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Note verbale dated 18 April 2005 from the Permanent Mission of Costa Rica to the United Nations addressed to the Secretary-General

The Permanent Mission of Costa Rica presents its compliments to the Secretary-General, and has the honour to refer to the sixth meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea.

The Permanent Mission of Costa Rica is honoured to convey to the Secretary-General the document entitled "The bottom line: an investigation of the economic, cultural and social costs of industrial longline fishing in the Pacific and the benefits of sustainable use of marine protected areas", to be used as one of the background papers of the forthcoming meeting of the Consultative Process (see annex). The Government of Costa Rica is convinced that the information and the recommendations contained in the document will provide a valuable input to the consideration of the question "Fisheries and their contribution to sustainable development" at the forthcoming meeting of the Consultative Process.

The Permanent Mission of Costa Rica would be grateful if the present note and its annex would be issued as a document of the Consultative Process.

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Annex to the note verbale dated 18 April 2005 from the Permanent Mission of Costa Rica to the United Nations addressed to the Secretary-General

The Bottom Line: An investigation of the Economic, Cultural and Social Costs of Industrial Longline Fishing in the Pacific and the Benefits of Sustainable Use of Marine Protected Areas[1]

With Recommendations for Action

By Robert Ovetz, Ph.D., Sea Turtle Restoration Project

Mounting scientific evidence has documented the extensive damage caused by high seas industrial longline fishing in the Pacific to the marine ecosystem. What has received less attention is that industrial longline fishing also has extensive negative economic and social consequences for coastal communities and the nearly 1 billion people that rely on fish for their primary source of protein.

The impact of high seas longline fishing in the Pacific, which consists of the largest tuna fishery in the world, can be felt throughout our planet. Sea turtles, seabirds, marine mammals and other threatened marine species are caught, injured and killed by industrial longlines in large numbers and pushed to the edge of extinction. Industrial longline fishing not only threatens marine wildlife but human societies that rely on the ocean for their own well-being.

A recent investigation has found that pelagic longline fishing may be contributing to the depletion of local fish stocks, thereby threatening the food security of coastal communities primarily served by small-scale “artisanal” fishermen and women.[2] Additional recent scientific studies have identified industrial longlining as the cause of the decline in the population of large pelagic fish species including billfish, sharks and tuna by as much as 87-99 percent in the Atlantic, Gulf of Mexico and the Atlantic since the 1950s.

The modest profits of medium and large-scale industrial longline fishing are negated by hidden costs generated by massive government and intergovernmental subsidies, risk of fishery collapse, damage to small-scale fishing, threats to local food security, losses to indigenous island cultures integrally connected to sea turtles, sharks and the ocean, damage to local marine ecosystems, and harm to more lucrative sustainable economic activities such as sportfishing, tourism, whale watching and diving. Smallscale fishermen are finding their fisheries depleted by foreign industrial-scale vessels encouraged by heavy subsidies; local seafood consumers face rising prices and shortages, and native peoples are losing their traditional fishing grounds. When the industrial longline vessels deplete the local fisheries and move their operations that once provided a payoff to individual nations, local communities are left with the crisis of trying to feed their families and communities from badly damaged marine ecosystems. This damage to local

coastal communities is being carried out to catch fish that are primarily exported to markets in wealthy countries in Europe and North America well as Japan.

The benefits of conservation to both developed and developing countries are immense. Recent studies have shown that sustainable use Marine Protected Areas (MPAs)[3] that prohibit industrial fishing are extremely successful in replenishing the biological diversity of both target and non-target marine species in a period of 1-5 years and for less than the cost of subsidizing industrial fisheries. Because developing countries are home to the overwhelming majority of sea turtle populations, for example, these countries have the most to gain from protecting the species. In fact, a number of communities in developing countries home to sea turtle nesting habitats have profited from successful efforts to conserve sea turtle populations through enhanced eco-tourism.

MPAs are a valuable tool for fisheries management because they allow local control of the marine food supply. This ensures that these resources are not drained away from the local communities merely to be exported abroad for short-term profit.

On the other hand, aside from shouldering the cost of subsidizing a marginally profitable and inefficient longline industry, developed nations must also pay the costs to public health from mercury contaminated longline caught tuna, shark and swordfish.

The crisis caused by longline fishing is a case example of the systemic damage being done by unregulated industrial fishing in a newly emerging, increasingly unregulated global economy in which nations are encouraged to exhaust our shared ocean to generate commodities for export to wealthy markets. Industrial longline fishing is a case example of a destructive fishing practice which the United Nations General Assembly, World Summit on Sustainable Development, Convention on Biological Diversity, the United Nations Millennium Ecosystem Assessment Synthesis Report, and two consultative committees of the UN Food and Agriculture Organization (FAO) in addition to about 900 scientists from 83 countries and 230 nongovernmental organizations from 54 countries have recommended to be prohibited.

I. The Impact of Industrial Longline Fishing on Marine Biodiversity

Pelagic longline fishing in the Pacific is a highly unselective fishing technique that uses monofilament lines at the shallow surface of the high seas stretching as much as 60 U.S. miles with as many as thousands of baited hooks. These large vessels originate from a number of countries including the U.S., Japan, Taiwan, Spain and other Asian and Latin American countries and primarily export their catch to the U.S., Japan and the European Union. Targeting highly migratory predatory fish species including tuna and swordfish, industrial longlines also catch or kill as many as 4.4 million sea turtles, billfish, sharks, marine mammals and seabirds.[4]

Most threatened by industrial longline fishing are leatherback sea turtles which migrate thousands of miles across the Pacific to lay their eggs, feed and reproduce. According to recent scientific reports, the number of nesting female Pacific leatherback sea turtles has declined by 95 percent since 1980 and is expected to go extinct within the next 5-30 years unless efforts are taken to reverse their decline.[5] One of the largest threats to their survival is pelagic industrial longline fishing. Leatherback sea turtles get hooked on longlines and often drown before the line is reeled and the sea turtle can be released.

Longlines are also one of the main threats to the survival of sharks and billfish. Recent studies have documented the rapid decline of large predatory fish species such as billfish, sharks and tuna. In the Pacific, the biomass of large predatory fish caught by longline fishing, for example, has declined by 90 percent since 1950.[6] Earlier this year, the U.S. warned that albacore and bigeye tuna, also caught with longlines, are being overfished in the Pacific. The problem is not restricted to the Pacific. A recent report has found that industrial longline fishing has contributed to the decline of oceanic whitetip and silky shark species by 90-99 percent in the Gulf of Mexico.[7] Another scientific study showed that in the Atlantic "large predatory fish biomass today is only about 10 percent of pre-industrial levels."[8]

Longlines are also a significant threat to species of seabirds that are often caught on longline hooks on the high seas. Reports have documented that longline fishing is one of the main threats to the survival of the highly endangered Black-footed albatross in the Pacific. The latest estimates indicate that between 5,000 to 13,800 Black-footed Albatross (1.9 to 5 percent of the population) are killed each year by industrial longline fishers with additional birds killed by other types of fishing and pollution.[9] According to a recent report, 19 of the 21 species of albatross are now considered globally threatened with the remainder classified as near threatened.[10] Longlines are the most significant threat to these species' survival.

II. The Economics of Longlining

The combination of high subsidies, historically declining catches, high fuel costs and other factors make longlining unsustainable, inefficient and unprofitable to most fishers.

