-Third of Reef-Building Corals Face Elevated Extinction Risk from Climate Change and Local Impacts. *Science*, 1-5.
[19] Sandin, S.A., J.E. Smith, E.E. DeMartini, E.A. Dinsdale, S.D. Donner, et al. 2008. Baselines and degradation of coral reefs in the northern line islands. PLoS ONE: 1-11

To sum up, the reefs of the central Pacific islands are arguably the jewels in the crown among US coral reef ecosystems. Their geographic isolation, lack of human population, relatively healthy coral ecosystems, and ability to recover from disturbances, make them ideal areas for full protection.

Reef Fish

Recent studies show that coral reefs within the eight areas are among the most biomass-rich reefs and atolls in the central, if not the entire, tropical Pacific. Fish assemblages at Howland, Baker, and especially Jarvis Islands have some of the highest biomass and the greatest number of predatory fish of any reefs yet described[20]. Kingman Reef in particular is recognized as a near-pristine relict of natural coral reef ecosystems, and now represents the new baseline standard against which to compare other central Pacific reefs degraded by human impact. Total reef fish biomass at Palmyra atoll in 2005 was over twice as great as that found along the inhabited coastline of Kiritimati, where the human population is relatively dense, and in turn total fish biomass at Kingman was nearly twice that at Palmyra[21].

Unlike degraded reefs, these pristine reefs have exceptionally high numbers and biomass of top predators. Differences in shark abundance and diversity between Kingman (pristine) and Kiritimati (impacted) are extreme; in 2005 reef sharks comprised 62% of total fish biomass at Kingman, in stark contrast to their complete absence at Kiritimati during the same time period. Dr. J. Jackson examined all available evidence (mostly anecdotal) for the apparently marked historical declines in shark abundance at some central equatorial Pacific islands, noted the strong inverse relation between human population density and the abundance of sharks and other large predatory fishes, and concluded that overfishing has been the most likely cause of the observed declines. A similar conclusion was drawn regarding the low numbers of grey reef sharks along the southern margin of Wake Atoll; reasons for this are not clearly understood, but the island's civilian work force frequently fished for sharks and dried their fins, particularly in the south where access was easier and seas calmer than other parts of the island[22].

The diversity of reef fish found in the these eight areas is not as high as other islands in the tropical Pacific (typically ~300 species vs ~600 in the Hawaiian Islands and ~1350 in Palau) probably due to their small area, limited habitat diversity and large distance separating them

20 Maragos, J. et al. 2008. US Coral Reefs in the Line and Phoenix Islands: Chapter 15 and 16, in Riegl, B. M. and R. E. Dodge, editors. 2008. Coral Reefs of the USA.
21 Ibid.
22 Lobel P.S., and L. K. Lobel. 2008. Aspects of the biology and geomorphology of Johnston and Wake Atolls, Pacific Ocean. In: Riegl, B. and Dodge R.E., editors. Coral reefs of the USA. Coral reefs of the world, Vol. 1, Springer 806p

from other population sources[23]. The islands may however, play an important role as larval sources, stepping stones or refuges for reef fish that are found elsewhere in the tropical Pacific. The fish community of Wake Atoll represents a mixture of species from the Marianas Islands and Hawaii[24], including the Hawaiian endemic *Sebastipistes ballieui*. Johnston Atoll's fish fauna is dominated by Hawaiian species; however some species are indigenous only to Johnston and the Line Islands, but not found farther north in Hawaii. Johnston Island therefore represents an overlap point between fish species from the two regions[25]. Some of the fish species on Johnston may be sub-species of those found elsewhere; the pygmy angel has been identified as endemic to the island.

These relatively un-impacted islands provide refuge for reef fish that have been severely depleted elsewhere. The humphead wrasse (also known as the Maori or Napoleon wrasse) and the bumphead parrotfish, are listed by the International Union for the Conservation of Nature (IUCN) as endangered and vulnerable, respectively[26]. The humphead wrasse is highly prized in the live reef food fish export trade. Males can reach six feet long and weigh several hundred pounds. Only rarely are fish of this size seen anymore, except in remote unfished locations. The humphead is particularly sensitive to fishing pressure since it is slow growing, late to mature and forms aggregations that can be fished easily. Fishing often occurs at night by spear fishing and cyanide, with protection typically weak or non-existent[27]. The humphead has been severely depleted, to the point of extirpation, in some places. Both the humphead and bumphead parrot fish occur in higher numbers at sites located far from human populations, with the highest densities found at Wake Atoll. It is critical that these species be protected from human activity since both have already been driven to local extinction[28]. Protection of the assessment islands would not only provide refuge for these large and valuable fish, but also for other reef species that are suffering from the same pressures.

[23] Maragos, J. et al. 2008. US Coral Reefs in the Line and Phoenix Islands: Chapter 15 and 16, in Riegl, B. M. and R. E. Dodge, editors. 2008. Coral Reefs of the USA.

[24] Lobel P.S., and L. K. Lobel. 2008. Aspects of the biology and geomorphology of Johnston and Wake Atolls, Pacific Ocean. In: Riegl, B. and Dodge R.E., editors. Coral reefs of the USA. Coral reefs of the world, Vol. 1, Springer 806p

[25] Ibid.

[26] Zgliczynski B, R. Schroeder, M. Nadon, B. Richards. 2008. Pacific-wide status of the rare/endangered humphead wrasse (Cheilinus undulatatus) and bumphead parrotfish (Bolbometopon muricatum). 11th International Coral Reef Symposium, Ft Lauderdale (Abstract)

[27] Sadovy, Y., M. Kulbicki, P. Labrosse, Y. Letourneur, P. Lokani, T.J. Donaldson. 2003. The humphead wrasse, Cheilinus undulates: synopsis of a threatened and poorly known giant coral reef fish. Reviews in Fish Biology and Fisheries 13(3): 327-364

[28] Zgliczynski B, R. Schroeder, M. Nadon, B. Richards. 2008. Pacific-wide status of the rare/endangered humphead wrasse (Cheilinus undulatatus) and bumphead parrotfish (Bolbometopon muricatum). 11th International Coral Reef Symposium, Ft Lauderdale (Abstract)

Large Predatory Fishes

Large predatory fishes, such as sharks, tunas and billfishes, are a key component of pelagic ecosystems. They are highly migratory, ranging widely throughout the tropical central and western Pacific. The tuna populations of this region are distinct from the eastern tropical Pacific tuna populations and other areas in the Pacific. Four species of tuna are common to this region: skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*), bigeye (*Thunnus obesus*), and albacore (*Thunnus alalunga*). There is growing concern over the regional status of bigeye and yellowfin which are likely overfished or close to the threshold. Within the US EEZ of the eight islands, bigeye and yellowfin are targets of the longline fishery in and around Johnston, Palmyra and Kingman Reef, while the other species are more commonly targeted by the purse seine fleet near the equator in the waters of Howland, Baker and Jarvis. Other pelagic fishes that are kept by the longline fleet are blue marlin, black marlin, striped marlin, swordfish, sailfish, short-billed spearfish, mahi mahi, wahoo and bluefin tuna.

In 2003, a widely reported scientific report estimated the decline of large predatory fishes such as tunas at nearly 90%[29]. Among the populations of pelagic fishes that are greatly reduced are many species of oceanic sharks – the top predators in marine ecosystems. In 2006, another analysis further reported a 74% global decline in pelagic fishes from the pre-exploitation, pristine state[30]. Globally it is clear that pelagic fishes are being unsustainably fished, and that without drastic improvements in management they will not recover.

The loss of these top predators has significant impacts on the structure of ecosystems[31.] As explained in greater detail in this document, tunas are important to the foraging success of seabirds in the tropics as they drive small fish and squid to the surface where they are accessible by diving seabirds. Ninety percent declines of tuna stocks must be having deleterious effects on island seabird populations.

Tuna in the region are managed under international agreement by the Western Central Pacific Fisheries Commission. The four species of tuna and a number of other pelagic species provide a relatively small proportion of commercial fishing catch in the waters surrounding these islands. No international vessels are permitted to fish in the US EEZ, and the US purse seine and longline tuna fleets take roughly 5% of their annual tuna catch here. The areas surrounding the more

[29] Myers, R.A. and B. Worm. 2003. Rapid worldwide depletion of predatory fish communities. Nature 423:280-283.
[30] Lotze, H.K., et al. 2006. Depletion, degradation, and recovery potential of estuaries and coastal seas. Science 312:1806–1809.
31 Heithaus, M.R., A. Frid, A.J. Wirsing, and B. Worm. 2008. Predicting ecological consequences of marine top predator declines. TREE 23(4):202-210.

southerly US territories- Jarvis, Howland, and Baker - are of almost no significance to the US tuna longline fleet.

Given the significant role of schooling fish to the health of seabirds on these remote islands, and the small amount of overall catch taken from this region protecting, tuna and other large fishes in the waters surrounding the islands is the best way of ensuring the health of the surrounding pelagic ecosystems. Furthermore, restrictions on fishing in these areas are likely to help sustain these fisheries for the long term. (See Appendix 3 for a detailed analysis and discussion of the tuna fishery.)

Sea Turtles

Sea turtles have been around for a very long time, as evidenced by 150 million year old fossils. Over a century ago, sea turtle populations were at relatively healthy levels. But in the last 100 years, humans have been the cause of massive reductions in sea turtle numbers through direct capture of adults and collection of eggs, and indirectly as by-catch in commercial fisheries. Although destructive gear and irresponsible fishing practices are the main cause of turtle declines today, turtles also face other threats including: entanglement in marine debris, feeding and nesting area destruction, and ingestion of garbage and plastic objects carelessly thrown into the sea. All of these stressors are having a significant impact on the dwindling populations of sea turtles that remain.

Sea turtles are listed as threatened or endangered with extinction by several international bodies and are protected domestically under the Endangered Species Act (ESA)[32]. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) controls the international trade in endangered and threatened species and currently lists all species of sea turtles found in US waters in CITES Appendix 1, as the most endangered animals and plants[33]. Similarly, the International Union for the Conservation of Nature (IUCN) categorizes all sea turtle species as endangered and lists the leatherback sea turtle, which has been documented in all the US Pacific territorial waters, as *critically endangered*[34].

Five species of sea turtle have been documented as present in the eight islands and surrounding waters: green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), and olive ridley (*Lepidochelys olivacea*)[35].

[32] http://www.nmfs.noaa.gov/pr/species/esa/turtles.htm
[33] http://www.cites.org/eng/app/index.shtml
[34] http://iucn.org/about/work/programmes/species/red_list/2008_red_list_summary_statistics/index.cfm
[35] Snover, M., J. Baker, and M. Sullivan. 2007. U.S. Pacific Islands research plan for green turtles (excluding Hawaii). Honolulu: Marine Turtle Assessment Program, PSD, NOAA/NMFS/Pacific Islands Fisheries Science Center.

Green and hawksbill turtles forage and nest in the US Pacific islands, and loggerheads, leatherbacks and olive ridleys forage and/or migrate through US Pacific waters[36]. There are reports of green sea turtles nesting on Baker, Howland, Jarvis[37], Palmyra and Rose[38]. Green sea turtles also swim and forage in the waters surrounding each of these islands, as well as those of Kingman, Wake and Johnston. Hawksbill sea turtles nest on Rose and are found in the waters surrounding Baker[39], Howland[40], Jarvis[41] and Palmyra islands,[42] and Kingman Reef.

