The Cost of U.S. Cetacean Bycatch Reduction Measures as a Reason for Supporting International Action

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Abstract

Due to requirements under the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA), U.S. fishermen are required to take measures to reduce cetacean bycatch. However, the U.S. imports fisheries products from countries that have significant cetacean bycatch problems which fishermen are not required to mitigate. I examined case studies of the California/Oregon drift gillnet, American lobster and Atlantic cod fisheries to demonstrate the costs of U.S. cetacean bycatch reduction measures and their economic affect. The cost of cetacean bycatch reduction in the California/Oregon drift gillnet fishery represents 1.9 - 4.5% of the fishery's total ex-vessel value. The annual cost to the lobster fishery is 0.7% - 6.3% of the industry's value and 3.3% - 13.3% of the ex-vessel landings value of an Atlantic cod vessel using sink gillnets is going to cetacean bycatch mitigation. U.S. fishermen face a competitive disadvantage because they have to bear the costs for mitigating cetacean bycatch while their foreign competitors do not. The U.S. is importing products from foreign fisheries with serious bycatch problems. Foreign products are in direct competition with U.S. domestic fisheries in which U.S. fishermen have borne substantial costs to mitigate cetacean bycatch. The only way to protect marine mammals and maintain a competitive global fisheries market is to take action on an international level to reduce cetacean bycatch. To do this, influential countries like the U.S. need to support international negotiations and cooperation.

Background

Bycatch threatens many species of marine mammals. More whales, dolphins and porpoises die every year from entanglement in fishing gear than from any other cause.[1] It is the cause of death of nearly 60,000 cetaceans each year, which is equivalent to roughly 150 taken per day.[2] The fishing gears that pose the greatest risk to cetaceans include gillnets, set nets, trammel nets, purse seines, trawl nets, and longlines.[3] Due to their low cost and widespread use, gillnets are believed to be responsible for a very high proportion of the cetacean bycatch.[4]

Cetaceans are taken as bycatch because they swim in to nets that they do not detect or they become entangled while feeding too close to fishing gear. Small whales, dolphins and porpoises are not strong enough to break free from most nets.[5] Large whales may break free, but continue to tow some of the gear for long periods, causing debilitating injuries and possibly slow death.[6]

Several cetaceans are on the verge of extinction because they are taken as bycatch. Among these species are vaquitas in the Gulf of California, hector's dolphins in New Zealand, irrawaddy dolphins in the Philippines, harbor porpoises in the Baltic and Black Seas, the franciscana dolphin (La Plata dolphin) of South America and the North Atlantic right whale (Appendix A).[7]

In the U.S., there are two regulations that govern fishery/marine mammal interactions, the Marine Mammal Protection Act (MMPA) and The Endangered Species Act (ESA). These regulations require U.S. fishermen to modify their actions to protect cetaceans.

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[1] WWF Cetacean Bycatch Resource Center
[2] WWF Cetacean Bycatch Resource Center
[3] WWF Cetacean Bycatch Resource Center
[4] WWF Cetacean Bycatch Resource Center
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[6] WWF Cetacean Bycatch Resource Center
[7] WWF Cetacean Bycatch Resource Center

The MMPA established a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas, and on the importation of marine mammals and marine mammal products into the United States.[8] The MMPA protects all marine mammals by preventing their "take." The term "take" is statutorily defined to mean, "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture or kill any marine mammal.[9]"

Section 118 of the MMPA establishes requirements for the incidental take of marine mammals in commercial fisheries. Under section 118, the National Marine Fisheries Service (NMFS) must publish, at least annually, a List of Fisheries (LOF) that places all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals that occurs in each fishery.[10] Category I fisheries have the highest levels of marine mammal injury and mortality and category III fisheries have the lowest. The categorization of a fishery in the LOF determines whether participants in that fishery are required to comply with certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements.[11]

Take Reduction Teams (TRTs) are established by NMFS with the purpose of developing take reduction plans to assist in the recovery or to prevent the depletion of strategic stocks of marine mammals that interact with Category I and II fisheries.[12] A strategic stock is one which is listed as endangered or threatened under the ESA, declining and likely to be listed as threatened under the ESA, listed as depleted under the MMPA, or has direct human-caused mortality which exceeds the stock's Potential Biological Removal (PBR) level.[13] The PBR for a marine mammal stock is the maximum number of animals, not including natural mortalities that may be removed from that stock, while allowing the stock to reach or maintain its optimum sustainable population.[14] To date, the six Take Reduction Teams that have been convened are the Atlantic Large Whale