A. Subsidies Obscure the True Costs of Longlining

Globally, governments are estimated to subsidize fishing at a rate of 20-25 cents for every dollar earned by fishermen. Members of the Organization for Economic Cooperation and Development (OECD) plus China account for approximately 75 percent of the $14-$20 billion[11] in subsidies that are doled out each year. This estimate may be extremely low, as the UN Food and Agriculture Organization (FAO) found in 1993 that such subsidies may amount to as much as

$50 billion.[12] The European Union and its member states provide an estimated $1.5 billion in annual subsidies, Japan close to $3 billion, and the United States $868.43 million, $150 million of which consists of tax rebates on marine diesel fuel.[13] In all, an estimated $2.5 billion per year is pumped into the multi-national North Atlantic fleets alone.[14] According to the UN Food and Agriculture Organization, worldwide fishing revenue amounted to only $70 billion while total operating costs totalled $85 billion.[15]

As we will see, a significant proportion of the U.S. longline fleet has been unprofitable in recent years. An even larger portion would have been unprofitable without the government subsidies that cushion potential losses. Such losses do not include additional significant direct and external costs to the ocean ecosystem and coastal communities that rely upon it.

B. Longlining is Unprofitable

New technologies and increased fishing effort are not necessarily leading to higher profits in the longline fishery. In fact, according to a study of the worldwide impacts of longline fishing, U.S. and Canadian "longline fisheries emerge as a marginally profitable industry that, in some regions, target species that are considered endangered or vulnerable by the IUCN."[16] Longline fishing methods are flooding the market with high quantities of relatively low quality fish which drives down prices and reduces profit. For example, the longline fleet in the Indo-Pacific is flooding Japan with low-grade tuna, causing prices to decrease while continuing to take relatively large numbers of tuna from the ocean.[17] As a result, the price for swordfish has been declining because the market is flooded by swordfish from the Caribbean, South America, Australia, Canada, Spain and the Western Pacific.

There has been an ongoing conflict between Chile and the European Union since 2000, when the Chilean government closed its waters to Spanish industrial longline vessels that had depleted Chile's swordfish stocks and depressed take by local fishers. Chile was merely a transit station for the bulk of the catch on its way to lucrative U.S. and Japanese markets. In retaliation, the EU threatened Chile with action at the WTO forcing it to back down and reopen its waters to the EU until 2002 when it refused to renew its lease agreement. This case went to the International Tribunal for the Law of the Sea but was eventually suspended by both parties as a result of a new trade pact.

Longline swordfishing is often only marginally profitable, if profitable at all. A study of 95 vessels in the Hawaiian longline fleet in 1993 found that 32, or one third of the vessels, realized a negative return, when amortization of the vessels was included.[18] Overall, longline vessels targeting swordfish had the lowest average annual profit, $11,000, while longline vessels targeting tuna and mixed species earned $20,000 and $47,000 per year, respectively. In fact, 48 percent of the swordfish vessels lost money that year. The total revenues for 1993 were $55 million. Because the analysis did not include subsidies, rebates, tax write-offs,

docks constructed at public expense, and costs for training and marketing, this estimate should be considered conservatively low. A 2005 study of 20 Hawaii based longline vessels found an average loss of $39,897 per vessel. If these vessels had remained in California, where they temporarily relocated from 1999-2004 after being banned in Hawaii, they would have had an average loss of $100,164 per vessel.[19] Another study of longlining in the Atlantic and Gulf of Mexico found that full-time longline vessels lost on average a total of about $3,500 per year and part-time longline vessels lost $23,500 per year, although these losses may not be apparent due to subsidization of the longline fishery.[20]

Figure 1: Profitability of Longline Fishing in the Atlantic and Gulf of Mexico (U.S. dollars)

Revenue	Variable Costs	Fixed Costs	Depreciation	Other Fishing Income	Profit F/T*	Profit P/T**
$250,000	$190,000	$50,000	$17,000	$3,500	—$3,500	—$23,500

Notes:

* “F/T” refers to full-time

** “P/T” refers to part-time

• All figures are averages

Source: Porter, R. M., Wendt, M., Travis, M. D., and I.E. Strand, “Cost-earnings study of the Atlantic-based U.S. pelagic longline fleet,” unpublished paper, SOEST 01-02, JIMAR Contribution 01-337, Pelagic Fisheries Research Program, Joint Institute for Marine and Atmospheric Research, University of Hawaii, Honolulu, HI, 2001; and Dumas, C., “The economics of pelagic longline fishing in the U.S. and Canada—A brief overview,” presentation notes submitted at the International Leatherback Survival Conference, April 22-25, 2002, p. 11.

C. Longlining Is Inefficient and Wasteful

Since the mid 1970s oil crisis, the amount of fuel consumed by larger and larger vessels has been rapidly outpacing the growth in the actual catch. A recent study explored the energy efficiency of a number of world fisheries, including longlining, and found longlining to be the second most inefficient industrial fishery.[21] Taking into account the material and petroleum required to power a wide variety of industrial fishing vessels, the study compared the amount of edible protein in the catch. According to the study, amongst fisheries targeting high value species, “it is now common for direct fossil fuel energy inputs alone to exceed nutritional energy embodied in the catch by at least an order of magnitude.” In an earlier preliminary study of 54 North Atlantic fisheries from five countries, the

author uncovered a wasteful paradox: “the availability of abundant energy enables most contemporary fisheries to continue even when stocks are in decline.”

Among the fisheries with the most inefficient “edible protein return on investment,” vessels targeting shrimp, tuna and swordfish are at the top of the list. By comparison, it is relatively fuel-efficient to target deep sea species such as menhaden and mackerel, most of which are ground up into meal or used for oil for unsustainable fish farms.

Tuna and swordfish fisheries are especially petroleum hungry, with energy consumption three times the average. Between 1986 and 1999, the amount of energy consumed by these fisheries skyrocketed fourfold. Of the 32 demersal, pelagic and shellfish fisheries studied, the Central Pacific swordfish/tuna longline fishery had the fourth highest “fuel use intensity” (liters of fuel per ton of catch), and the tuna/billfish longline fishery had the highest—exceeding even that of shrimp trawling, the second highest. As a result, these two industrial longline fisheries are among the eight lowest in terms of “edible returns on investment” for protein.[22]

Figure 2: Energy Performance of Industrial Fisheries for Direct Human Consumption

	Main Fishery Targets	*Gear*	*Time Frame*	*Location of Fishery*	*Fuel Use Intensity (litres/tonne)*	*Edible Protein EROI*
Demersa	Redfish spp.	Trawl	Late 1990's	North Atlantic	420[A]	0.11
	Cod/Flatfish spp.	Danish seine	Late 1990's	North Atlantic	440[A]	0.10
	Cod/Haddock	Longline	Late 1990's	North Atlantic	490[A]	0.091
	Cod/Saithe	Trawl	Late 1990's	North Atlantic	530[A]	0.084
	Alaskan Pollock	Trawl	Late 1980's	North Pacific	600[B]	0.052
	Flatfish spp.	Trawl	Late 1980's	NW Pacific	750[B]	0.066
	Croakers	Trawl	Late 1980's	NW Pacific	1,500[B]	0.029
	Flatfish spp.	Trawl	Late 1990's	NW Atlantic	2,300[A]	0.019
Pelagic Fisheries	Herring/Mackerel	Purse seine	Late 1990's	NE Atlantic	100[A]	0.56
	Herring	Purse seine	Early 1990's	NE Pacific	140[C]	0.36
	Herring/Saithe	Danish Seine	Late 1990's	NE Atlantic	140[A]	0.35
	Salmon spp.	Purse seine	1990's	NE Pacific	360[C]	0.15
	Salmon spp.	Trap	Early 1980's	NW Pacific	780[B]	0.072
	Salmon spp.	Gillnet	1990's	NE Pacific	810[C]	0.068
	Salmon spp.	Troll	1990's	NE Pacific	830[C]	0.067
	Herring	Purse seine	Early 1980's	NW Pacific	1,000[B]	0.051
	Skipjack/Tuna	Pole and line	Early 1980's	Pacific	1,400[B]	0.053
	Skipjack/Tuna	Purse seine	Early 1980's	Pacific	1,500[B]	0.049
	Swordfish/Tuna	**Longline Late**	**1990's**	**NW Atlantic**	**1,740[A]**	**0.042**
	Salmon spp.	Gillnet	Early 1980's	NW Pacific	1,800[B]	0.031
	Swordfish/Tuna	**Longline**	**Early 1990's**	**Central Pacific**	**2,200[D]**	**0.027**
	Tuna/Billfish	Longline	Early 1980's	Pacific	3,400[B]	0.022
Shellfish	Abalone/Clams	Hand gathering	Early 1980's	NW Pacific	300[B]	0.11
	Crab	Trap	Late 1990's	NW Atlantic	330[A]	0.057
	Scallop	Dredge	Late 1990's	North Atlantic	350[A]	0.027
	Shrimp	Trawl	Late 1990's	North Atlantic	920[A]	0.058
	Shrimp	Trawl	Early 1980's	North Pacific	960[B]	0.056
	Norway Lobster	Trawl	Late 1990's	NE Atlantic	1,030[A]	0.026
	Crab	Trap	Early 1980's	NW Pacific	1,300[B]	0.014
	Spiny Lobster	Trawl Early	1980's	NW Pacific	1,600[B]	0.017
	Squid	Jig	Early 1980's	NW Pacific	1,700[B]	0.033
	Shrimp	Trawl	Late 1990's	SW Pacific	3,000[D]	0.019