The EEZ waters surrounding the assessment islands also are important migration paths for all sea turtle species in the region. These waters are particularly important to the migration of the critically endangered leatherback sea turtle. MCBI obtained from NOAA and mapped satellite tag tracking data for 24 individual leatherbacks (see Appendix 4). The map shows leatherbacks moving through the EEZs of all the assessment areas except Rose Atoll. Considering the extremely low population of leatherback sea turtles globally (90% or greater in decline in the Pacific), and the miniscule percentage that are successfully tagged, the fact these turtles have been tracked navigating US waters demonstrates that these EEZs form part of an important migration route between Indonesia and California[43] and deserve strict protection.

All five species of sea turtles found in US island waters have been documented as bycatch fatalities in US high seas fisheries. Longliners fishing for tuna and other large pelagic fish accidently catch and kill large numbers of sea turtles throughout Pacific waters.[44] A report by Lewison and colleagues, estimated the effects of longline fisheries on turtle species in the entire Pacific:

[36] Balazs, G. 1982. Status of sea turtles in the Central Pacific Ocean. Washington, D.C. p 583: In K.A Bjorndal, editor. Biology and conservation of sea turtles. Smithsonian Inst. Press. National Marine Fisheries Service and US Fish and Wildlife Service. 1998. Recovery plan for the U.S. pacific populations of the green turtle (Chelonia mydas). National Marine Fisheries Service. Silver Spring, MD, p. 84

[37] National Marine Fisheries Service and US Fish and Wildlife Service.1998. Recovery plan for the U.S. Pacific populations of the green turtle (Chelonia mydas). National Marine Fisheries Service. Silver Spring, MD, p.84.

[38] Maragos, J. et al. 2008. US Coral Reefs in the Line and Phoenix Islands: Chapter 15 and 16, in Riegl, B. M. and R. E. Dodge, editors. 2008. Coral Reefs of the USA.

[39] Pacific Remote Islands National Wildlife Refuge Complex. Baker Island National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. (2007): 1 – 142

[40] Pacific Remote Islands National Wildlife Refuge Complex. Howland Island National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. (2007): 1 - 139.

[41] Pacific Remote Islands National Wildlife Refuge Complex. Jarvis Island National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. (2007): 1 - 140.

[42] "Pacific Islands – Rose Atoll NWR." U.S. Fish & Wildlife Service. 22 April 2008. 29 April 2008. http://www.fws.gov/pacificislands/wnwr/prosenwr.html.

[43] Donnelly, M. 2008, October 2. Director of International Policy. Interviewer: Jennifer Felt.

[44] Lewison, R.L., S.A. Freeman and L.B. Crowder. 2004. Quantifying the effects of fisheries on threatened species: the impact of pelagic longlines on loggerhead and leatherback sea turtles. Ecol. Lets. 7:221-231.

> "despite infrequent rates of encounter, the analyses show that more than 200,000 loggerheads and 50,000 leatherbacks were likely taken as pelagic longline bycatch in 2000. The analyses suggest that thousands of these turtles die each year from longline gear in the Pacific Ocean alone. Given 80–95% declines for Pacific loggerhead and leatherback populations over the last 20 years, this bycatch level is not sustainable.[45]"

Turtle bycatch numbers are compiled separately by NMFS observers for the tuna and swordfish fisheries. According to NMFS, tuna purse seine vessels have 100% observer coverage, and the tuna longline fleet has approximately 20% observer coverage. MCBI requested turtle bycatch data for the eight assessment areas from the Pacific Islands Regional Office of NMFS, but has not received this data. One thing in favor of the turtles is that tuna longline sets are "deep sets" that are less prone to hook turtles than shallow sets for swordfish. We recommend CEQ ask for NOAA's data for the considered waters.

As discussed earlier, the economic importance of commercial tuna fishing in the EEZs of the eight assessment areas is relatively small. Altogether, about 5% of the annual tuna catch by US boats comes from the eight islands' EEZs. A fully protected monument would provide much needed sanctuary for migrating, foraging and nesting turtles and their hatchlings, especially if commercial fishing were prohibited within the entire EEZ of the eight islands. Given the precarious status of these sea turtles, full protection is the appropriate action (see Appendix 3 for additional details on fishing).

Seabirds

Seabirds are an important component of marine and coastal communities and play an especially important role in small island ecosystems. Unfortunately, the population of just about every seabird in the greater Pacific islands region is declining[46]. The major threats to seabirds and factors contributing to their decline are the human settlements, nonnative predators such as rats and cats, habitat destruction, direct and indirect fishery interactions, pollution, and global climate change and sea level rise[47]. Protecting and effectively managing the few remaining refuges for seabirds in the tropical Pacific, particularly uninhabited islands and their surrounding waters which the seabirds rely on for food, are essential for the continued health and survival of these species. For a list of seabirds that breed in the central and western Pacific island areas and their conservation status, see Appendix 5.

[45] ibid.
[46] Flint, E. 1996. Status of seabird populations and conservation in the tropical island Pacific. Chapter 9 in: Eldrige, L.G., J.E. Maragos, P.F., Holthus, and H.F., Takeuchi, editors. 1996. Marine and Costal Biodiversity in the Tropical Island Pacific Region. East-West Center.
[47] ibid.

An estimated 14 million seabirds of 19 species use the lands and marine waters of the eight islands for breeding, foraging, or resting (see Appendix 6 for bird counts on the eight islands). These birds are primarily pelagic feeders that obtain the fish and squid they consume and feed to their young by associating with schools of large predatory fish such as tuna and billfish[48]. Large schools of predatory fish force schools of small pelagic fish to the surface where they become easy picking for seabirds; otherwise the fish would be too deep or scattered for the seabirds to reach. It is especially important to have abundant schools of small prey and large predatory fish near breeding colonies because it is much harder for newly hatched and inexperienced birds to find food and successfully feed far from shore and return home safely[49]. Because tropical oceans have very low productivity, predators such as tuna and seabirds are adapted to unpredictable and patchy prey distributions[50]. What food can be found exists mostly in ocean fronts and currents that concentrate nutrients. These zones of high nutrients encourage the growth of plankton and attract small pelagic fish which in turn attracts tunas and seabirds. Commonly, there are eddies that form patches of high nutrients and food availability downstream of remote islands, aided in part by the nutrients brought back to the island and surrounding waters by the seabirds themselves. These areas of high nutrients attract small pelagic fish and in turn attract tunas and seabirds. The presence of natural densities of these tunas within the foraging radius of seabird colonies enhances the ability of birds to provide adequate food for themselves and their chicks[51].

Although some food is available close to shore, breeding seabirds typically have to travel great distances to find enough food to feed themselves and their young[52]. Shorter travel distances translate into energy conservation that will enhance survival of chicks. Several of the longer-ranged species will feed even beyond the 200 nm boundary of the islands. To see how various bird species forage relative to the extent of the US EEZ, see Appendix 7.

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[48] Fefer, S.I., C.S. Harrison, M.B. Naughton, and R.J. Shallenberger. 1984. Synopsis of results of recent seabird research conducted in the Northwestern Hawaiian Islands. Proc. Res. Inv. NWHI UNIHI-SEAGRANT-MR-84-01.

[49] Fish and Wildlife Service. 2008. Personal Communication.

[50] Ashmole, N.P. 1971. Seabird ecology and the marine environment. In: Farner D.S., King J..R., editors. Avian Biology 1:223–286 and Weimerskirch, H., M. Le Corre, S. Jaquemet, M. Potier, and F. Marsac. 2004. Foraging strategy of a top predator in tropical waters: great frigatebirds in the Mozambique Channel. Mar Ecol Prog Ser. 275: 297–308.

[51] Ashmole, N.P. & M.J Ashmole. 1967. Comparative feeding ecology of sea birds of a tropical oceanic island. Peabody Museum of Natural History, Yale University Bulletin 24. Au, D.W.K. and R.L. Pitman. 1986. Seabird interactions with dolphins and tuna in the Eastern tropical Pacific. Condor 88:304-317. Diamond, A.W. 1978. Feeding strategies and population size in tropical seabirds. American Naturalist 112:215-223. Fefer, S.I., C.S. Harrison, M.B. Naughton, and R.J. Shallenberger. 1984. Synopsis of results of recent seabird research conducted in the Northwestern Hawaiian Islands. Proc. Res. Inv. NWHI UNIHI-SEAGRANT-MR-84-01.

[52] Flint, E.N. 1991. Time and energy limits to the foraging radius of sooty terns Sterna fuscata Ibis 133: 43–46. Weimerskirch, H., M. Le Corre, S. Jaquemet, M. Potier, and F. Marsac. 2004. Foraging strategy of a top predator in tropical waters: great frigate birds in the Mozambique Channel. Mar. Ecol. Prog. Ser. 275: 297–308.

Unfortunately, the patchy nature of food resources in the tropical Pacific and the association between tuna and seabirds exposes the birds to higher likelihood of contact with fishing vessels. Of the fisheries occurring in the US EEZ in the tropical Pacific, the most harmful to the seabirds is longlining for tuna. Longlining is a fishing method in which many baited hooks are attached to a fishing line that is typically miles long. Seabirds will get caught on the hooks which are baited with their usual prey and drown. One avian species in particular that interacts with the longline fishery is the globally endangered black-footed albatross. Data from the National Marine Fisheries Service (NMFS) observer program shows that 25 black-footed albatrosses were killed in the three months between April 1 and June 30, 2008 in the longline fishery. In the entire years of 2005, 2006, or 2007, only 12, 17, and 14 black-footed albatross, respectively, were killed in the deep-set longline fishery.

Marine Mammals

The waters surrounding the eight islands are home to many species of marine mammals, many of which are rare or endangered. There are at least 21 species of marine mammals that live in the central and western Pacific and spend some of their time in the assessment areas. These species are shown in Table 1.

Table 1: The status of species under the Endangered Species Act (ESA) and the International Union for the Conservation of Nature (IUCN) for marine mammals that live in the Pacific Remote Island Area, American Samoa, and the Northern Marianas Islands region.[53]

Marine Mammals	ESA Status	IUCN Status
Blainville's beaked whale (*Mesoplodon blainvillei*)		Data Deficient
Blue whale (*Balaenoptera musculus*)	Endangered	Endangered
Bottlenose dolphin (*Tursiops truncatus*)		Data Deficient
Bryde's whale (*Balaenoptera edeni*)		Data Deficient
Cuvier's beached whale (*Ziphius cavirostris*)		Least Concern
Dwarf sperm whale (*Kogia simus*)		Data Deficient
False killer whale (*Pseudorca crassidens*)		Lower Risk
Fin whale (*Balaenoptera physalus*)	Endangered	Endangered
Hawaiian monk seal (*Monachus schauinslandi*)	Endangered	Critically Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered	Vulnerable
Killer whale (*Orcinus orca*)		Data Deficient
Melon-headed whale (*Peponocephala electra*)		Least Concern
North Pacific right whale (*Eubalaena japonica*)	Endangered	Endangered
Pan-tropical spotted dolphin (*Stenella attenuata*)		Least Concern
Risso's dolphin (*Grampus griseus*)		Data Deficient
Rough toothed dolphin (*Steno bredanensis*)		Least Concern
Sei Whale (*Balaenoptera borealis*)	Endangered	Endangered
Shortfinned pilot whale (*Globicephala macrorhynchus*)		Lower Risk
Sperm whale (*Physeter macrocephalus*)	Endangered	Vulnerable
Spinner dolphin (*Stenella longirostris*)		Data Deficient
Striped dolphin (*Stenella coeruleoalba*)		Least Concern

The life histories and conservation status of many of these species are not well known due to the difficulty and cost of research. However, it is safe to assume that many of these species rely on the waters surrounding the US islands to some degree for food, mating, calving, migration or play; many of the details await discovery.