[8] NOAA Fisheries, OPR. Marine Mammal Protection Act (MMPA) of 1972
[9] NOAA Fisheries, OPR. Marine Mammal Protection Act (MMPA) of 1972
[10] NOAA Fisheries, OPR. List of Fisheries
[11] NOAA Fisheries, OPR. List of Fisheries
[12] NOAA Fisheries, OPR. Take Reduction Teams
[13] NOAA Fisheries, OPR. Take Reduction Teams
[14] NOAA Fisheries, OPR. Take Reduction Teams

TRT, the Atlantic Offshore Cetacean TRT, the Gulf of Maine Harbor Porpoise TRT, the Mid-Atlantic Harbor Porpoise TRT, the Pacific Offshore Cetacean TRT, and the Bottlenose Dolphin TRT.

The Endangered Species Act provides for the conservation of species, including cetaceans, which are in danger of extinction throughout all or a significant portion of their range.[15] The ESA mainly uses recovery plans and section 7 consultations to accomplish this goal. A Recovery Plan identifies conservation measures to help the species recover.[16] Section 7 of the ESA requires all Federal agencies to consult with NMFS, or the Fish and Wildlife Service, concerning the potential effects of their actions on any species listed under the ESA.[17]

The Marine Mammal Protection Act and The Endangered Species Act constitute the legal basis for requiring U.S. fishermen to undertake cetacean bycatch reduction measures. Some of the cetacean bycatch reduction methods commonly used under these regulations are time/area closures, gear modifications, and acoustic alarms. Closures are temporary or permanent measures restricting fishing in particular areas. Gear modifications are changes in a specific type of fishing gear to make it less likely to incidentally take marine mammals. Acoustic alarms, also known as pingers, reduce entanglement of several dolphin and porpoise species by either deterring cetaceans from gillnets or alerting them to the presence of the nets. These bycatch reduction measures are effective but can be quite expensive.

The quantity and value of seafood products supplied by U.S. fisheries, the cost of these products and profits to the fishing industry are all affected by cetacean bycatch reduction measures. Different types of bycatch reduction measures will have different economic effects. Gear modifications increase harvesting costs, which may result in a reduction in quantities supplied to seafood market and higher prices to consumers. In the case of closures, catch and revenue may be decreased, which may result in a reduction in

[15] NOAA Fisheries, OPR. Endangered Species Act of 1973.
[16] NOAA Fisheries, OPR. Endangered Species Act of 1973.
[17] NOAA Fisheries, OPR. Endangered Species Act of 1973.

quantities supplied to seafood markets and higher prices to consumers.[18] The magnitude of these effects depends on the cost to the fishermen, the reduction in catches and the quantity of product imported from other countries.

The costs associated with bycatch reduction measures are paid for by the fishermen, consumers or the government. U.S. fishermen currently face a competitive disadvantage because they have to bear the costs for mitigating cetacean bycatch, but fisheries products are imported from countries where such mitigation is not required. In the following case studies of the California/Oregon Drift Gillnet Fishery, the American Lobster Fishery and the Atlantic Cod Fishery, I show that the U.S. is importing products from foreign fisheries with serious bycatch problems (Appendix A). Those fisheries products are in direct competition with U.S. products produced by U.S. fishermen who have borne substantial costs to mitigate bycatch.

The information in these case studies was gathered from a variety of sources. A major source of information was the Environmental Assessments related to the proposed Take Reduction Team Plans. Other sources used were NOAA/NMFS documents, federal register notices, personal communication with NOAA/NMFS staff and peer reviewed journal articles. Most of the landings data and foreign trade information was obtained from database at the NMFS Statistics and Economics Division webpage (http://www.st.nmfs.gov/st1/). Whenever discrepancies in numbers appeared, the value giving the lowest cost to the fishing industry was used. In addition, the Environmental Assessments occasionally did not explicitly account for all costs, such as batteries for pingers and increased labor costs. Therefore, the actual cost to the U.S. fishermen may be significantly higher than the values presented in the following case studies.