Notes:
* Higher fuel use intensity implies lower energy efficiency
* Bold added

Source: Reprinted with permission from P. Tyedmers, "Fisheries and energy use", prepublication draft, C. Cleveland (ed.) Encyclopedia of Energy, Academic Press/Elsevier Science, vol. 2, 2004, p. 12.

The issue of fuel inefficiency is the consequence of larger systemic developments directly correlated to spiralling expansion of the industrial longline industry. Since the late 1980s, the expansion of the industrial longline fishery has created a damaging feedback loop both for the marine ecosystem and the societies that rely on pelagic species for their livelihoods. As longline and industrial fishing technology developed, it allowed a rapid expansion of fishing capacity that far exceeded the reproductive capacity of the targeted fish stocks. This created a feedback loop that drove industrial longline fleets to go farther from shore to catch dwindling stocks. At the same time, decreasing catches forced small-scale fishermen to increase the size of their vessels and fish farther from shore. Encouraged by a wide range of subsidies and access to lucrative foreign export markets, many of these fleets descended deeper into debt to finance an expansion of capacity to chase fewer and fewer fish farther and farther from shore.

Longlining is also a major contributor of climate warming carbon dioxide gases. The fisheries in this study consumed a staggering 1 billion liters of diesel fuel, each liter of fuel producing 2.66 kilograms of CO2. The very small island nations that rely on meager royalties from the foreign longline catch in their EEZ are caught in a paradox. Threatened by rising sea levels from global climate change, they rely heavily on royalties from an industry that is a significant contributor of CO2 responsible for creating climate change.

D. The Costs of Bycatch

Bycatch and overfishing impose significant costs on the oceans and society, most of which are not directly borne by the fishers themselves. It is estimated that global commercial fisheries generate roughly 44 billion pounds of wasted catch each year, including over 3 billion pounds by U.S. fishermen alone.[23] Bycatch is both a problem for target as well as non-target species.

Two kinds of bycatch plague a vessel. First, fishers catch and kill marine life that has little or no market value. Second, fishers catch commercially valuable fish that do not meet legal minimum size and weight requirements or exceed catch quotas. In both cases, this waste is not included in estimates of the total operating costs or the price of fish, except to the extent that extra time is required to free or dispose of the bycatch, repair damaged nets and lines and empty nets otherwise crowded with unwanted species. In effect, the estimated “cost” attributed to bycatch includes only the time and equipment it takes to remove unwanted animals from nets, lines and boats.

We have yet to manage our fisheries to take into account the social and ecological costs of removing such a significant part of our marine biodiversity as so-called incidental bycatch. This portion of bycatch costs alone can be significant, especially in the longline fishery. The rate of bycatch in the Atlantic longline fleet, for example, was found to be one-half of the total catch.[24] Many regional fisheries councils and national governments inadequately report bycatch or do not have

observers aboard to monitor let alone require fishers to implement bycatch mitigation gear or strategies.[25]

As a result, much of the swordfish caught is classified as so-called "bycatch." According to Crowder and Myers, "swordfish is such a common catch on tuna-targeted trips that about 50 percent of the total swordfish catch is taken as bycatch, not as targeted catch. In fact, the swordfish caught by the world's leading swordfish harvesters—Japan and Taiwan—is primarily bycatch from tuna fisheries."[26] In effect, the value of the bycatch fish may exceed the targeted fish. It is estimated that more swordfish is caught by tuna longlines in the Pacific than longlines targeting swordfish and that such bycatch amounts to about 25 percent of the global catch.[27]

Bycatch has extensive negative consequences on both the economy and biodiversity. Sportfishers, divers, and other humans who live and work with billfish, sea turtles, seabirds, marine mammals and other species caught as bycatch are harmed directly, often with direct economic consequences. Bycatch destroys both predatory and prey species upon which complex ecosystems rely for survival, the long-term consequences of which we are only now beginning to ascertain. For example, the reduction in leatherback sea turtles, which feed almost exclusively on jellyfish due to longline fishing has paralleled extensive jellyfish blooms. These blooms result in beach closings, damage to fisheries and the loss of tourism revenues.

III. The Negative Impact on the Economy

Longline fishing supplies a luxury item for wealthy markets in the U.S., EU and Japan that makes an insignificant contribution to the local and global economy while creating extensive external costs from the ecological and social damage. The U.S. is a good example of this widening gulf between the costs and benefits of longlining. In Hawaii, the total value from industrial longliners was $47.4 million in 1999, a decline from $53.4 million in 1993.[28] An estimated additional $101 million in regional personal income from value-added processing, distribution, wholesaling and retailing likely was generated.[29] This $141 million comprises only a small fraction of the total Hawaiian economy. In contrast, the overall Hawaiian state economy in that year was approximately $40 billion, meaning that this industry is a mere one-thousandth (0.1 percent) of the state's economy. Globally, the longline fishery is estimated to be valued at $4-$5 billion in dockside value and the annual South Pacific tuna fishery is estimated to be valued at $2 billion.[30]

In addition to longline fishing contributing a small part of the U.S. West Coast's overall economy, it also comprises only a small part of the fishing-related economy. The U.S. National Marine Fisheries Service notes that the U.S. West Coast longline, gillnet and other fishing for highly migratory species (such as tuna and swordfish) make up only a small portion of overall fisheries-related business in most ports and communities. This is true even in southern California, where the bulk of the industrial longline vessels were located until the Hawaiian swordfish

longline fishery was reopened in spring 2004. Of California's 90 seafood processors in 1995, only five processed significant quantities of swordfish.[31]

Extensive bycatch by longline vessels has significant, negative consequences for recreational fishing and other industries that rely on a healthy marine ecosystem. Marine wildlife tourism generates many times more revenues from non-extractive activities, such as visits to intact marine habitats. Whale watching has grown quite rapidly. In 1991, about 4 million people in 31 countries watching whales and other cetaceans generated $317.9 million. This grew rapidly to 5.4 million people in 64 countries only three years later in 1994, generating $504.3 million.[32] The value of ocean-related recreation in small regions can rival the estimated $4-$5 billion value of the global longline industry. According to the U.S. Commission on Ocean Policy, “In just four South Florida coastal counties, recreational diving, fishing, and ocean-watching activities generate $4.4 billion in local sales and almost $2 billion in local income annually.”[33]

MPAs are proven to also contribute significantly to local economies. In Hawaii, which the report singles out for attention, “the annual recreational value of the coral reefs of each of six Marine Management Areas in the Hawaiian Islands in 2003 ranged from $300,000 to $35 million.”[34]