[53] Data from Western and Central Pacific Fisheries Commission- Scientific Committee. 2008. Annual Report – Part 1 Information on Fisheries, Research, ad Statistics. WCPFC-SC4-AR PART 1/WP-31. ; http://www.nmfs.noaa.gov/pr/species/esa/ ; http://www.iucnredlist.org/ ; http://www.wpcouncil.org/protected/species_mammals.html ; Fish and Wildlife Service Fact Sheets. 2008. Summary of interagency assessment process as of October 1st, 2008.

Still, some important information regarding marine mammals is known. The waters around Johnston Island are teaming with spinner dolphins and frequented by endangered whales such as blue whales, sperm whales, sei whales, Northern Pacific right whales, Cuvier's beaked whale, and even humpback whales, some of which are believed to give birth in the warm waters near shore. Johnston Island, Kingman Reef, and Palmyra Atoll are visited by the rare and endangered Hawaiian monk seal, and may hold potential as monk seal re-colonization areas. There are less than 1200 Hawaiian monk seals remaining, and starting experimental populations in other locations is a potential recovery strategy being considered. Kingman and Palmyra are known to have large numbers of dolphins swimming in their waters, as well as large resident pods of rare melon-headed whales. What may very well be a new species of marine mammal, a type of beaked whale, was recently found stranded on Palmyra's shores. Pilot whales, humpback whales, and scores of spotted dolphins have been seen in the waters surrounding Rose Atoll in American Samoa. Even Wake Island, once a fierce battleground, has its own resident population of spinner dolphins.[54]

All marine mammals in US waters are protected from take by the Marine Mammal Protection Act, and all of the whales are similarly protected by the International Whaling Commission, with limited exceptions for research. In addition, blue, fin, humpback, right, sei, and sperm whales, as well the Hawaiian monk seal are endangered species protected by the Endangered Species Act (ESA). Despite all this protection, these animals still are not safe. Every year, whales, dolphins and seals get caught and killed by fishing gear. Most of the deaths occur when marine mammals get snagged on a longline, trapped in a purse seine net, or entangled in derelict fishing gear (see Appendix 3 on fishing for additional details).

In the past three years, about half of the marine mammal species living in the assessment areas have been caught on longline gear used for swordfish and tuna; the most frequent deaths involve false killer whales that are part of a small and distinct Hawaiian population. The sustainable take level for this whale is one death a year, suggesting major concern for this species.[55] Table 2 shows *estimated* deaths of marine mammals in the Hawaii-based longline fishery (both for swordfish and tuna) for 2005 and 2006, and *actual* deaths in 2007 (because the estimates were not complete).

[54] Fish and Wildlife Service Fact Sheets. 2008. Summary of interagency assessment process as of October 1st, 2008.
[55] Tosatto, Mike. Pacific Islands Regional Office, NMFS, NOAA. Personal Communication with Lance Morgan.

Table 2: Estimated numbers of fishery interactions with long-line fishing gear for the Hawaiian longline fishery (swordfish and tuna fleets) from 2005-2007

Species	**2005**	**2006**	**2007***
Striped dolphin (*Stenella coeruleoalba*)	**0**	**6**	**0**
Bottlenose dolphin (*Tursiops truncatus*)	**0**	**2**	**3**
Risso's dolphin (*Grampus griseus*)	**4**	**7**	**4**
Unidentified dolphin (Delphinidae)	**0**	**9**	**1**
Blainvilles beaked whale (*Mesoplodon blainvillei*)	**6**	**0**	**0**
False killer whale (*Pseudorca crassidens*)	**6**	**17**	**4**
Shortfinned pilot whale (*Globicephala macrorhynchus*)	**6**	**6**	**1**
Bryde's whale (*Balaenoptera edeni*)	**1**	**0**	**0**
Humpback whale (*Megaptera novaeangliae*)	**0**	**1**	**0**
Unidentified whale (Cetacea)	**1**	**14**	**1**
Total	**24**	**62**	**14**

*2007 is observed interactions, not estimated ones which would be higher.

Entanglement is another problem. Lost fishing gear can get entwined around a marine mammal making it hard to impossible for the whale, dolphin, or seal to feed or come to the surface to breathe. Marine debris from other sources, such as trash dumped overboard at sea, can also damage or even kill marine mammals and their prey if they consume or get entangled in it (see marine debris discussion below under threats).

Other factors affecting marine mammals living in the central and western Pacific are whaling, noise pollution, and vessel strikes. Whaling is not allowed in US waters, but occurred in the region for over a century, decimating populations in the process[56]. All vessels traveling through water make some noise, some more than others. Many marine mammals, particularly whales and dolphins, are acoustically oriented animals that rely on audible feedback to locate prey and navigate. It is unknown how much damage noise pollution causes to marine mammals, but it has been known to confuse, disorient, and in extreme cases cause the death of marine

[56] National Marine Fisheries Service. 2006. Biological opinion and incidental take statement under section 7 of the Endangered Species Act on the effects of the U.S. purse seine fishery in the western and central Pacific Ocean.

mammals. No known vessel strikes of whales have been documented in the region; thus strikes are thought to be uncommon, but certainly possible[57].

Terrestrial Biology

The seven central Pacific territories and Rose Atoll are not only known for their highly diverse species in their surrounding waters, but also for their terrestrial uniqueness. Every territory, except Kingman reef, includes emergent terrestrial environments that provide habitat to a variety of migratory and resident seabird species as mentioned earlier. Although these emergent islands and atolls are relatively small, and their native vegetation sparse, some are home to endemic terrestrial plant species. For instance, Palmyra and Rose atoll are some of last remaining locations for the *Pisonia grandis* trees in the Pacific region. Due to human development, *Pisonia grandis* forests have been lost or severely degraded over much of their range. Also, Wake Island supports a rare grass species, *Lepturus gasparricensis*. More detailed information on terrestrial species and ecosystems may be obtained from FWS and DOD.

CURRENT USES

Within the last 100 years, the eight islands and their near shore waters principally have been used for extraction of natural resources, military defense and most recently, conservation. These uses have ebbed and flowed with time and events. As our understanding of the complexity, importance and vulnerability of island ecosystems has increased, the preponderant trend has been to place the islands in conservation status as their highest and best use. Six of the eight islands are national wildlife refuges that include emergent lands, near shore waters, and submerged lands to a distance of 3 or 12 nm, depending on the islands' establishment authority. The next logical step is to standardize refuge boundaries to 12 nm around all the islands and permanently protect the adjoining pelagic ecosystems as biological reserves, free from fishing and other extractive uses.

Resource Extraction and Commercial Fishing

Early uses of the islands included stopovers by explorers, whalers and other mariners in the 18th and 19th centuries in search of lands to be claimed and food, water and exploitable resources. Several of the islands were claimed as US possessions under the Guano Act and three of them

[57] National Marine Fisheries Service. 2006. Biological opinion and incidental take statement under section 7 of the Endangered Species Act on the effects of the U.S. purse seine fishery in the western and central Pacific Ocean.

were subsequently mined for guano until extraction was no longer profitable[58]. Industrial scale commercial fishing is a phenomenon of the last 60 years; it is now the principal extractive use of the islands' EEZ waters, and a use that could potentially grow as more boats chase tuna.

Early commercial catch levels are not known. The enactment of a federal fisheries law in 1976 inaugurated a new era of catch reporting by US vessels; reporting has gradually improved, but is not yet comprehensive for all species. Although reef fish, bottom fish and shellfish have been take sporadically in the past near some islands, there is little near shore fishing going on now. As of January 2008, according to NMFS there were eight permits in the island EEZ fisheries, including pelagic trolling and handline (4), lobster (3), and bottomfish (1). Some of these have expired since then. According to NMFS, the permits are held by a total of three fishermen, all based in Hawaii; reportedly not all of these permits are being exercised.

Commercial fishing for tuna by longline and purse seine boats is the main fishery occurring in the outer waters of the EEZs; other species also are taken and kept, such as swordfish and mahi mahi. Tuna fishing effort varies from island to island.EEZ. The longline fleet concentrates around Hawaii and Kingman, Palmyra and Johnston. Most of the purse seine catch is taken around Howland, Baker and Jarvis. The portion of the total US tuna catch obtained from the islands' collective EEZs is small, amounting to about 3% of the purse seine fleet catch, and 7% of the longline fleet's take. Were commercial fishing to be ended around the islands, the catch would likely be made up elsewhere as tuna are very mobile and wide ranging (see Appendix 3 for a detailed analysis of the tuna fishery).

There is also some illegal foreign fishing in US island waters. We know this from foreign fishing vessel groundings at Rose, Kingman, and Palmyra; the occasional arrest of a high seas vessel in our EEZ by the Coast Guard (more information in "threats" section); and anecdotal biological evidence of poaching, such as a decline in species numbers over time (e.g., sharks, bumphead parrot fish, and humphead wrasse at Rose, and sharks at Palmyra); shells of dead giant clams on the seafloor(Rose); skewed age structures (grey reef sharks at Howland and Baker), and suspiciously low absences of expected numbers of fish (grey reef sharks at Wake).[59]

Military Use

Military use of the islands accelerated in the 1930s, precipitated by defense concerns related to the rise of the Japanese Empire, and reached its apogee during World War II. At one time, the

[58] Maragos, J. et al. 2008. US Coral Reefs in the Line and Phoenix Islands: Chapter 15 and 16, in Riegl, B. M. and R. E. Dodge, editors. 2008. Coral Reefs of the USA.
[59] Ibid.

military occupied Palmyra, Howland, Johnston, Wake, Baker, Jarvis and Kingman, for varying periods. The US government also put civilian 'settlements' on Howland, Baker and Jarvis in the mid-1930s to demonstrate US claims to these lands; the settlements were withdrawn after WW II began. In addition, Kingman Reef, Palmyra, Johnston and Wake all had naval defensive seas declared around them.

Human Occupancy

Civilian and military occupancy has had substantial impacts on many of the islands, including dredge and fill construction, altered landscapes, introduction of non-native species, and the dumping of toxic and non-toxic wastes trash. The Wake rail went extinct during the period of Japanese occupation of the island. Defense needs changed after WWII. Military use wound down, and the islands were gradually were converted to conservation use under FWS management. The military withdrew from Palmyra, Kingman, Jarvis, Howland and Baker, but remained at Johnston and Wake. In 2004, the Air Force vacated Johnston and now seeks to transfer the island to another party. Wake is the only island still in active use as an air base, and its waters as a Navy training area.