[18] NMFS, December 2001c.

Case study 1: California/Oregon Drift Gillnet Fisheries

Background

The California and Oregon drift gillnet fishery takes several species of marine mammals including common dolphins, Risso's dolphins, Dall's porpoises, Pacific white-sided dolphins, northern right whale dolphins, sperm whales, short-finned pilot whales and various beaked whales.[19] Because of these incidental takes, NMFS has classified this fishery as a category I fishery.

The California/Oregon drift gillnet fishery developed rapidly in the late 1970's off southern California and originally targeted common thresher shark (*Alopias vulpinus*), but swordfish (*Xiphias gladius*) and shortfin mako shark (*Isurus oxyrinchus*) soon became important components of the catch.[20] Swordfish, common thresher shark, and mako shark represent over 90% of the total landings by the California drift gillnet fishery, but other species commonly sold include opah, bigeye thresher shark, louvar, and tunas.[21] During 1990-98 the distribution of catch and effort extended from the U.S.-Mexican border to the Oregon-Washington border with swordfish being the primary target in more than 95% of the observed sets.[22] The fishery operates primarily within 200 miles from shore off California between San Diego and Cape Mendocino, however, during years of El Niño events; vessels have moved northward to Oregon.[23]

Landings for swordfish, common thresher shark, and mako shark vary from season to season. Swordfish comprise the majority of the catch in the fishery and demand the highest price per pound. Between 1995 and 2000, drift gillnet landings of swordfish ranged from 684 (1995) to 880 (1998) metric tons, at an average of 703 metric tons per year.[24] Landings of common thresher shark have averaged 218 metric tons while those of mako shark have averaged 78 metric tons.[25] From 1995-2000, this fishery averaged $4.2

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[19] NMFS, Southwest Regional Office. Pacific Drift Gillnet Observer Program.
[20] NOAA, August 2001
[21] Hanan *et al.*, 1993
[22] Marine Mammal Division, OPS, NMFS. October 2000.
[23] NOAA, August 2001
[24] NOAA, August 2001
[25] PFMC, 2001

million in ex-vessel gross revenues from landings of swordfish, common thresher shark and mako shark.[26] The fishery accounts for about 10 percent of the total swordfish landings in the United States by domestic vessels.[27] In addition, the fishery accounts for over 70% of the commercial landings of common thresher shark in the U.S.[28] Landings for the common thresher peaked in 1982 at 1,091 mt.[29] Due to extensive fishing pressure, by the end of the 1980s, the thresher shark population crashed. There are indications that management actions and the resulting reduction in fishing pressure may have contributed to a rebuilding of the stock over the last decade as seen by an increase in catch per unit effort (CPUE).[30] Researchers believe that the thresher shark population harvested by this fishery is also subject to harvest off Baja California, Mexico.[31] Mexico has no management plan in place for this fishery.[32]

The International Union for Conservation of Nature and Natural Resources (IUCN) currently lists the shortfin mako as "vulnerable"[33]. The shortfin mako caught off Mexico is probably the same stock fished in U.S. waters, and makos tagged in the Southern California Bight have been recaptured as far south as Acapulco[34]. Shortfin mako catches in California peaked at 240mt in 1982, and then declined though no studies address the reason for this reduction[35]. The shortfin mako is taken primarily by the drift gillnet fishery for swordfish (82% of commercial mako landings)[36].

Worldwide, swordfish is harvested by drift gillnets and longlines. Longline fisheries have bycatches of marine mammals, sea turtles and sea birds. The number of longlining vessels in California and Oregon is increasing but about half of the swordfish landed commercially are taken by drift gillnet vessels (average landings for 1995-1999).[37]

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[26] NOAA, August 2001
[27] NOAA, August 2001
[28] Seafood Watch Fishery Report: Sharks, Volume I Common Thresher *Alopias vulpinus*
[29] Seafood Watch Fishery Report: Sharks, Volume I Common Thresher *Alopias vulpinus*
[30] Seafood Watch Fishery Report: Sharks, Volume I Common Thresher *Alopias vulpinus*
[31] Seafood Watch Fishery Report: Sharks, Volume I Common Thresher *Alopias vulpinus*
[32] Seafood Watch Fishery Report: Sharks, Volume I Common Thresher *Alopias vulpinus*
[33] Biological Profiles, Shortfin Mako. Icthyology at the Florida Museum of Natural History
[34] Mazurek, Robert. Seafood Watch Fishery Report: Sharks Volume II Shortfin Mako
[35] Mazurek, Robert. Seafood Watch Fishery Report: Sharks Volume II Shortfin Mako
[36] Mazurek, Robert. Seafood Watch Fishery Report: Sharks Volume II Shortfin Mako
[37] NOAA, August 2001