Regional contributions to the U.S. economy made by recreational fishing are equal to the global value of the longline industry. Recreational fishing in California generates $2.9 billion in sales, $5 billion in personal income and $5.7 billion in value added to the economy. It is estimated that 153,849 people are employed in the state in jobs related to recreational fishing while only 20,820 are employed in commercial fishing. In Hawaii, the value of recreational fishing far exceeds the estimated $47.4 million value of the longline industry.[35] Recreational fishing trip-related expenditures were estimated to range from $130-$347 million in 1995-1996.[36] In the U.S. as a whole, saltwater recreational fishing generates $30.5 billion and nearly 350,000 jobs.[37]

Industrial longline fishing damages not only stocks of billfish, it also impacts existing and potential ecotourism revenues based on healthy marine ecosystems. Many of the small coastal and island nations that rely on meager access fees from longline fishing averaging 2-5.5 percent are ironically destroying the very marine ecosystem that offers a longer-term and less volatile source of revenue.[38]

IV. The Social and Cultural Costs of Longlining

In November 2001, the European Council recognized that the access of foreign fleets to the waters of developing coastal and island nations threatened widespread social and economic consequences for the employment and food security of local populations that exceed the fees paid by the foreign user. The council explicitly “notes with concern that many developing countries are

experiencing problems related to decreasing catches, while supply of fish is vital for their food security and their economic development."[39]

Access agreements present a triple threat to local communities. The agreements often result in the depletion of fish stocks, limited fishing access to hereditary fishing areas, and damage to the marine ecosystem. First, such agreements threaten local food security and employment as fish become increasingly scarce. Second, access agreements threaten the ability of local communities to generate future revenues from tourism because fewer visitors will come to an environmentally degraded destination. Finally, the cultural survival of local communities is threatened as a result of the loss of marine biodiversity that is at the center of many of their worldviews and spiritual beliefs.

Island Nations Are Left Holding the Line

As we have seen, a healthy marine ecosystem has more to offer in terms of long-term revenue generation than unregulated and unsustainable exploitation of predatory species. Yet, even the $2 billion regional tuna market has little to offer island nations other than meager access fees, depleted near shore fisheries and loss of a cultural way of life that is interdependent on fish, sea turtles and cetacean species that are being caught and killed on longlines.

Access agreements signed by Pacific island nations in the region have only earned them 2-5.5 percent royalties of the $2 billion regional annual tuna market.[40] While these fees comprise a large part of their national budget, about 20 percent for Tuvalu for example, they represent only a tiny fraction of an extremely lucrative market.[41] In total, "fourteen Pacific island countries shared U.S. $79.3 million (less than 4 percent) towards their GDPs from locally based offshore fishing vessels in 1999."[42] This is a short-term pay-off as many of the vessels that are now fishing in this region have arrived after destroying their own and African fisheries. The rapid increase in this problem is evidenced by the fact that the number of registered vessels in the South Pacific increased about 50 percent between 1997/98 and 2001/02.[43]

These access agreements perpetuate the economic and ecological impacts created by government subsidies of the fishing industry. In addition to the EU access agreements that have been signed in recent years, a 1987 treaty between 16 Pacific island nations and the U.S. granted access to their EEZ to as many as 50 vessels. The U.S. government subsidizes $14 million of the annual $18 million payment.[44]

One factor that has accelerated the number of access agreements is the industry's response to conservation efforts in their home countries. When conservation efforts are successful in closing vast swaths of territorial waters to destructive fishing in order to stimulate a recovery of depleted or exhausted fish stocks, the same vessels that caused the overfishing crisis will use government subsidies to relocate to other fisheries or even the waters of poor developing

nations, shifting the problem abroad far from public oversight and scrutiny. What is happening in the South Pacific is only the latest chapter in a repeating cycle of the global pillaging of our shared ocean.

The access agreement problem is compounded when island nations lack the resources to regulate and enforce the agreements. With very few onboard observers, incomplete Vessel Monitoring Systems and limited oversight by flag governments, these nations have no way to verify reported catches or tackle rampant IUU (illegal, unregulated and unreported) fishing which is estimated to be 5-15 percent of the reported catch.[45]

To address the problems of low access fees, absence of catch limits, IUU fishing, and the lack of reporting, observers and regulation, the new Western and Central Pacific Fisheries Convention took effect in June 2004. Unfortunately, some of the largest longlining nations including Japan, the U.S., China, Taiwan and South Korea have yet to accede.

This array of problems underlies an emerging conflict that threatens the survival of these island nations, global food security and our fragile marine ecosystem. Because 80-95 percent of the coastal marine harvest in U.S. colonies of American Samoa, Guam and the Commonwealth of the Northern Mariana Islands (worth a total of $1-$2 million each) are collected for home consumption, these fisheries provide both a source of employment and an inexpensive food source for the local population that is being put at risk by overcapacity by foreign and domestic industrial fleets.

As reports of declining catches near shore are emerging, many on these islands are faced with a Faustian choice between declining opportunities for subsistence fishing and relatively lucrative access agreements. According to the Associated Press, “That money is needed and that dilemma is felt on scores of islands across the Pacific, the vast setting for what may become one of the great battles between consumption and conservation in the 21st century, as a growing appetite for fish meets oceans fast being emptied of them.”[46]

V. The Impact on Small-Scale Artisanal Fishing

The impact on local “artisanal” fishermen and women is nowhere better illustrated than in the Western and Central Pacific where an estimated 10 percent of the total tuna catch is taken by vessels based in the region.[47] The net result of access agreements is a net outflow of resources and employment that is being repeated in many other regions of the world.

Industrial longline fishing also threatens the jobs, and in some cases the nutritional subsistence, of artisanal, subsistence and other small-scale fishers, who represent 90 percent of the world’s fishermen and women, and who are responsible for almost 50 percent of total world landings.[48] Near-shore waters long used for subsistence fishing, which account for an estimated 95 percent of world fish catch

(80 million tons), are becoming an increasingly contested terrain that will determine the food security for about 20 percent of the human population. Because worldwide fishing and fishing-related industries employ approximately 400 million people and another 1 billion rely on fish for a significant source of protein, wasteful fishing practices can have significant multiplier effects. Declining catches over the past decade have cost about 100,000 jobs among the world's 15-21 million fishers and the "cost of fish in some local marketplaces has risen dramatically, placing fish out-of-reach for many low income consumers."[49]

The UN Secretary-General's report on oceans and the law of the sea and fisheries (A/60/63) identified a series of threats posed by foreign industrial fishing to small-scale near-shore artisanal fisheries in its discussion of fisheries and their contribution to sustainable development. The report warned that "many fisheries conducted in areas under national jurisdiction, including small-scale fisheries, are facing difficulties relating to local excess fishing capacity, unauthorized incursions by foreign fleets in violation of the sovereign rights of the coastal State under articles 56, 61 and 62 of UNCLOS, ecosystem degradation, undervaluation of catch, excessive by-catches and discards, and increasing competition between artisanal and large-scale fishing, and between fishing and other types of activities. Absence of control in the overall fishing effort and fishing practices of local fishers and foreign fishing vessels, prompted by the inadequacy of monitoring, control and surveillance, is the root cause of such unsustainable fishing practices. These practices are believed to have adverse effects on the sustainable development and conservation of fishery resources, economies and food security of coastal States, particularly developing coastal States."[50]

Reports of declining, small-scale, near-shore artisanal fisheries throughout the Pacific are on the rise. A number of small Pacific island nations, including Fiji, Kiribati and Samoa, have reported that subsistence catches are on the decline.[51]