Conservation

Six of the eight islands and a portion of Johnston are part of the National Wildlife Refuge System. The refuges have been created by a number of executive branch decisions, commencing with the establishment of a bird refuge by President Coolidge on Johnston in 1926. Refuge lands and waters are managed by The Department of the Interior, Fish and Wildlife Service, under various authorities. Under the Refuge Administration Act, all refuges are closed to public entry unless specifically opened. FWS manages Palmyra Atoll and Kingman Reef to a distance of 12 nautical miles off shore; a Nature Conservancy in holding, the only private land on Palmyra, is managed for conservation purposes in cooperation with FWS under a cooperative agreement. A permanent scientific research station is maintained on Palmyra by a nine-member research consortium. Palmyra is open to public wildlife viewing and limited recreational fishing.

The refuges on Baker, Howland, Jarvis and Rose Atoll in American Samoa include all emergent lands and the seaward waters and submerged lands to 3 nautical miles. These remote refuges are closed to public entry and use. Rose Atoll is cooperatively managed with the Government of American Samoa. FWS continues to manage its lands on Johnston as a closed refuge, but has no authority over the near shore waters; a three-mile naval defensive sea is still in effect.

Wake Island is the only island that lacks formal conservation status. Wake is one of the oldest and most isolated atolls in the world. The island has been developed as an air base and is currently managed by the Air Force, though at reduced activity levels from previous years. The Navy uses the surrounding waters for training purposes. The island possesses outstanding terrestrial and marine resources, including large numbers of migratory seabirds and shorebirds, green sea turtles, and a healthy coral reef community. The food web of the reef ecosystem is virtually intact, with high numbers of predators and high diversity of invertebrates. There are abundant populations of bumphead parrotfish, Napoleon (humphead) wrasse and large grouper, all of which have been depleted elsewhere from overfishing. Because of its long occupancy by the military and long distance from Hawaii, there has been little US commercial fishing around Wake. The Navy's enforcement of a naval defensive sea of 3 nm around Wake has created a de facto marine protected area. The Air Force allows recreational fishing by base occupants under guidelines issued periodically by the base commander. Also, the Air Force manages an informal bird reserve of about 100 acres on part of the island. Feral cats have been eliminated, and this year a rat eradication program will be launched to end this rodent's predation on birds.

Scientific Research

The eight islands have seen various research expeditions over the last century with most activity occurring in the last 25 years. NOAA and FWS now conduct regular biennial research cruises to the islands of Johnston, Kingman, Palmyra, Baker, Howland and Jarvis Islands[60], but these provide only short stays. Researchers are in the early stages of researching and monitoring coral reefs, large predatory and reef fish density and diversity, and seabird and sea turtle diversity and abundance. The Nature Conservancy maintains a scientific research center on Palmyra and hosts visiting scientist on a regular basis to study degraded corals reefs, invasive species, ocean acidification and other global environmental threats[61]. Research at Wake Island is conducted under NOAA sponsorship with permission and assistance from the DOI and the U.S. Air Force[62].

[60] Miller, J. et al. 2008 The state of coral reef ecosystems of the Pacific remote island areas. p. 353-386. In: J.E. Waddell and A.M. Clarke, editors, The State of the Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2008. NOAA Technical Memorandum NOS NCCOS 73. Silver Spring, MD.

[61] The Nature Conservancy. 2008. The nature conservancy joins world's top scientists to launch climate change research station on pacific atoll. Retrieved October 14, 2008, from The Nature Conservancy: http://www.nature.org/wherewework/asiapacific/palmyra/press/press2152.html.

[62] Miller, J. et al. 2008 The state of coral reef ecosystems of the Pacific remote island areas. p. 353-386. In: J.E. Waddell and A.M. Clarke, editors, The State of the Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2008. NOAA Technical Memorandum NOS NCCOS 73. Silver Spring, MD

Actions critical to the preservation of the islands' original ecosystems are ongoing. All island areas have been significantly affected by introduced species including mammals, plants, and insects. Over the years, FWS has eradicated rats and feral cats. FWS conducts problem-specific species monitoring on a number of the islands as part of its management program. For example, preliminary research is presently being conducted to see whether damage to the native *Pisonia* forest in Palmyra Island and Rose Atoll caused by an introduced scale insect is being further exacerbated by the presence of an introduced ant species[63]. Unfortunately, many of these eradication and research programs lack adequate funding.

THREATS TO THE ISLANDS

The central Pacific islands suffer a variety of threats. Human use of the Pacific Ocean has intensified significantly in the last 40 years. Within the assessment areas, most research has concentrated on the islands proper and their near shore waters and seafloor, and not on the larger surrounding pelagic and benthic ecosystems. Threats in the pelagic realm include the overfishing of target populations of large predatory fish, disturbance of seabird foraging grounds, the killing of non-target species (marine mammals, sea turtles, and seabirds) in fisheries, and marine debris. The lack of good research on these pelagic threats does not detract from their reality; our ignorance about them is one good reason to take the precautionary approach of fully protecting these relatively intact ecosystems while we can.

Here we discuss the principal threats to the eight islands. Fundamental to this discussion is the problem of disunity of federal management caused by a long standing jurisdictional dispute between NOAA and FWS.

Federal Agency Conflict

A significant problem in the assessment areas (except Wake and Rose) is uncoordinated federal management due to a dispute between the Department of Commerce (NOAA) and the Department of the Interior (FWS) over the legitimacy of refuge boundaries around the islands, and over the controlling legal authorities that apply. This clash manifests itself especially in commercial fisheries management and nautical chart production. NMFS asserts that the Magnuson-Stevens Fishery Conservation and Management Act gives it authority to regulate marine fishing in all waters of the US EZZ not controlled by a state or territory, which would mean up to the high water mark of the islands. When NMFS issues fishing permits in the US EEZ, NMFS does not mandate that the holder stay out of waters managed by FWS as refuges,

[63] Flint, Beth. FWS. Personal Communication.

but rather directs the permitee to contact the FWS for further information about fishing requirements for refuge waters. Do they? Not according to FWS. This has understandably produced interagency friction and confusion, and undercuts effective enforcement because to make an arrest you have to have sound cause. FWS complains that some US vessels may be illegally fishing in refuge waters, but cannot prove it.

For law enforcement purposes, including the effective prosecution of violators, the controlling manager must be able to cite which statutes are applicable in the area under US control, and which uses are allowed or prohibited in the controlled area. Furthermore, the proper boundaries of the legal enforcement zone must be made clear—formally published in the Federal Register, put on US nautical charts by NOAA, and publicized to vessels that may enter the management area. None of these conditions are being met now.

This inter-agency stand-off needs to be addressed in any monument proclamation so as to resolve the diverse legal arguments that have confused protection of marine resources. The President has the power to address the issue under the Antiquities Act by establishing the degree of protection applicable to any proclaimed area, and by designating the federal agency with primary management responsibility for the area. In addition, the designation could recognize the applicable laws for protecting the marine resources. Finally, the review and approval by the Office of Legal Counsel, Department of Justice, of the terms of any proclamation could be a de facto resolution of the legal controversy. It should be noted that the NOAA-FWS dispute also manifested itself in the Northwestern Hawaiian Islands. President Bush addressed the issue there through the detailed protective overlay proclaimed for Papahānaumokuākea Marine National Monument. The same paradigm could be considered for a central Pacific monument.

Fishing

Commercial fishing is a threat to the ecosystems of the eight islands because by definition fishing can remove large numbers of fish which in turn has ecosystem impacts. Commercial fishing, especially for tuna, has been occurring in the islands' waters for many years. Regrettably, its cumulative effects have not been assessed. Nevertheless, we know that population growth and economic globalization is placing an enormous strain on fisheries everywhere. Overexploitation is a constant danger, whether by legal or illegal fishing. The macro impacts of fishing on large fish species has been addressed by Myers and Worm, who found that the world's oceans have lost more than 90% of their large predatory fish[64]. Jackson

[64] Myers, R.A. and B. Worm. 2003. Rapid worldwide depletion of predatory fish communities. Nature 423:280-283

indicates that more important than the percentage of decline is the shift in species abundance and composition.[65]

These analyses highlight the need for precautionary management and point to the need for establishing large ecosystem reserves in the oceans. Therefore, we recommend commercial fishing be prohibited in the eight islands' EEZs. A more detailed discussion of fishing, including recreational fishing may be found in Appendix 3.

Illegal Fishing

All refuge waters in the assessment islands are closed to US and foreign commercial fishing. Because most of the islands are unoccupied and poorly monitored, it is not possible to easily catch US or foreign boats that may enter refuge waters. This issue is complicated by the fact that NOAA and FWS disagree over who has jurisdiction over which waters under what controlling authorities, as discussed above.

It is prohibited for foreign vessels to fish in the entire EEZs of the eight islands. Infrequent Coast Guard patrols and the lag time between spotting and apprehending a violator before the boat exits US waters means few illegal entrants are caught and prosecuted. The Coast Guard patrols Kingman, Palmyra and Johnston Island EEZs using direct flights from Honolulu. Regular aerial patrols of the other five EEZs do not happen unless there is an extended deployment of a Coast Guard aircraft. As a result, even if an aircraft from Hawaii is deployed to Samoa or Guam, only one to two hours of active patrol time per dispatch could be dedicated to patrol the most remote EEZs, such as those of Howland, Baker, Jarvis or Wake Island. These factors, combined with an aging air fleet in need of modernization, challenge the Coast Guard's ability to protect US living marine resources in the assessment areas. Despite these limitations, the Coast Guard has observed the presence in the islands' EEZs of an average of 15 illegal fishing vessels per year for the last 4 years. In 2007, there were 11 illegal fishing vessels detected in the islands' EEZs compared to nine illegal vessels in 2006. [66]

One such case is documented in the US Department of Homeland Security United States Coast Guard *Report on Illegal Incursions into the United States Exclusive Economic Zone by Foreign Fishing Vessels.* On February 23, 2007, a Coast Guard aircraft observed the Ecuadorian fishing vessel *San Andres* actively fishing approximately 80 nautical miles inside the US EEZ around Jarvis Island. The Coast Guard was unable to intercept this vessel with a cutter, but did obtain evidence of active fishing activity by the Ecuadorian vessel inside the US EEZ. The Coast Guard is now working in partnership with the State Department and NOAA Fisheries to address this case

[65] Jackson, J. 2008. Ecological extinction in the brave new ocean. PNAS. 105:11458-11465

[66] United States Coast Guard. 2007. Report on illegal incursions into the United States exclusive zone by foreign fishing vessels.

via diplomatic channels. The US will request the government of Ecuador to take enforcement action against the vessel and prevent further occurrences[67].

Landscape Alterations and Settlements

Many of the islands have been altered by military use, especially Palmyra, Kingman, Wake, Baker, Howland and Johnston. Landscapes and seascapes were disturbed and changed by base and airfield construction, the dredging of shipping and sea plane channels, and building construction. Civilian settlements were built on Baker, Howland and Jarvis islands in the mid-1930s. These alterations pose a challenge to FWS managers who seek to restore natural functioning ecosystems. Despite the negative impacts of former uses, the reef ecosystems of the islands are in relatively good condition, especially compared to degraded islands in the rest of the Pacific. Restoration action is desirable at most of the islands, including restoring natural water flows, removing discarded equipment and structures, and dealing with waste disposal sites.