Overall, fishing effort in the CA/OR drift gillnet fishery has declined since the mid 1980's. In the 1986/87 seasons, there were 11,000 sets (equivalent to days fished), while in the 1999/2000 and 2000/2001 seasons there were 2,634 and 1,936 sets, respectively.[38] The decrease in effort coincides with increasing regulations, and a decrease in the number of active permittees.[39]

U.S. Bycatch Reduction

Swordfish and shark drift gillnet fisheries have a history of marine mammal bycatch. The CA/OR drift gillnet fishery is categorized as a category I fishery.[40] To address the bycatch problems in this fishery; the Pacific Offshore Cetacean Take Reduction Team (PCTRT) was established in 1996. The PCTRT prepared a plan to address incidental takes of beaked whales, pilot whales, pygmy sperm whales, sperm whales, and humpback whales.[41] The plan required that the float line be set at a minimum depth of 36 feet below the water surface, that pingers be used on all nets, that the states of California and Oregon reduce the number of "inactive" permittees, and that vessel operators be required to attend educational workshops to educate them about marine mammals and the take reduction plan.[42]

Many of these regulations have financial implications for the fishermen. For example, the plan requires the use of pingers on all nets in this fishery. Pingers cost $50-80 each depending on the brand.[43] The average net in CA/OR swordfish drift net fishery is 5760 ft,[44] and pingers must be placed every 150 feet; thus, the average net requires 38.4 pingers at a cost of $1920-3072 depending on the type of pinger used. A pinger only has a life span of approximately 3 years so the costs of pinger purchase will reoccur regularly.[45] Pingers need batteries to run so this is a reoccurring cost that the fishermen incur. Batteries need to be replaced every four months if they are removed after every set

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[38] NOAA, August 2001
[39] NOAA, August 2001
[40] NOAA, August 2001
[41] NOAA, OPR. Marine Mammal-Commercial Fisheries Interactions.
[42] NOAA, OPR. Marine Mammal-Commercial Fisheries Interactions.
[43] Dr. Donald Petersen, NMFS Southwest Regional Office, Personal Communication
[44] Dr. Donald Petersen, NMFS Southwest Regional Office, Personal Communication

but this incurs a cost of time and labor to remove the 153 batteries after each set. If the average net requiring 38.4 pingers, a 4-pack of AA batteries costs $4.99,[46] and batteries must be replaced every four months, a fisherman will spend $574.85 annually in batteries. If the batteries are not removed after each set, costs for batteries will be higher because batteries will need to be changed monthly leading to an annual battery cost of $2299.32. There are 65 active vessels in this fishery so the industry spends at least $124,800 on the purchase of pingers every three years and $37,365 in battery costs annually assuming batteries are removed after every set. These costs to the industry, totaling $78,965-$191,056 annually, are significant considering the fishery has annual ex-vessel values of approximately $4.2 million. Thus, the costs of mitigating cetacean bycatch account for 1.9 – 4.5% of the total ex-vessel value. This value is lower than the acutal cost because it does not include any costs of changing the height of the floatline, which leads to a reduction in catch, or attending the required workshops.

Foreign Bycatch Reduction

There is a market for both swordfish and shark in the U.S. but the swordfish market is much more significant financially. Singapore is by far the greatest supplier of U.S. swordfish, supplying over 1.3 million dollars in swordfish products annually.[47] Major suppliers of swordfish to the U.S. in order of decreasing value are Singapore, Australia, Panama, Mexico, Brazil, Costa Rica, South Africa, Indonesia and Ecuador.[48] Frozen swordfish makes up approximately 41% of swordfish imports to the U.S. and fresh swordfish makes up the remainder.[49]

Over 1/3 of the swordfish imported to the U.S. is from Singapore. Much of the swordfish from Singapore is in frozen filet form are fish landed by the Japanese and Taiwanese