Traditional fisheries are rapidly being depleted as local laws are changed to commercialize publicly owned fisheries for the benefit of large industrial vessels. In the Philippines, one study by Pamalakaya (the National Federation of Fisherfolk Organizations in the Philippines) identified changes in the Philippine Fisheries Code that "facilitate the entry of commercial fishing boats into municipal grounds that should be reserved for small fishermen."[52] Economic liberalization has resulted in overfishing, an increase in cheap imported fish and the entry of Taiwanese longline vessels in Philippine waters all of which threaten to make fish inaccessible to the local population and destroy fish stocks relied on by local handline tuna fishers.[53] Similar cases of drastically lower catches have also been reported in other areas of the Western and Central Pacific.[54]

In Chile, artisanal fisheries received only 2 percent of the quota in the horse mackerel fishery, too little to maintain current fishing effort when "individual non-transferable quotas" were created in 2001. The impact on local food security was

severe since horse mackerel is an important source of local food. Horse mackerel is used by the industrial fishery as feed for animals that are exported abroad as meat.[55]

Likewise, the impact to local fishing communities and consumers in importing countries can also have serious consequences. Cheap imports can drive out local producers, as is happening with the U.S. shrimp industry, which is threatened by cheap imported aquaculture shrimp from Asia and Latin America. The cheap imports can replace a locally or even sustainably produced product (such as Alaskan salmon) with lower quality fish, invasive species, toxics and genetically modified species.

In many parts of the Pacific, local people rely on seafood for their livelihoods and as important sources of protein. In the U.S. Pacific islands, for example, 80 to 95 percent of the coastal marine harvests in American Samoa, Guam and the Commonwealth of the Northern Mariana Islands are collected for home consumption. These fisheries provide both a source of employment and an inexpensive food source for the local population. At the same time, Pago Pago, American Samoa, and Agana, Guam, are the first ($211.8 million in 1996) and fourth ($94.2 million in 1996) largest U.S. ports in terms of ex-vessel value of commercial fishery landings by domestic and foreign vessels. Much of the fish is tuna transhipped from the South Pacific region on its way to the U.S. market.[56]

A. The Impact on Island Cultures

Many of the island nations of the Western and Central Pacific have developed unique cultures interwoven with the ocean, fish and other living creatures that are crucial to their self-awareness of their place in the world, their origins, spirituality and unique socio-economic subsistence-based ways of life. The rapid depletion of not only large predatory fish but also associated species, such as sea turtles and cetaceans, by industrial longline fishing threaten the very existence of their ways of life.

Writer Osha Gray Davidson relates that a number of island cultures trace their origins to the sea turtle. Hawaiian spiritual teachers relate the creation myth of the sea turtle as “the benevolent character who inhabits the spiritual world and the physical world at the same time. It is the link between the two. Turtle is the foundation.” Likewise, in Samoa the belief that the islands float upon the backs of giant sea turtles goes back many generations; in China many place the entire universe on the back of the sea turtle, and the people of Tokelau and Bora Bora believe their peoples were carried to one another’s island on the back of a sea turtle. At the core of these beliefs are traditions that allowed sea turtles to be consumed as food but prevented them from being depleted. Even the capture of sea turtles as food required that they be shared by the entire community under threat of prohibitions for violating community norms.[57]

These legends are not merely myths. Rather, they define cultural rules that have allowed these island societies to live in harmony with the ocean and its living

beings, a harmony now threatened by longline fishing that may contribute to government coffers at the cost of emptying the people's plates. With declining catches by small-scale fishing communities on many of these islands who are finding it increasingly difficult to continue subsistence fishing, the survival of these communities and their ancient cultures are at stake.

B. The Threat to Public Health

Longlining threatens the survival of artisanal and subsistence fishing communities, large predatory fish stocks, sea turtles, marine mammals and sea birds to provide seafood that is too dangerous to eat. In the U.S., Japan and the EU, widespread attention is being focused on the dangers to pregnant women and expectant and nursing mothers and their children from the consumption of methyl mercury, a dangerous neurotoxin found in high concentrations in predatory species that can damage the developing brains of fetuses and young children. Methyl mercury is formed in the ocean from mercury created by the burning of fossil fuels such as petroleum and coal in automobiles and power plants. Methyl mercury bio-accumulates up the marine food chain to create high concentrations in predatory species of fish such as shark, swordfish and tuna, as well as marine mammals such as whales, dolphins and porpoises.

A recent study by the U.S. Environmental Protection Agency found that about 630,000 children are born each year with enough methyl mercury in their blood to put them at risk of brain damage. This new estimate, in which one of every six women of childbearing age has enough methyl mercury in her blood to put her child at risk, doubled the previous calculation issued by the EPA. The U.S. Centers for Disease Control and Prevention, which collected the data, found that women who had eaten fish two or more times a week over the previous month had blood mercury levels seven times higher than women who had not eaten fish in the same period.[58] A recent study conducted in Finland and published in the journal of the American Heart Association has also linked mercury poisoning in male adults with increased coronary heart disease.[59] As awareness grows, levels of consumption of large predatory fish such as tuna and swordfish are dropping. In the six weeks after the U.S. Food and Drug Administration revised its mercury in fish warning, the sale of tuna fell by 9.3 percent. On March 19, 2004, the U.S. Environmental Protection Agency and the FDA revised their warning to pregnant women regarding tuna consumption. The warning advised that expectant, pregnant and nursing women and children should not eat any shark, swordfish or king mackerel due to high mercury levels. The advisory also included a caveat that women should eat no more than 12 ounces of light tuna a week and no more than six ounces a week of white tuna. A recent study found that 20 percent of consumers are "extremely" or "very" concerned about mercury in seafood, the third highest food-safety issue of concern in the U.S.[60]

The implication for Pacific island nations that rely on longline access fees is that consumption of these predatory species may continue to experience a decline in the U.S. as a result of health concerns and may soon do the same in the EU as more reports on the dangers emerge. The U.S. and EU are two of the largest global import markets for tuna. Because new EU rules allow testing imported fish for mercury levels and other contaminants, import restrictions and declining demands may soon result. Combined with declining predatory fish stocks, declining demand will have serious consequences for countries that rely too heavily on access fees from longlining.

VI. The Economics of Conservation

A number of recent studies have underscored the cost effectiveness of marine conservation relative to fishing subsidies that contribute to the economic damage caused by longline fishing.

A. Marine Protected Areas Are Cost Effective

Numerous countries use Marine Protected Areas (MPAs) to protect critical breeding grounds and migration routes for marine life. While MPAs are supported by extensive biological assessments—demonstrating their value in facilitating the recovery of threatened stocks, endangered species and damaged ecosystems to recovery—until recently there was little data demonstrating their effectiveness relative to fishing subsidies for the purpose of sustaining fish stocks.

Various types of MPAs that range from “sustainable use” to “no take” have been proven to effectively preserve endangered marine species and rapidly increase fish biomass by allowing fish to reproduce undisturbed. In most MPAs studied, biomass has doubled in just five years, while those in Kenya and South Africa have grown between 700-800 percent.[61] A recent study of 80 marine reserves found significant improvements in fisheries inside the reserves compared to the same area before the reserve was formed or areas outside the reserve. According to the authors of the report, “relative to reference sites, population densities were 91 percent higher, biomass was 192 percent higher, and average organism size and diversity were 20-30 percent higher in reserves” regardless of their size.[62] The authors conclude that marine reserves can make a significant positive contribution to the biological diversity of both target and non-target species in a relatively short period of time. “The establishment of marine reserves appears to result in significant increases in average levels of density, biomass, and likely diversity within 1-3 y [years], and these values persist through time,” they conclude. “Because we analyzed data for target and non-target species, responses by larget species alone to reserve protection may be even more rapid and dramatic than our results indicate.”