Invasive Species

Human exploration and occupation brought many invasive species to the islands, including various plants, insects, and cats and rodents that preyed on bird populations. The FWS has eliminated most invasive mammalian predators from all islands except Palmyra (where rat eradication is still ongoing) and Wake. DOD eliminated cats on Wake and is now targeting rats. A house mouse, *Mus musculus*, continues to populate Jarvis, Johnston and Baker Islands; FWS hopes to eradicate it in the near future. Such removals of invasive species have promoted the healthy increase of bird populations and the restoration of nearly extirpated species, like the black-footed and Laysan albatrosses. This is especially important since populations of some of the same species have declined on non-US islands.

In addition, all of the central Pacific islands have alien ant species that have caused significant ecological damage. For instance, at Palmyra and Rose Atoll an introduced scale insect, *Pulvinaria urbicola,* has been implicated in the destruction of part of the native *Pisonia* forest – a tree species that has been degraded elsewhere[68]. Furthermore, there are a number of introduced plant species requiring management. These include the coconut palms planted at Palmyra atoll for the coconut meat and oil, but now are out-competing native taro vine forest trees. The invasive plant species, *Leucaena* (Haole Koa) and *Casuarina* (Ironwood) are currently

[67] United States Coast Guard. 2007. Report on illegal incursions into the United States exclusive zone by foreign fishing vessels.
[68] Flint, Beth. 2008. FWS. Personal communication.

of concern at Johnston Atoll and an incipient population of Sandbur grass (*Cenchrus echinatus*) was recently eradicated Rose Atoll[69].

Vessel Groundings

A major concern associated with allowing fishing vessels or ocean freighters near the islands is the danger of a catastrophic grounding due to human error, weather or mechanical failure. Fishing vessels, whether fishing or not, and small freighters passing thorough are of particular concern because in general, their navigation and seamanship skills are not as good as those of large vessels. Groundings are not an idle concern. Three fishing vessels have grounded in the islands in the recent past. In 1991, a 121-foot Taiwanese fishing boat sank on Palmyra Atoll; a 135-foot long Taiwanese fishing vessel grounded in 1993 on Rose Atoll; and an abandoned 85-foot fishing vessel was discovered on Kingman Reef in August 2007. With great expense and over a period of years, the Rose wreck was removed by FWS, but not before it significantly harmed the reef and wildlife. The Palmyra wreck is still on the reef and continues to damage the ecosystem by accelerating the rapid growth of an invasive coralliamorph that smothers the reef ecosystem. The Kingman reef wreck also remains and is showing early signs of the invasive coralliamorph, and also an elevated growth of blue-green algae which in time can cause algal blooms that block sunlight to the reef below.

Future groundings could create a major fuel spill that would be hard to contain and clean up because salvage vessels and oil spill response crews are far away. Fuel and oil spills could contaminate the reefs and kill large numbers of marine life and resident birds. In addition to physical damage to reefs, grounding could possibly release more invasive species to an island, including the return of rats where they have been eliminated. The logistics of dealing with a grounding and spill on remote islands would be difficult and costly; therefore, groundings risk should be reduced as much as possible.

A preventative strategy is needed to minimize groundings risk to US islands. Unfortunately, one does not exist. The refuges are not well identified on NOAA charts partly because of the reluctance of NOAA to concede the refuge boundaries claimed by FWS. Furthermore, neither FWS nor NOAA is using potentially available tools to adequately monitor vessel entries near the islands; Coast Guard patrols are infrequent due to lack of budget and priority. Finally, the US has not sought to nominate the islands for designation as Particularly Sensitive Sea Areas (PSSAs) by the International Maritime Organization (IMO). The IMO designates areas that are vulnerable to damage and need special protection from maritime shipping because of their ecological, economic, cultural or scientific significance. For an area to be considered a PSSA, it

[69] ibid.

must also have at least one established Associated Protected Measure (APM) such as areas to be avoided, no anchoring areas, or discharge restrictions. Securing PSSA status for each of the island areas would lead to needed international protections from ship traffic and reduce groundings risk. Commercial vessel traffic lane locations are shown in Appendix 8.

Marine Debris

Marine debris has become one of the most widespread pollution problems in the world's oceans and waterways[70]. Once thought of as simply something unpleasant to look at, research has proven that debris has serious effects on the marine environment, marine wildlife, the economy and human health and safety. Marine debris is wreaking havoc on our oceans and the species that depend on the ocean for survival. Reports of death by entanglement of marine mammals, many of them endangered or threatened, and of sea turtles and seabirds continue to grow. The numbers of animals killed are staggering and bring to light the urgency of immediate action to reduce these occurrences.

Marine debris comes in many shapes and sizes. Derelict fishing gear is a common source of marine debris, consisting of lines and nets that entangle marine mammals, sea turtles, seas birds and catch fish long after the gear is able to be retrieved. Pieces of plastic—often mistaken for food by sea birds, and plastic bags—mistaken for jellyfish (the primary diet of the critically endangered leatherback sea turtle), are also a huge contributor to marine debris. Perhaps the most well known marine debris problem is the Pacific "garbage patch" formed by the the North Pacific Anti-cyclonic Gyre, which dominates the circulation and current systems of the North Pacific Ocean. This system deposits large amounts of marine debris in the Northwestern Hawaiian Islands (NWHI)—an estimated 57 tons every year[71].

The eight assessment islands are not as hard hit by marine debris as are the NWHI, but debris is nevertheless a growing a problem whose precise dimensions have yet to be quantified. Of special concern are lost and discarded nets from Asian fishing fleets and other plastic debris. Due to their location, Baker, Howland and Jarvis miss the brunt of the debris transported by the North Pacific gyre. Kingman and Palmyra are at the southern edge of the gyre and marine debris accumulates along their shorelines. The two islets of Rose Atoll are very small and the perimeter reefs are steep, so accumulation of marine debris is small.[72]

[70] http://marinedebris.noaa.gov/marinedebris101/welcome.html
[71] Bamford, H. July, 2008.
[72] Maragos, J. 2007, November 1. Coral Reef Biologist, FWS. Interviewer: William Chandler

Another source of marine debris in the central and western Pacific is fish aggregation devices (FADs). FADs are floating fishing gear used to attract species that like to congregate under floating objects, usually highly migratory species that are otherwise difficult to find. Many species of fish, most notably tuna, are drawn to naturally occurring floating objects such as wood or seaweed mats that are usually found in convergence zones where food and nutrients are plentiful, in what is otherwise is a relatively 'barren' open ocean. Commercial fishers deploy FADs in open-water areas to attract and concentrate tuna and other pelagic species, essentially bringing the fish to their boats instead of having to hunt them down. While FADs have increased the efficiency of off-shore fishing, there is increasing evidence that they can have a harmful effect on marine ecosystems and fish populations. For example:

- FADs may wash up on reefs and beaches as marine debris, harming or killing wildlife through entanglement. Fishing vessels may harm coral reefs and other sensitive habitat if they run aground in an attempt to retrieve the FADs.
- There is concern that the use of FADs may intensify the overfishing of species that are already under stress.
- FADs may set an "ecological trap" for tuna and other species. A recent study found that 74% of FADs-associated skipjack tuna were caught with empty stomachs, compared to only 13% of free-swimming schools. The FADs-associated fish also showed less "plumpness," which could reflect a deficiency in energy-reserve accumulation. The research could not conclusively say that FADs had a negative impact on tuna lifecycles, but it did suggest that FADs are affecting both migration distances and directions, and possibly luring tuna to inappropriate waters with scarcer food supplies[73].

FADs are a becoming a concern globally, and the negative effects of these devices in US waters is a growing threat that needs to be dealt with. According to FWS, most of the assessment islands are afflicted with FADs lost by tuna purse seine vessels. Full protection of the islands' EEZs from tuna fishing would end direct US sources of FADs. Measures may still be required to limit FADs intrusions from outside the US EEZ.

National Recognition Means Stronger Protection

EDF and MCBI recommend that the eight islands and their complete EEZs be proclaimed by President Bush as marine national monuments, and managed as no-take reserves to protect and restore their ecology. This is a visionary idea whose time has come, and whose realization is imminently feasible. The pelagic realm of the open ocean and the underlying seafloor is the

[73] Institut de Recherche Pour le Développement. 2008. Does fishing on drifting fish aggregation devices endanger the survival of tropical tuna? Retrieved July 28, 2008. Science Daily: http://www.sciencedaily.com/releases/2008/05/080515094614.htm

largest but least protected ecosystem in the world. Now is the time to protect relatively intact portions of it while we can.

If fully protected as marine national monuments with no extractive uses, the eight areas would be havens for all kinds of marine wildlife, and a precautionary bulwark against the degradation and decline of marine ecosystems in the Pacific which continues to unfold at an alarming rate. In addition, the areas would provide restoration benchmarks for other Pacific nations who are increasingly working to restore their own degraded coral island and pelagic ecosystems. Also, the islands would be ideal places to monitor and study the ocean impacts of global climate change, such as coral bleaching and ocean acidification.

Another reason for declaring these areas national monuments is that it would clarify management objectives and enhance US management and enforcement. *The ongoing dispute between NOAA in the Department of Commerce and FWS in the Department of the Interior over who has control over the nearshore marine waters of the islands needs to be resolved and can be by the President.*

Finally, recognition usually brings with it a heightened sense of purpose and potentially more funding. The eight islands have languished out of the public eye, known mainly to a few hundreds of scientists and federal employees. Consequently, federal budgets for management, restoration, and research have been modest if not bare boned. Important work is not getting done. For example, FWS has not budgeted the estimated $500,000 needed to remove a derelict 85-foot fishing vessel that drifted onto Kingman Reef—the most pristine reef in US possession! A year later, the boat is still there, damaging the reef.

<u>Use of Antiquities Act</u>

EDF and MCBI believe the Antiquities Act is the most appropriate tool for the President to use to permanently protect the islands. The key operative language of the Antiquities Act is as follows:

> "That the President…is hereby authorized, in his discretion to declare by public proclamation historic landmarks, historic and prehistoric structures, and objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be national monuments, and may reserve as a part thereof parcels of land, the limits of which in all cases shall be confined to the smallest area compatible with proper care and management of the objects to be protected[74]."

[74] Antiquities Act 16 U.S.C. §431 (2000).

As previously mentioned, several visionary presidents have used the Antiquities Act to permanently protect lands and waters of unique importance interest to America's natural and cultural heritage because of their scientific values. Since first used by Theodore Roosevelt, all but two succeeding presidents have used the Act to establish one or more national monuments.

The Antiquities Act has many attributes that commend its use for protecting the eight islands:

- **Authority**. The Act may be used by the President to protect lands and waters controlled by the US including waters and submerged lands in the US EEZ. An Office of Legal Counsel opinion issued in 2000 found that:

  > "The President may use his authority under the Antiquities Act to establish a national monument in the territorial sea." [and that] "The President may use his authority under the Antiquities Act to establish a national monument in the exclusive economic zone to protect marine resources[75]."

- **National interest**. The President is uniquely positioned to determine the national interest. The courts have given him wide discretion to determine which objects are of historic or scientific interest to the nation, and therefore how large a monument may be. A large marine ecosystem could be included within a monument because the courts have determined that a monument may be as large as necessary to encompass the objects of scientific or historic interest.