[45] Dr. Donald Petersen, NMFS Southwest Regional Office, Personal Communication
[46] $4.99 is the list price in Feb 2003 for 4 Energizer 4-Pack AA Advanced Formula Alkaline Batteries
[47] National Marine Fisheries Service Statistics and Economics Division
[48] National Marine Fisheries Service Statistics and Economics Division
[49] Calculated from values from National Marine Fisheries Service Statistics and Economics Division

fleets.[50] Japan and Taiwan don't specifically target swordfish; their fleets target tunas, but catch swordfish as bycatch.[51]

Table 1: NMFS Swordfish Import Data, January 2002 – January 2003

Country	**Kilos of fish Imported to the U.S.**	**Value of Imports to U.S.**	**Imported Fresh or Frozen**
Singapore	237,178	$1,297,379	fresh and frozen
Australia	72,539	$536,503	fresh
Panama	73,169	$508,759,	fresh and frozen
Mexico	67,282	$319,280	fresh
Brazil	56,742	$190,837	fresh
Costa Rica	33,998	$175,630	fresh
South Africa	44,028	$149,593	fresh and frozen
Indonesia	28,102	$148,340	fresh and frozen
Ecuador	17,389	$135,755	fresh and frozen
Totals Imports to the U.S.	678,500	$3,777,052	fresh and frozen

Foreign fishermen export 1.64 million lbs. of swordfish annually to the U.S. while U.S. fishermen landed 9.3 million lbs. themselves.[52] This means that fishermen from other countries contribute approximately 15% of the swordfish sold in the U.S.

Many swordfish importers are harvesting using longlines but Mexico is harvesting via drift gillnet, like the California Oregon drift gillnetters. These Mexican catches are particularly relevant because many of these fish are from the same stocks exploited by U.S. fishermen in the California Oregon drift gillnet fishery. The Environmental Assessment of the final Rule to Implement the Pacific Offshore Cetacean Take Reduction Plan specifically addresses the Mexican drift gillnet fishery. The Mexican drift gillnet fishery likely interacts with some of the same marine mammal populations that NMFS is implementing a take reduction plan for in U.S. waters.[53] The Mexican fishery does not have any protective measures in place for marine mammal stocks and greater restrictions on U.S. fishers could result in a shift of U.S. fishing effort to Mexico.[54] This was what

[50] Crowder, L.B. and Myers, R.A. 2002
[51] Crowder, L.B. and Myers, R.A. 2002
[52] National Marine Fisheries Service Statistics and Economics Division
[53] NMFS, September 1997
[54] NMFS, September 1997

occurred in the case of the eastern tropical Pacific yellowfin tuna purse seine fishery after the U.S. placed regulations on U.S. fishermen to reduce the bycatch of pelagic dolphins[55].

The Mexican swordfish drift gillnet fishery, uses vessels, gear, and operational procedures similar to those used in the U.S. drift gillnet fishery, although their nets may be up to 4.5 km long.[56] The Mexican fleet increased from two vessels in 1986 to 31 vessels in 1993.[57] The total number of sets in this fishery in 1992 was approximately 2,700, with an observed rate of marine mammal bycatch of 0.13 animals per set (10 marine mammals in 77 observed sets).[58] This overall mortality rate is similar to that observed in California driftnet fisheries during 1990-95 (0.14 marine mammals per set), before the implementation of the Pacific Cetacean TRP.[59] There are currently efforts underway to convert the Mexican swordfish driftnet fishery to a longline fishery.[60]

The U.S. fishermen in the drift gillnet fishery are required to take cetacean bycatch reduction efforts but their competitors from Mexico are not. In this case U.S. fishermen have increased cost because of money spent on cetacean bycatch reduction while their competitors do not.