MPAs offer the added advantage over subsidized industrial fishing by creating regions where the recovery of fish stock and endangered species could take place for less than the cost of subsidizing the global industrial fisheries. A recent study of 83 MPAs worldwide found that conserving 20-30 per cent of the world's oceans would cost between $5-$19 billion annually and would create about 1 million new jobs to manage and protect them.[63] Global subsidies for industrial fishing are estimated to be between $14-$50 billion per year.[64]

Because MPAs are a proven cost effective way to increase fish stocks, they would be a crucial complement to a moratorium on industrial longline fishing in the Pacific. High seas MPAs would aid the recovery of depleted and overfished fish stocks thereby creating employment and ensuring food security for coastal communities. As we have seen above, many of these benefits would originate from sustainable use MPAs that would allow small-scale traditional fishing, recreational fishing and other tourism activities such as diving, snorkelling and wildlife viewing if they have a minimal impact on the ecosystem.

B. Saving Sea Turtles, Making Money

Reducing sea turtle mortality through reductions in longline bycatch would save money by reducing the need for costly, emergency sea turtle conservation efforts that are not calculated in the true costs of industrial fishing. Governments spend money on sea turtle conservation because of the role turtles play in maintaining healthy sea grass and coral reef ecosystems, reducing sponges and jellyfish, preserving the cultural and spiritual heritage of island and coastal communities, and attracting ecotourism. These efforts will continue to be undermined as long as the market fails to account for the economic costs to communities and countries from the destruction of sea turtles. Current spending on sea turtle conservation efforts is estimated at U.S. $20 million per year.[65]

A recent study documented the replacement cost of raising sea turtles in captivity rather than protecting them in their habitat. It has been estimated that the cost of raising one leatherback to maturity at the nursery in Rantau Abang, Malaysia over the course of 10 years would be $72,632. "Failure to reverse marine turtle decline would imply a replacement cost for nesting females through captive breeding estimated at U.S. $245.9 million–$263.3 million for green turtles and $2.5 billion for leatherback turtles. The cost of rearing turtles in captivity suggests that conservation of marine turtles in the wild is less expensive."[66] In effect, the necessary cost to recover the critically endangered leatherback sea turtle is equal to one-half the global annual revenue earned by longline fishing, the largest threat to its survival.

Sea turtles offer an ideal case study of the potential complementary relationship between conservation and sustainable development. Developing countries account for a striking 78-91 percent of the countries where five of the seven species of sea turtles live, and 61 percent of these countries are home to two

or more turtle species.[67] As a consequence of the global distribution of sea turtles, "the future of marine turtle populations and their potential to generate benefits to human societies depend mainly on policies implemented in countries with developing economies. These are the countries that stand to lose most from continued marine turtle decline. Conversely, developing countries would benefit most increasing sea turtle populations."[68]

These benefits are not insubstantial. "Non-consumptive use [of sea turtles] generates more revenue, has greater economic multiplying effects, greater potential for economic growth, creates more support for management, and generates proportionally more jobs, social development and employment opportunities for women than consumptive uses."[69]

For example, revenue from sea turtle tourism at the leatherback nesting beach at Playa Grande, Costa Rica, was $1,121,057 in 2002. Similarly, revenues were $2,113,176 at Leatherbacks National Park in 2001/2002.[70] The income earned by the residents of Gandoca, Costa Rica, from their conservation efforts amounted to $506 per leatherback turtle, $135.50 per nest and $1.70 per egg deposited on the beach. The cost of illegal fishing of green sea turtles in Costa Rica in 2000 was estimated to be $1,142 per turtle due to losses in visitors to nesting beaches and habitats when populations decline. Globally, the average gross revenue earned from locations where sea turtles were a major attraction for tourists was 2.9 times higher than areas where they were consumed as food.[71]

Malaysia, one of the first countries to encourage sea turtle tourism in the 1960s, provides an example of how unrestricted fishing can impact tourism revenues. In contrast to Costa Rica, which has made local conservation and international efforts at the 5th Informal Consultative Process of the UN Convention for the Law of the Sea in 2004 top priorities of sea turtle conservation, Malaysia has suffered heavy losses in sea turtle populations and tourism revenues. Although the fisheries sector in Malaysia employs only 1.5 percent of the total working population and tourism 6.2 percent, high levels of fisheries mortality led to rapid declines in leatherback sea turtles. The near-total extinction from 1994 to 2002 created a collapse in sea turtle tourism and revenues. If Malaysia had prevented the decline in the leatherback nesting population from the over-harvesting of eggs, it is estimated that gross revenue from tourism could have been 14 times its current amount, equivalent to $7,031,335 in 2002.[72]

Currently, there are 92 sea turtle nesting sites in 43 countries annually toured by 175,000 visitors. Because nature-oriented tourism is growing at 10-30 percent per year—far faster than the growth of general tourism at 4 percent annually—the potential benefits to developing countries with significant sea turtle populations is great.[73]

VII. Conclusion

Considering its total contribution to the economy and fishing industry, the destructive impact of industrial longline fishing on our oceans, fisheries, endangered species and government budgets cannot be justified. The threat to coastal communities, food security and irreplaceable biodiversity and natural resources, which are shared by all the nations and peoples of the earth, is too high a price to pay for the short-term profits of subsidized longline fishing. In contrast, high seas sustainable use MPAs offer a unique solution to rapidly restoring our depleted and threatened fisheries while creating much needed employment and revenues for coastal communities.

VIII. Recommendations for Action

Short-term Recommendations

- Implement a moratorium on high seas industrial longline fishing in the Pacific until such time that the species most threatened by longlining are out of danger
- Amend the UN Convention on the Law of the Sea Annex I to include all seven species of sea turtles
- Support further biological research to identify remaining critical habitat for endangered marine species
- Convene a UN special investigation of destructive fishing
- Ban the landing and transhipment of shark fins

Medium-term Recommendations

- Expand and strengthen enforcement and surveillance with special attention to IUU fishing
- Require longline fishing nations to release critical data
- Establish a global fund to assist developing nations in implementing sustainable fishing
- Require regional fisheries management organizations to require 100 percent observer coverage and the use of bycatch mitigation measures that minimize wildlife bycatch based on the best available science

Long-term Recommendations

- Create a Pacific-wide network of Marine Protected Areas on the high seas that allow sustainable artisanal and recreational fishing and tourism along known migratory, feeding and nesting habitats of threatened and endangered marine species
- Support sustainable small-scale fishing

Notes

[1] This backgrounder is an excerpt from the book *Striplining the Pacific: The Case for A United Nations Moratorium on High Seas Industrial Longline Fishing*, Sea Turtle Restoration Project, 2005, pp. 71-101, available at: www.seaturtles.org.

[2] See Manoa, P., Apps, L., and Q. Hanich, "Development without destruction: Towards sustainable Pacific fisheries," February, 2004, found at: http://www.greenpeace.org.au/oceans/pdfs/DWDReport_feb04.pdf.

[3] Sustainable use MPAs are defined as allowing uses such as small-scale artisanal fishing, recreational fishing, wildlife viewing, diving and snorkelling for example as long as they have minimal impact on the marine environment.

[4] Ovetz, R., Pillaging the Pacific: Pelagic Longline Fishing Captures or Kills About 4.4 Million Sharks, Billfish, Seabirds, Sea Turtles, and Marine Mammals Each Year in the Pacific Ocean, a report by the Sea Turtle Restoration Project, November 16, 2004. The bycatch data is extrapolated from reported Hawaiian longline bycatch by U.S. NOAA Fisheries. The phrase "catch or kill" is used because very little is known about post-hooking mortality. While some individuals may survive capture, too little is known to estimate how many will die later or be recaptured due to their injuries. According to one scientific study, "fisheries bycatch can result in direct mortality, but can also lead to delayed mortality or sublethal injuries, both of which are challenging to measure." (Lewison, R. et al, "Understanding impacts of fisheries bycatch on marine megafauna," Trends in Ecology and Evolution, vol. 19, no. 11, November 2004, p. 600.)