- **Timeliness**. The Act allows the president to take immediate, unilateral action to proactively protect important cultural, historic, and natural areas that face immediate threat of destruction or ongoing degradation. Designation by Act of Congress or pursuant to other statutory authority requiring executive agency action, such as the National Marine Sanctuaries Act or the National Wildlife Refuge Administration Act, is far more time consuming; in that time, precious resources and their values may be irrevocably degraded or destroyed.

- **Permanent Protection.** The Act's proclamation authority is "one-way"; i.e., the president can unilaterally establish or enlarge national monuments, but does not have

[75] In 2000, the Office of Legal Counsel (OLC) concluded that "the President could establish a national monument in the EEZ to protect marine resources." Op. Off. Legal Counsel, *Administration of Coral Reef Resources in the Northwest Hawaiian Islands* (Sep. 15, 2000).

the power to shrink or abolish them once established. The courts have determined that the president's power under the Act is broad.

- **Strongest Presidential Action.** Other presidential actions do not have the force of law that proclamations made under the Act's authority have. Withdrawals of land for conservation or protection by Executive Order, for example, may be ignored, modified, or overturned by future presidents.

- **Precautionary Protection with Congressional Review.** Designation of a national monument by presidential proclamation allows for protection of resources and their values while preserving for the Congress its constitutional right to determine the ultimate future disposition of the protected area. For example, a number of national monuments later became National Parks through Acts of Congress. Congress has even abolished a few monuments, but not many, thus indicating its concurrence with the President's judgment most of the time.

Presidential Leadership

Action by President George W. Bush to conserve the areas is appropriate and timely for a number of reasons. First, President Bush already has demonstrated his personal interest in the oceans through implementation of his Ocean Action Plan. Furthermore, in 2006, the President employed his authority under the Antiquities Act to proclaim the Papahānaumokuākea Marine National Monument in the Northwestern Hawaiian Islands, a 140,000 square mile pelagic marine and islands ecosystem with scientific and ecological values comparable to those in the central and western Pacific. Protecting the rest of our Pacific island ecosystems would be a natural and culminating step on the President's part.

Second, protection is politically feasible because the islands are under federal control, mostly uninhabited, and already partly dedicated to conservation. Six of the eight islands are federal national wildlife refuges in their entirety, managed by the US Fish and Wildlife Service. Part of Johnston also is a refuge. Although Wake and Johnston are under Department of Defense (DOD) management, their nearshore waters are closed to a distance of 3 nm for defense purposes, thereby providing de facto conservation zones. All of the islands are uninhabited except for a handful of scientific researchers and government staff at Palmyra, and about 125 personnel who maintain the Air Force base at Wake.

Fishing is the only current extractive use of the islands. FWS allows limited recreational fishing at Palmyra, but has closed all the other refuges to recreational fishing and all island refuge

waters to commercial fishing. Commercial fishing, mainly for four species of tuna, occurs episodically in the US exclusive economic zones (EEZ) of Howland, Baker, Johnston, Palmyra, Kingman, Jarvis and Johnston. Managers believe the tuna fisheries of the Central and Western Pacific oceans are close to fully exploited, although science reports suggest that biomass levels are greatly reduced over the past 50 years, as much as 90% in the case of some populations. The fish caught in these pelagic waters make up about 7% of the Honolulu-based longline fleet's annual catch, and about 3% of the purse seine vessel catch, or about 5% of the catch of the combined fleets. Both tuna fleets obtain most of their catch outside the assessment areas, either around Hawaii or on the high seas.

Third, full protection of the islands will be well received by other Pacific nations and by the public at large. President Bush's permanent protection of the Northwestern Hawaiian Islands generated an outpouring of praise from scientists, conservationists and the public at large (see Appendix 8). Why? Because there is widespread recognition that the oceans need more protection, especially no-take reserves, to protect and restore marine life. There is a growing movement among Pacific states, large and small, to protect and recover their pelagic and coral reef ecosystems and manage their fisheries more sustainably. Soon after President Bush proclaimed Papahānaumokuākea Marine National Monument, the island state of Kiribati established a marine protected area approximately 158,000 square miles in size. Other nations like Australia and New Zealand have been developing national systems of marine reserves for a number of years. Protecting all of our own unique islands and their surrounding pelagic areas, would make the US a world leader in ocean conservation.

In sum, the natural resource values of our eight Pacific islands are superb, the need for their conservation is clear, and the timing is right for bold leadership by President Bush who is the only one with the ability and authority to act swiftly and decisively to protect these national treasures. Should the President protect these places, he would make conservation history by laying the foundation for a national system of ocean protected areas. Theodore Roosevelt laid the seeds for the national park system through his proclamation of 18 national monuments. President Bush can leave a comparable ocean legacy by protecting our unique Pacific islands on an ecosystem scale.

STRATEGIC ISSUES

Military Uses

EDF and MCBI recognize there has been a long history of military use of the islands and that military activities are continuing, albeit in a different pattern. President Bush stated in his

Memo of August 25, 2008 that any protection action recommended[76] should not compromise the DOD mission in the Pacific at large or around islands it now manages. MCBI and EDF recognize and accept this need, but believe there are opportunities for DOD to be constructively engaged in defense *and* conservation.

Currently, Johnston and Wake Island are under the management of the U.S. Air Force. As a result of conversations with Air Force staff, it is our understanding that DOD has vacated Johnston and seeks to transfer it to another administrator. Thus, Johnston has become a non-issue in terms of defense needs. We recommend that Johnston be transferred in its entirety to FWS, including the waters and submerged lands to a distance of 12nm. FWS should manage the islands to restore and protect its terrestrial and marine wildlife, and prohibit all extractive uses in the refuge. NOAA, in consultation with FWS, should be mandated with determining if and when an experimental monk seal population should established at Johnston. If NOAA determines such a population should be established, FWS should provide appropriate assistance to NOAA.

Wake Island is still an active airbase. In 2007, the Air Force made the decision to keep the base open for training, contingency operations, emergency landings, and as a stopover spot for transpacific missions. In addition, the Navy has informed us that they conduct training operations in the EEZ waters around Wake; the exact nature of these activities and their impacts on the ecosystem is not known to us. Because of the rich biodiversity of Wake's marine waters and the potential to restore terrestrial wildlife, we support the concept of cooperative conservation and planning between DOD and FWS to effectively manage the natural resources on Wake and within the 12 nm territorial sea. In particular, we believe the marine waters to 12 nm should be set aside as a wildlife refuge with FWS managing the waters under its authorities, including regulation of recreational fishing, in consultation with DOD. The 12 nm zone would in effect be a FWS "overlay" refuge, with DOD still having the ability to maintain or extend the naval defensive sea zone, and to exercise exemptions to refuge purposes as it deems necessary for the national defense; we hope these exemptions would be few.
We recommend the 12 to 200nm zone be managed as a no-take marine reserve by NOAA. Again, DOD would still able to exempt its activities in this zone as necessary. However, we would urge that DOD be required to consult with NOAA on conservation and biodiversity preservation issues and research expeditions at the request of NOAA and vice versa.

[76] President G.W. Bush. Memo to The Secretary of Defense, The Secretary of the Interior, The Secretary of Commerce, the Chairman of the Council of Environmental Quality. 25 August 2008

Fishing

The vision of a fully protected biological reserve, which protects natural ecological functions, energetics and ecosystem processes, is incompatible with the extraction of fish or shellfish by commercial and recreational fishers. This was recognized by President Bush when he proclaimed the NWHI marine national monument, which prohibits all fishing (except sustenance fishing) within 50 nm of the island chain. At the time of the proclamation there was little recreational fishing taking place in the NWHI, and only a few commercial fishermen were actively fishing for bottom fish and pelagic species. President Bush's proclamation capped commercial fishing at the existing catch level, and directed a phase out of the fishery within five years; recreational fishing was terminated immediately.

A similar situation pertains in the eight Pacific islands, with minor exceptions. There is virtually no recreational fishing occurring in the near shore and open ocean waters, because among other things, there are no people in these remote regions. There is no NMFS-managed recreational fishery.

FWS has closed all its refuges to recreational and commercial fishing, except at Palmyra where it permits limited recreational fishing by resident FWS and Nature Conservancy staff and visitors. Research is being conducted on the impacts of the bonefish fishery; FWS has the option under its authorities to close this fishery should it find that fishing is incompatible with resource protection. Base personnel at Wake are allowed to recreationally fish under base fishing guidelines; the take of certain rare species like the humphead wrasse is prohibited. The impacts of the recreational fishery have not been independently assessed. Enforcement is a potential issue at Wake, as there is no NOAA or FWS law enforcement officer present. There have been cases of illegal marine wildlife shipments from Wake; MCBI has submitted a Freedom of Information Act request to FWS for more details, but have not yet received an answer. In sum, recreational fishing could be prohibited in all of the islands with little on-the-ground controversy except for the two situations mentioned above. We recommend recreational fishing be prohibited permanently everywhere it does not exist now, but allow FWS to regulate it at Wake and Palmyra under the Refuge Administration Act.

Commercial fishing managed by NMFS and Western Pacific Fishery Management Council (WESPAC) does occur in the EEZ areas of the islands. According to NMFS, as of January 2008, there were eight existing permits in the so called PRIA EEZ fisheries, including pelagic trolling and handline (4), lobster (3), and bottomfish (1). Since then, several of these permits have expired; CEQ should request the latest number from NMFS. The various permits are held by three fishermen based in Honolulu; according to NMFS, not all of these permits are being used.

These fishers most likely would fish around Johnston, Kingman, and Palmyra, the places nearest to Honolulu, though technically the permits allow fishing in any island EEZ except Rose. Catch levels of this very minor fishery are not publically available from NMFS due to data confidentiality concerns, but are reportedly small. There are no fisheries-independent biological assessment of these near shore fisheries.

NMFS also issues permits to the long line tuna fleet based in Honolulu, totaling 164 boats; in 2007 only 83 of these permits were active. These fishermen, who target bigeye and yellowfin, are allowed to fish in the US EEZ areas of all the eight islands except Rose (which is covered by a different NMFS office), in the EEZ of Hawaii, and on the high seas. Tuna fishermen basically chase tuna, which are highly migratory. The longliners concentrate their greatest fishing effort in the triangular area formed by the points of Kingman-Palmyra, Oahu, and Johnston. The proportion of the longline fleet's total catch coming from the assessment areas is relatively small—about 7% over the last 5 years. (See Appendix 3.) Islands that experience very light longline fishing include Baker, Howland, and Jarvis; Wake is apparently little fished, if at all; and there is no longlining near Rose, according to American Samoan officials.

Purse seine tuna boats target schools of skipjack tuna, which is canned for sale. There are 13 US permitted purse seine boats fishing in the Central Pacific. Catch locations of skipjack are highly variable from year to year. Due to the more tropical distribution of skipjack, most of the fishing by the US fleet occurs in the Baker, Howland and Jarvis EEZ's. Less than 3 % of the fleets' total annual catch comes from the eight island EEZs.

Of the four species targeted by the tuna fleet, the bigeye population is the one most likely to be overexploited at this point in time. Yellowfin tuna is considered to be fully exploited, while skipjack and albacore are nearing full exploitation levels. There is also anecdotal information and satellite observation of illegal fishing (e.g., shark-finning) in the region by non-US flagged vessels.

Given the massive amount of fishing capacity and power of the entire Pacific fishing fleet, closing the EEZ of the US central Pacific islands will offer a much needed respite for these large pelagic creatures. Critically endangered sea turtles, albatrosses and sharks will once again have significant areas where they are protected during their oceanic wanderings. The closure of these fishing grounds will have relatively small impacts to the combined fishing fleets (less than 5% of their average landings) which can be made up in other areas. Indeed the scientific value from studying these near pristine and intact ecosystems far outweighs the commercial opportunities that are lost. Extending the coral reef refuges into the adjacent pelagic waters

will provide a unique opportunity to study the linkages between ocean and coastal tropical atolls.

Minerals Extraction

Given the geological history of the Pacific Basin, there are no likely oil and gas deposits in the region. For a number of years there has been discussion of mining cobalt crusts and manganese nodules from the basin and some limited exploration. No mineral extraction is currently taking place on the seafloor of the eight assessment areas. We believe seabed mining in the eight islands EEZs would be incompatible with preserving these areas as intact, fully protected ecosystems. Therefore, we recommend all minerals extraction be prohibited.

Scientific Research

The eight US Pacific islands are home to some of the healthiest marine ecosystems remaining in the world; compared to other areas, they are relatively intact and rich in biodiversity. As mentioned earlier, the islands have nearly four times as many shallow-water, reef-building coral species as the Florida Keys, and are home to hundreds of fish species, dozens of seabird species, and an untold number of invertebrate species, including many endemic species found nowhere else. The islands serve as stepping stones on dispersal highways for many coral reef species and marine colonizers that are now established throughout the Pacific. Seldom visited, and mostly uninhabited, the islands' surrounding marine waters are relatively free from the problems of most other marine ecosystems: over-exploitation, disturbance and pollution.

An estimated 14 million seabirds representing 19 species use the islands as critical stopover points, as well as breeding areas and feeding grounds. The eight islands serve as critical components of flyways for seabirds and migratory shorebirds. If fully protected from fishing, large tunas that inhabit the pelagic waters of the region will continue to provide their ecological function of driving smaller prey to the surface where it is easily caught by seabirds. The community dynamics that reveal themselves to scientists in untrammeled waters cannot be gained in areas under heavy exploitation.

It is within this context that the great scientific value of the island areas must be understood – they offer a unique window into the past. Nowhere else do we have such remarkably intact tropical ecosystems from which to develop historical baselines of what "natural" islands and oceans are supposed to be. The assessment islands and their surrounding waters offer tremendous opportunities for scientific research on a number of topics if they are protected in their natural state. The islands offer:

- pristine examples from which to assess the status of coral reef ecosystems throughout the Pacific, and an understanding of coral reef community dynamics without the impacts of fishing, pollution or runoff
- a historical baseline for setting coral reef restoration goals throughout the Pacific
- sites to monitor the effects of climate change on healthy ecosystems
- areas study the ecology of near shore ecosystems and their relationship to open ocean waters
- sites to enhance knowledge of seabirds, sea turtles and marine mammals in open ocean settings and their congregation and migratory patterns—much remains to be done here
- zones for exploration of the open ocean ecosystem, including its pelagic waters and the deep sea, all of which are not well understood
- areas to implement and learn from terrestrial and coral restoration projects

Comprehensive coral reef research between NOAA, FWS and several other institutions began in 2000. NOAA has done integrated ecosystem assessments to develop benthic habitat maps; conducts biennial Pacific Reef Assessment and Monitoring Program cruises to each region/island; and conducts Oceanographic and water quality monitoring around each island. A modest budget allocation goes to this effort—about $3M annually[77]. Scientists have mapped and monitored all US-affiliated islands in the Pacific, allowing for status and health comparisons between the eight islands and with other non-US islands. These comparisons have only begun. Researchers must continue to more completely understand the differences between nearly pristine and less than pristine coral areas. In addition, The Palmyra Atoll Research Consortium (PARC) should be allowed to continue operation and supported.

Research already has provided stunning examples of the tremendous biomass of large fishes that reefs can harbor when they are left un-fished. The incredible biomass of large fish and sharks that inhabit these reefs, and the inverted predator-dominated food webs that result might readily be dismissed if scientists did not have the proof from these islets and atolls. These systems need to be protected lest we forget what a healthy ocean looks like, and how an intact ecosystem functions. This latter point is even more significant given future uncertainty due to rising levels of atmospheric CO_2 and its impacts.

Fully protected from fishing, large tunas will inhabit the pelagic waters of the region and provide an important ecological function to foraging seabirds at these remote islets and atolls driving prey, such as squid, towards surface waters where they are easily caught by seabirds.

[77] Brainard, Rusty. 2008. Personal Communication.

The community dynamics that reveal themselves to scientists in these untrammeled waters are important insights that cannot be gained in areas under heavy exploitation.

Open ocean research also must be advanced to understand the importance of the ocean areas beyond the coral reef shelves. The assessment areas collectively encompass an estimated 200 seamounts, most of which have not been identified or explored. Given the high rates of species discovery at other seamounts and bottom habitats in the deep Pacific Ocean, we can easily surmise that hundreds to thousands of new species will be discovered in these waters.
EDF and MCBI recommend that research be continued and increased levels of funding. All research should continue under current agency research permits, consistent with the monuments 'objective of protecting and restoring these unique areas. Funding must be increased for future research for coral reef, deep sea, and open ocean surveys and studies. We recommend and additional $5 million annually to start. In an ocean where impacts from so many different activities weigh heavily on the ecosystems, the eight islands offer unparalleled opportunities for the study of naturally intact ecosystems and new discoveries.

RECOMMENDATIONS FOR PROTECTION

General Recommendations and Use

In general, we recommend that the eight islands be fully protected to the outer boundary of the US EEZ as marine national monuments in order to safeguard these rare, relatively pristine and intact ecosystems. Rose is the only exception due to the Governor's recommendation that a monument extend to 12 nm. Resource extraction should be prohibited on all of the islands, in the waters of the EEZ and on the seafloor, with certain limited exceptions. The purposes of the monument should be to protect and restore the scientific and historic resources therein, and to maintain natural biodiversity and ecological processes. Uses of the monument would be limited to scientific research, education, and wildlife viewing by permit.

Management

Because of the existing FWS presence on the ground and its extensive management knowledge and experience in the islands, we recommend FWS retain its full and exclusive authority over the islands and nearshore waters to a distance of 12nm, where it has such jurisdiction now, and that is jurisdiction be expanded to 12 nm at the rest of the islands where it currently has a 3 nm boundary. With the exception of Rose Atoll, NOAA should manage the 12 to 200 nm zone around the islands as a pelagic biological reserve under its authorities. The President should direct NOAA and FWS to coordinate their research and law enforcement activities in their

respective zones of management. The area around Rose should be cooperatively managed with the Government of American Samoa. Furthermore, adequate funds must be provided to NOAA and FWS for effective outreach and education to increase understanding of these rare natural gems, as well as for monitoring and enforcement of the areas with the assistance of the Coast Guard, which also needs additional funds.

The following principles should apply to the areas under consideration:

- Commercial extractive activities are prohibited, including mining and drilling.
- Ships waste discharges and other discharges are prohibited unless relevant national and international treatment standards are met.
- Commercial fishing is prohibited in the 12 nm zone.
- Commercial fishing in the 12 to 200 nm zone is capped at the average catch level for the last five years, and terminated within three years.
- Recreational fishing is prohibited in the 0- 12 nm zone and the 12- 200 nm zone. Exceptions are that fishing in the 0-12nm zone around Palmyra Island is capped at the average catch level for the last five years. FWS is authorized to manage recreational under the Refuge Administration Act and consistent with the management goals of the monument.

The special circumstances of the two military-managed islands call for special measures:

- Johnston Island and surrounding waters to 12 nm is transferred to the Department of the Interior immediately and managed by FWS as a refuge, with funding provided for staff to be based on the island.
- Wake Island remains under DOD management until such time as the DOD declares the island surplus to its needs, at which time it would revert to the Department of the Interior.
- Interior and DOD are directed to negotiate a cooperative wildlife management agreement for Wake Island's emergent lands. FWS and DOD are directed to co-manage the land areas and wildlife as mutually agreed upon. Funding is provided to place FWS staff on the island for wildlife law enforcement and management purposes.
- The marine waters of Wake to a distance of 12 nm are designated as an overlay national wildlife refuge with primary management authority granted to FWS. Recreational fishing in the 0-12nm zone around Wake Island is capped at the average catch level for the last five years; or if such statistics are not available, appropriate regulations should

be issued by FWS. FWS is authorized to manage recreational fishing under the Refuge Administration Act, consistent with the management goals of the monument.

- The waters from 12 to 200 nm at Wake are managed by NOAA as a fully protected area.

Military Activities

As per the President's memo of August 26, 2008, DOD should be permitted to continue any activities it deems necessary for national defense in the waters surrounding Wake and the other islands.

Conclusion

In sum, the natural resource values of our eight Pacific islands are superb, the need for their conservation is clear, and the timing is right for bold leadership by President Bush who is the only one with the ability and authority to act swiftly and decisively to protect these national treasures. Should the President protect these places, he would make conservation history by establishing the world's largest protected area and laying the foundation for a national system of ocean reserves. Theodore Roosevelt laid the seeds for the national park system through his proclamation of 18 national monuments. President Bush can leave a comparable ocean legacy by protecting our unique Pacific island ecosystems.

PALMYRA ATOLL

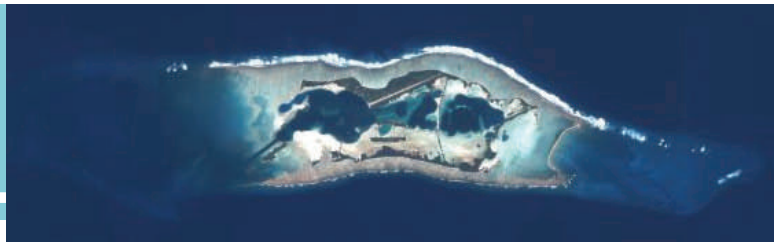


Photo: Space Imaging

KEY SPECIES

Birds
- Red-tailed tropicbirds
- White-tailed tropicbirds
- Red-footed boobies
- Masked boobies
- Brown boobies
- Great frigatebirds
- Sooty terns
- Black noddies
- Brown noddies
- White terns

Reptiles
- Green sea turtles (threatened)
- Hawksbill sea turtles (endangered)

Mammals
- Mellon-head whales
- Hawaiian monk seals (occasionally)

Invertebrates
- 176 stony coral species over 36 genera
- 17 benthic cnidaria species over 15 genera
- 12 species of macro-invertebrates other than cnidarians
- Coconut crabs (globally depleted)
- Giant clams (globally depleted)

Fish
- 418 fish species

PROPOSAL

- Establish a National Monument that includes Palymyra Atoll and its surrounding waters
- Expand US Fish and Wildlife Service management authority from 3 to 12 nautical miles (nm)
- Manage the island and nearshore waters to 12 nm as a fully protected National Wildlife Refuge under authority of the Secretary of the Interior
- Establish appropriate conservation measures to protect and conserve the wildlife in the waters and on the seafloor surrounding the fully protected refuge, in particular shallow and deepwater corals, large predatory fishes, and seabirds. This zone from 12 to 200 nautical miles would be managed by the Secretary of Commerce acting through NOAA

IMPORTANCE

- Atoll lies within the inter-tropical convergence zone and path of the eastward moving Equatorial Countercurrent, which bring more rainfall and the larvae of additional reef species from the more diverse West Pacific
- The only uninhabited "wet" atoll in the Pacific when rediscovered by American explorers two centuries ago
- Serves as a baseline from which to evaluate the condition of other coral reefs and seabird populations elsewhere that have been degraded
- Protects many depleted species, including coconut crabs, giant clams, resident whales, and sea turtles
- Strong cultural value for the early history of Polynesians, Micronesians, guano miners, and recent colonists
- During WWII, Palmyra Atoll Naval Air Station was occupied by American troops
- Location of the biological research station managed by The Nature Conservancy

SITE DESCRIPTION

Palmyra Atoll includes approximately 680 acres of emergent reef and land and nearly 515,000 acres of submerged lands. Palmyra Atoll and surrounding waters out to 12 nautical miles are currently managed by the US Fish and Wildlife Service and closed to public entry except for limited catch and release and sustenance fishing.