[5] Crowder, L., and R. Myers, First Annual Report To The Pew Charitable Trusts, A Comprehensive Study of the Ecological Impacts of the Worldwide Pelagic Longline Industry, December 31, 2001, p. xi; Lewison, R. et al., Quantifying the effects of fisheries on threatened species: the impact of pelagic longlines on loggerhead and leatherback sea turtles, Ecology Letters, vol. 7, 2004, p. 221-231; and Spotila, J., et al., "Pacific leatherback turtles face extinction," Nature, vol. 405, June 1, 2000, pp. 529-530.

[6] Ward, P. and R. Myers, "Shifts in open-ocean fish communities coinciding with the commencement of commercial fishing," Ecology, vol. 86, no. 4, 2005, pp. 835–847. May 15, 2003, p. 280.

[7] Baum, J. and R. Myers, "Shifting baselines and the decline of pelagic sharks in the Gulf of Mexico," Ecology Letters, 2004, vol. 7, p. 135–145.

[8] Myers, R. and B. Worm, "Rapid worldwide depletion of predatory fish communities," Nature, vol. 423.

[9] Lewison, R. and L. Crowder, "Estimating fishery bycatch and effects on a vulnerable seabird population" Ecological Applications, 2003, 13 (3), p. 748. Estimates of seabird bycatch may even be much higher for some species. A recent study found that when longline catch rates are adjusted for soak time to take into account that most seabirds are taken during deployment of longlines and fall off or are taken by predators before the line can be retrieved estimates of mortality of some seabird species would rise by as much as 45 percent. (Ward, P., R. Myers and W. Blanchard, "Fish lost at sea: the effect of soak time on pelagic longline catches," Fishery Bulletin, 2004, vol. 102, pp. 179–195.)

[10] BirdLife International, Threatened Birds of the World, CD-Rom, Cambridge, UK, 2004.

[11] M. Milazzo, Subsidies in World Fisheries: A Reexamination. World Bank Technical Paper No. 406. Washington: The World Bank, 1998:10, and 77-78.

[12] FAO, The State of Food and Agriculture 1993, Rome, 1993, p. 58.

[13] Ironically, the U.S. has obscured the costs of its own extensive range of fishing subsidies. See National Marine Fisheries Service, Federal Fisheries Investment Task Force Report to Congress, July 1999, available at: http://www.nmfs.noaa.gov/sfa/ITF.html; analysis of the Federal Fisheries Investment Task Force Report to Congress by fisheries economist C. Dumas, conversation with author, August 8, 2004; M. Earle, "Greens/Boell EU-US regional briefing on fisheries," prepared for the Green group in the European Parliament, Brussels, July 8, 2003, p. 1; and W. Broad and A. Revkin, " Has the sea given up its bounty?," The New York Times, July 29, 2003.

[14] Larsen, p. 99.

[15] A. Somma, "The environmental consequences and economic costs of depleting the oceans, Economic Perspectives: An Electronic Journal of the U.S. Department of State, "Overfishing: A global challenge," vol. 8, no. 1, January 2003, p. 15.

[16] Crowder, L., and R. Myers, A Comprehensive Study of the Ecological Impacts of the Worldwide Pelagic Longline Industry, 2001 First Annual Report to the Pew Charitable Trusts, draft, Philadelphia: Pew Charitable Trusts, December 3, 2001, p. xii, 112. In the Pacific, for example, bigeye tuna is listed as endangered by the IUCN.

[17] While accepted economic theory would argue that lower prices are good for consumers, it does not consider the "hidden" costs that accompany lower prices such as the health damaging effects of high levels of methyl mercury and the destruction of ocean marine resources.

[18] Hamilton, M., Curtis, R. and M. Travis, "Cost-earning study of the Hawaii-based domestic longline fleet," unpublished paper, SOEST 96-03, JIMAR Contribution 96-300, Pelagic Fisheries Research Program, Joint Institute for Marine and Atmospheric Research, University of Hawaii, Honolulu, HI, 1996, p. 5 and 8; and Crowder, L. and R. Myers, p. 14.

[19] C. Dumas, The Economic Impacts of Banning U.S. Pelagic Longline Fishing, "Eastern Pacific (U.S. West Coast) Longline Fisheries," Chapter 2, unpublished research report, January 15, 2005, pp. 11 and 21.

[20] Porter, R. M., Wendt, M., Travis, M. D., and I.E. Strand, "Cost-earnings study of the Atlantic-based U.S. pelagic longline fleet," unpublished paper, SOEST 01-02, JIMAR Contribution 01-337, Pelagic Fisheries Research Program, Joint Institute for Marine and Atmospheric Research, University of Hawaii, Honolulu, HI, 2001; and C. Dumas, "The economics of pelagic longline fishing in the U.S. and Canada—A brief overview," presentation notes submitted at the International Leatherback Survival Conference, April 22-25, 2002, p. 11.

[21] P. Tyedmers, "Fisheries and energy use", pre-publication draft, Cleveland, C. (ed.) Encyclopedia of Energy. Academic Press/Elsevier Science. vol. 2, 2004, p. 12.

[22] Ibid., p. 12.

[23] Dobrzynski, T., Gray, C., and M. Hirshfield, Oceans at Risk: Wasted Catch and the Destruction of Ocean Life—A Report by Oceana, 2002, p. 5.

[24] K. Hinman, Ocean Roulette: Conserving Swordfish, Sharks and Other Threatened Pelagic Fish in Longline-Infested Water, Virginia: National Coalition for Marine Conservation, February 1998, p. 8.

[25] For example, the U.S. agency NOAA Fisheries reopened the Hawaiian pelagic longline fishery in spring 2004 with mackerel bait, circle hooks and training in de-hooking sea turtles in place of closures. The swordfish fishery was closed and the tuna fishery subject to time-area closures due to high levels of sea turtle and sea bird bycatch. Although NOAA Fisheries has attempting to encourage other nations to implement these mitigation techniques, only one country, Ecuador, has agreed to do so. Unfortunately, NOAA Fisheries has agreed relax their new rules in response to

comments by the very longline fishermen who participated in the study of the techniques in the Atlantic that led to the reopening.

[26] Crowder, L. and R. Myers, p. 115.

[27] L. Dayto et al, "A global assessment of fisheries bycatch and discards," FAO Fisheries Technical Paper, No. 339, 1994.

[28] Hamilton, M., Curtis, R. and M. Travis, "Cost-earning study of the Hawaii-based domestic longline fleet," unpublished paper, SOEST 96-03, JIMAR Contribution 96-300, Pelagic Fisheries Research Program, Joint Institute for Marine and Atmospheric Research, University of Hawaii, Honolulu, HI, 1996, p. 1; and Tillman, M., "Director's report to the 51st tuna conference on tuna and tuna-related activities at the Southwest Fisheries Science Center for the Period May 1, 1999-April 30, 2000, Administrative Report LJ-00-05, May 2000.

[29] Crowder, L. and R. Myers, p. 17.

[30] C. Dumas, 2002, p. 5; and Asian Development Bank, "The role of tuna fisheries in the national economies," date unknown, available at: http://www.adb.org/Documents/Reports/Tuna/tuna08.pdf.

[31] Crowder, L. and R. Myers, p. 18.

[32] R. Constantine, "Effects of tourism on marine mammals in New Zealand," Science for Conservation, Department of Conservation, Wellington, New Zealand, No. 106, 1999, found at:http://www.doc.govt.nz/publications/004~science-and-research/Science-for-Conservation/PDF/sfc106.pdf.

[33] U.S. Commission on Ocean Policy, Chapter 9, "Managing coasts and their watersheds," Preliminary Report, 2004, p. 107.