Palmyra Atoll is home to a diverse array of terrestrial and marine species, many of which are threatened or endangered. Palmyra Atoll is known to have the third largest colony of red-footed boobies in the world.

THREATS

- Localized upwelling around the island attracts illegal foreign commercial fishermen
- Potential trespass by a handful of US fishing vessels, which cannot be monitored
- Potential shipwrecks, groundings, and oil spills from commercial fishing vessels in refuge waters
- Potential for transiting vessels to ground due to poor charts
- Invasive insects, coconut trees, and invasive marine species destroying natural ecology
- Lost fish aggregating devices (FADs) wash up on reefs and beaches as marine debris and entangle and kill wildlife; potential groundings by trespassing vessels retrieving FADs

Rose Atoll, American Samoa

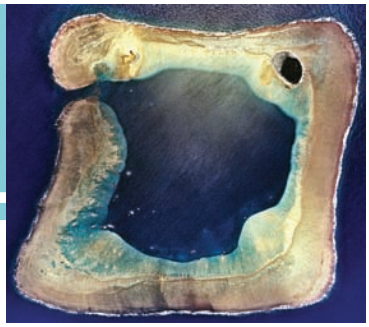


Photo: Hawaii Air Survey

Key Species

Birds

White-tailed tropicbirds
Red-tailed tropicbirds
Masked boobies
Brown boobies
Red-footed boobies
Great frigatebirds
Lesser frigatebirds
Gray-backed terns
Sooty terns
Brown noddies
Blue noddies
White terns
Long-tailed cuckoos

Reptiles

Green sea turtles (threatened)
Hawksbill sea turtles (endangered)

Invertebrates

Giant clams (globally depleted)

Fish

Over 500 fish species
Gray reef sharks

Ostorhinchus leslie Photo: J E Maragos

School of goatfish Photo: J E Maragos

Proposal

- Establish a National Monument with a boundary of 12 nautical miles around Rose Atoll
- Expand US Fish and Wildlife Service (USFWS) management authority from 3 to 12 nautical miles offshore
- USFWS and American Samoa Government to co-manage the monument as a biological reserve
- Gov. Togiola Tulafono, American Samoa, supports presidential designation as stated in his letter of April 16, 2008 to President Bush

Importance

- Smallest atoll in the world
- Largest concentration of nesting sea turtles, nesting sea birds, *Pisonia* trees, and giant clams in American Samoa
- Strong cultural value for the early history of Samoa and Nu'u O Manu

Site Description

Rose Atoll is an uninhabited island that is part of the Territory of American Samoa. The atoll and surrounding waters out to 3 nautical miles are currently managed cooperatively by the American Samoan Government and the US Fish and Wildlife Service as part of the Pacific Remote Islands Area Refuge Complex, and the refuge is closed to public use.

Rose Atoll is the easternmost Samoan island and the southernmost point of the United States. It is among the few islands in the Western Pacific that was never permanently inhabited and one of the very few that is now protected. Rose Atoll is home to a very diverse assemblage of terrestrial and marine species, many of which are threatened or endangered. Threatened *Pisonia* atoll forest trees are found here. Rose Atoll supports 97% of the seabird population of American Samoa, including 12 federally-protected migratory seabirds and 5 species of federally-protected shorebirds. Rose Atoll is the largest nesting ground in the Samoan Islands for threatened green sea turtles and is also an important nesting ground for the endangered hawksbill turtle. It also provides sanctuary for the giant clam, which is severely depleted throughout the Pacific.

Threats

- Illegal poaching of clams, sharks and fish by local and foreign fishermen
- Potential shipwrecks, groundings, and oil spills from illegal fishing vessels in refuge waters
- Invasive algae, cyanobacteria, and coconut trees
- Potential for transiting vessels to ground due to poor charts

October 25, 2008

The Honorable James L. Connaughton
Council on Environmental Quality
722 Jackson Place, NW
Washington, D.C. 20503

Subject: MCBI and EDF comments regarding Potential Marine Conservation Management Areas

Dear Chairman Connaughton,

On behalf of Marine Conservation Biology Institute (MCBI) and Environmental Defense Fund (EDF), we write to express our strong support for President Bush's consideration of new Marine Conservation Management Areas in the central and western Pacific Ocean and to offer our recommendations for immediate action.

The areas under consideration are unique natural gems. They include some of the world's most pristine coral reefs and the deepest canyon, with important scientific, cultural, and historic value. President Bush has the unique opportunity to safeguard these areas for generations to come by designating them a fully protected marine national monument. This would mean prohibiting extractive uses including mining, drilling, and fishing throughout the surrounding exclusive economic zone. In total, this would be the largest conservation area in the world – bigger than the area of all National Parks combined – and a lasting legacy for President Bush.

President Bush made history in 2006 when he created one of the world's largest ocean protected areas in the Northwestern Hawaiian Islands. Papahānaumokuākea Marine National Monument encompasses 140,000 square miles and contains the nation's largest shallow-water coral reefs. We are excited by his interest in taking further action.

President Bush has asked you and the Secretaries of Defense, Interior and Commerce to assess the conservation needs of three areas in the Pacific Ocean: seven islands in the Central Pacific and their surrounding waters (Johnston Atoll, Howland, Baker and Jarvis Islands, Kingman Reef, Palmyra Atoll, and Wake Island); in American Samoa, Rose Atoll and adjacent waters; and in the western Pacific, marine waters around the northern islands of Commonwealth of the Northern Mariana Islands.

These are some of the most pristine tropical islands and coral reef ecosystems in the world. For instance, Kingman reef, as it stands today, is the most pristine coral reef on Earth, and has the world's highest proportion of top predators, including sharks. Throughout the exclusive economic zone, these large pelagic fish are important for seabird survival: they drive smaller fish to the surface on which seabirds forage. In addition, 75 % of the world's corals are found in this region of the world, and corals there are disappearing twice as fast as tropical rain forests. Conservation action by the President would help ensure these rare places can continue to thrive.

Historically several of the islands are important to the United States. Many of them were used for defense purposes during World War II. Wake Island was the site of an important battle with the Japanese and was where President George H. W. Bush made his first wartime flight. Designating the area as a marine national monument would be a fitting tribute to those who served their country.

We greatly appreciate the robust public process you have conducted as part of the assessment of the areas. Attached are our detailed comments and specific suggestions for conservation action. Please contact us if you have questions.

Sincerely,

William Chandler
Vice President for Government Affairs
Marine Conservation Biology Institute
bill@mcbi.org

Amanda Leland
National Policy Director, Oceans
Environmental Defense Fund
aleland@edf.org

Wake Island

Wake Atoll Photo: DOD

Key Species

Birds

White-tailed tropicbirds
Red-tailed tropicbirds
Masked boobies
Brown boobies
Red-footed boobies
Great frigatebirds
Sooty terns
Gray-backed terns
Brown noddies
Black noddies
White terns
Christmas shearwaters
Turnstones
Bristle-thighed curlews
Wandering tattlers
Lesser golden plovers
Greater yellowlegs
Black-footed albatross
Wake rail (extinct)

Reptiles

Green sea turtles (threatened)

Invertebrates

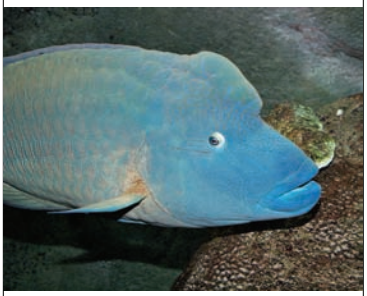
52 corals species over 24 taxonomic genera

Fish

323 species in 63 taxonomic families

Mammals

Spinner dolphins



Napolean wrasse Photo: Melbourne Aquarium

Proposal

- Establish a National Monument in Wake Island's surrounding waters
- Manage the nearshore waters to 12 nm as a fully protected National Wildlife Refuge under the authority of the Secretary of the Interior with necessary and appropriate use by the Department of Defense (DOD) for Wake operations
- Establish appropriate conservation measures to protect and conserve the wildlife in the waters and on the seafloor surrounding the fully protected refuge, in particular shallow and deepwater corals, large predatory fishes, and seabirds. This zone from 12 to 200 nautical miles would be managed by the Secretary of Commerce acting through NOAA

Importance

- Historically important to the Northern Marshall islanders who periodically visited Wake Island to harvest fish and other foods
- Site of significant battle with the Japanese during WWII and the first US territory to fall
- Relatively pristine coral reefs that have not been fished extensively since WWII
- Numerous unexplored seamounts very near to Wake Island
- An endemic rail, *Rallus wakensis,* inhabited the atoll and went extinct during the WWII Japanese occupation. The atoll could provide suitable habitat for the intoduction of the Guam rail, a similar species endemic to Guam but now limited to captive propagation
- Identified as an island of significant importance for its capacity to provide habitat to endangered albatross. Currently endangered black-footed and threatened laysan albatrosses inhabit the island
- Abundant populations of Napolean wrasse, bumphead parrotfish, and large groupers, all of which are depleted elsewhere
- Presence of the rare grass species *Lepturus gasparricensis*

Site Description

Wake Island is a small atoll in the central Pacific with a rich array of natural and cultural resources. Wake Island is one of the most isolated—and perhaps oldest living—atolls in the world. It was designated as a National Historical Landmark in 1985.

Wake Island is an unincorporated possession under the Department of Interior's (DOI) authority, but currently used and managed by the DOD. DOD currently restricts access within a 3 nautical mile Naval Defensive Sea. Because DOD restricts access, there has been little fishing pressure, and marine biomass and biodiversity is likely to be extremely high.

Threats

- Nearby reefs and seas may be exposed to unauthorized fishing due to insufficient enforcement by federal wildlife personnel
- Unregulated fishing by residents of Wake Island for the bumphead parrotfish and Napolean wrasse, two extremely vulnerable species
- Potential contamination from old World War II steel dump. Continued presence of algal mats point to an increase in levels of iron in the water
- Illegal presence of shark-finners is suspected due to an unusual absence of gray reef sharks as noted by scientists