[34] United Nations, Millennium Ecosystem Assessment Synthesis Report, Pre-publication Final Draft Approved by MA Board on March 23, 2005, A Report of the Millennium Ecosystem Assessment, p. 91.

[35] Hamilton, M., R. Curtis and M. Travis, "Cost-earning study of the Hawaii-based domestic longline fleet," SOEST 96-03, JIMAR Contribution 96-300, p. 1.

[36] Western Pacific Regional Fishery Management Council, "The value of the fisheries in the Western Pacific Regional Fishery Management Council's Area," July 1999, pp. 3, 6.

[37] See Steinbeck, S., Gentner, B., and J. Castle, Economic Importance of Marine Angler Expenditures in the United States, NOAA Professional Paper NMFS, No. 2, 2004. The American Sportfishing Association estimated that it generates $8.1 billion and 300,000 jobs in their report Sportfishing in America: Values of our Traditional Pastime, 2001, found at: http://www.asafishing.org/asa/statistics/economic_impact/economic_impact_table.html.

[38] For example, EU vessels pay South Pacific island nations $44 per tonne of fish caught. However, when the market price of these fish are included in the calculations of their value, the island nations earn as little as 2 percent per ton. See Manoa, P., L. Apps, and Q. Hanich, Development without destruction: Towards sustainable Pacific fisheries," Greenpeace, 2004, p. 13; and Western Pacific Fishery Management Council, "The Value of the fisheries in the Western Pacific Fishery Management Council's Area," July 1999, p. 7, found at: www.wpcouncil.org/documents/value.pdf.

[39] Unfortunately, the Council has yet to act on this concern when it applies to lucrative pelagic longline fisheries in the Western and Central Pacific where there is little to no regulation, data collection on bycatch, observers, and implementation of bycatch mitigation techniques. The Council still has not extended the much stricter rules applied to vessels in EU waters to this

region. Council Resolution on Fisheries and Combating Poverty. 8 November 2001; and M. Earle, "Comments on the EU-Senegal Fisheries Agreement 2002-2006," report to the European Parliament, November 3, 2002, p. 3.

[40] Asian Development Bank, "The role of tuna fisheries in the national economies," date unknown, available at: http://www.adb.org/Documents/Reports/Tuna/tuna08.pdf.

[41] C. Hanley, "Global appetite, islanders' poverty threaten tuna's vast last refuge," Associated Press, July 21, 2004.

[42] P. Manoa, et al, p. 12.

[43] Ibid., p. 13.

[44] This is part of the large picture of a lucrative trade that exceeds the value of coffee, bananas, tea, rubber and rice and totalled $20 billion in 1994. Globally, an estimated 50 percent of internationally traded fish originates from the waters of developing countries. See L. Speer, et al, Hook, Line and Sinking: The Crisis in Marine Fisheries, NY: NRDC, 1997, p. 95 and 126.

[45] Greenpeace, "New era in pacific fisheries management," press release, June 16, 2004, found at: http://greenpeace.org.au/media/oceans_details.php?site_id=9&news_id=1401.

[46] Access agreements have been linked to declines in the population of wildlife on land as well. Overfishing by foreign fleets in Ghana has been linked to an increase in the bush meat trade. According to one study, "a poor fish year means fish are too expensive or are unavailable for most people, and these people must turn to wildlife hunting and the sale of wildlife products as a way of securing food and income." As a result, researchers found a 76 percent decline in abundance of the 41 species they studied. See David McAlary, "Study links low West African fish supply to increased bush meat hunting," VOA News, November 11, 2004.

[47] Greenpeace, cf. 29.

[48] United Nations Environment Programme, "UNEP supports Earth dive initiative to boost protection of oceans and seas," July 27, 2004, found at: http://www.enn.com/direct/display-lease.asp?objid=D1D1366D000000FE00D0A8F24F47749B; and L. Speer L., et al, Hook, Line and Sinking: The Crisis in Marine Fisheries, NY: NRDC, 1997, p. 127.

[49] G. Porter, Fisheries Subsidies and Overfishing: Towards a Structured Discussion, UN Environment Programme, Economics and Trade Branch, 1999, p. vii.

[50] A/60/63, para. 212, as cited in Annex III-A, "United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea, Sixth meeting, 6-10 June 2005," Advance and unedited text (English only), March 21, 2005, p. 8, A/AC.259/L.6.

[51] P. R. Gonzales, "Small island: a question of survival," World Conservation, vol. 1, 2004, p. 15; and P. Manoa, p. 14.

[52] J. Yu, "Fishing industry not safe from globalization net: Government policies favor foreign fishing interests and monopolies at the expense of the country's small fishermen and consumers," available online at: http://groups.yahoo.com/group/ibon.

[53] A. Estabillo, "20-T tuna handline fishers risk losing livelihood if…," Mindanao Times, 2003.

[54] Manoa, P., Apps, L., and Q. Hanich, "Development without destruction: Towards sustainable Pacific fisheries," February, 2004, found at: http://www.greenpeace.org.au/oceans/pdfs/DWDReport_feb04.pdf.

[55] B. O'Riordan, "The privatization process," Samudra, July 2002, p. 39.

[56] Western Pacific Regional Fishery Management Council, "The value of the fisheries in the Western Pacific Regional Fishery Management Council's Area," July 1999, p. 3-4.

[57] O. G. Davidson, "Turtle culture", draft unpublished chapter, Fire in the Turtle House: The Green Sea Turtle and the Fate of the Ocean, Public Affairs: NY, 2001.

[58] J. Lowy, "EPA raises estimate of newborns exposed to mercury," Scripps Howard News Service, February 4, 2004.

[59] J. K. Virtanen, et al, "Mercury, fish oils, and risk of acute coronary events and cardiovascular disease, coronary heart disease, and all-cause mortality in men in Eastern Finland," November 11, 2004; available at: http://atvb.ahajournals.org/cgi/content/abstract/25/1/228; and J. Kay, San Francisco Chronicle, "Mercury in fish poses heart risk for middle-aged men, study says," Tuesday, February 8, 2005; available at: http://sfgate.com/cgi-bin/article.cgi?file=/c/a/2005/02/08/MNGL8B7E921.DTL.

[60] Seafood Business, "Mercury fear rising," June 2004, p. 1.

[61] Pew Oceans Commission, America's Living Oceans: Charting a Course for Sea Change, Pew Oceans Commission, June 4, 2003, p. 32.

[62] Halpern, B. and R. Warner, "Marine reserves have rapid and lasting effects," Ecology Letters, vol. 5, 2002, pp. 361-366.

[63] Balmford, A., Gravestock, P., Hockley, N., McClean, C., and C. Roberts, "The worldwide costs of marine protected areas," Proceedings of the National Academy of Sciences, 15:17, May 25, 2004.

[64] Milazzo, cf. 7.

[65] Troëng, S. and C. Drews, Money talks: Economic aspects of marine turtle use and conservation, WWF-International, 2004, pp. 7 and 49, found at: http://www.panda.org/downloads/species/moneytalks.pdf.

[66] Troëng, S. and C. Drews, Money talks: Economic aspects of marine turtle use and conservation, WWF-International, 2004, pp. 7 and 49, found at: http://www.panda.org/downloads/species/moneytalks.pdf. According to one of the authors, Sebastian Troëng, "this estimate is based on the costs for raising a leatherback from hatchling to 8 years of age as done by Kamaruddin Ibrahim and his team at TUMEC in Rantau Abang (cost of 500 MYR per month during the first year and 2,500 MYR per month for each month after that)." Email communication with author, March 5, 2005.

[67] Ibid.

[68] Ibid., p. 11.

[69] Ibid.

[70] Ibid., p. 42.

[71] Ibid., pp. 10, 22 and 42.

[72] Ibid., p. 49.

[73] Ibid., p. 20.