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[55] James Joseph, 1994.
[56] NOAA, Stock Assessment Program. Humpback Whale
[57] NOAA, Stock Assessment Program. Humpback Whale
[58] NOAA, Stock Assessment Program. Humpback Whale
[59] NOAA, Stock Assessment Program. Humpback Whale
[60] NOAA, Stock Assessment Program. Humpback Whale

Case study 2: American Lobster

Background

American lobster, *Homarus americanus,* has been an important commercial species in the Northeast United States since the early 1800s. The American lobster is intensely fished along the Atlantic coast of Canada and in New England. In 2001, U.S. fishermen landed 70,447,318 lbs. of American lobster worth $246,325,656. The vast majority of these landings came from traps set to target lobster.[61] The states that are major U.S. lobster suppliers, in order of value, are Maine, Massachusetts and Rhode Island. Maine's lobster harvest had ex-vessel values of $153,963,865 in 2001, which represented 58.2% of the country's total catch in 2001.[62] Massachusetts and Rhode Island supplied 21.7% and 6.3% of the U.S. catches, respectively.[63]

The U.S. both imports and exports American lobster but imports are much more significant economically. In 2001, the U.S. imported $25 million worth of American lobster while exporting $11 million.[64] Canada, the only significant foreign supplier of American lobster, sold $23,924,862 worth of American lobster to the U.S. in 2001.[65] Canada is supplying approximately 96% of the American lobster imported to the U.S. each year.[66]

Baleen whales become entangled in the lines of lobster traps, so the American lobster fishery in the U.S. is considered a category I fishery. The North Atlantic right whale is a critically endangered species that occasionally becomes entangled in lobster gear. Other whales that become entangled in the U.S. and Canadian American lobster fisheries include fin whales, humpback whales, and minke whales.

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[61] National Marine Fisheries Service Statistics and Economics Division
[62] Values calculated from data at National Marine Fisheries Service Statistics and Economics Division
[63] Values calculated from data at National Marine Fisheries Service Statistics and Economics Division
[64] National Marine Fisheries Service Statistics and Economics Division
[65] National Marine Fisheries Service Statistics and Economics Division
[66] Values calculated from data at National Marine Fisheries Service Statistics and Economics Division

U.S. Bycatch Reduction

Due to the requirements of the Marine Mammal Protection Act, U.S. fishermen are required to take preventative actions to reduce bycatch of large whales in this fishery. The Endangered Species Act is also very important in this case because the North Atlantic right whale is listed under the ESA. The western North Atlantic right whale population was estimated to consist of only 295 individuals in 1992.[67] In 1996 a Take Reduction Team was established to mitigate bycatch of Atlantic large whales, especially North Atlantic right whales. The result of the Team's efforts was a Atlantic Large Whale Take Reduction Plan (ALWTRP) designed to reduce risk to North Atlantic right, humpback, fin and minke whales posed by lobster pot/trap gear and gill net gear in the U.S. Atlantic Ocean. The ALWTRP has changed several times over the past five years and will continue to evolve in the future. The plan includes modifications of fishing gear and the establishment of restricted areas based on either predictable congregations or unexpected aggregations of right whales.[68] These measures are necessary for the conservation of large Atlantic whales, but all cause economic loss for fishermen.

The first aspect of the Atlantic Large Whale Take Reduction Plan that affects fishermen is required modifications of fishing gear. The initial gear restrictions implemented in 1997 affected the only the Northeast and varied by fishing areas. Therefore, cost of the gear restrictions on a particular fisherman was dependent on where he fished. Table 2 shows the regulated areas and the estimated cost to individual fishing vessels due to the required gear modifications in each area.[69] These data were obtained from the Environmental Assessment and Regulatory Impact Review of the ALWTRP and Implementing Regulations. The total cost to industry was obtained by multiplying the cost per vessel by the number of vessels affected.

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[67] NOAA, North Atlantic Right Whale

[68] NMFS, January 2003

[69] The Economic Analyses contained in the EA prepared for the Lobster Emergency Rule (NMFS 1997b) and in Framework 23 to the Multispecies FMP (NMFS 1997a) addressing sink gillnet and lobster pot gear are incorporated into this analysis so that a consistent picture of the costs of large whale take mitigation on individual entities is presented.

Table 2: The cost to the lobster fishery of gear modifications and closures under the original ALWTRT[70]

Fishery Area	# Vessel Owners Affected	Cost Per Vessel (due to lost fishing opportunity)	Cost Per Vessel (due to required gear modifications)	Total Industry Cost
Cape Cod Bay Critical Habitat	72	$0	$13,600	$979,200
Great South Channel Critical Habitat	22	$900	$200	$24,200
Stellwagen Bank/Jeffreys Ledge Restricted Area	1008	$0	$1,300	$1,310,400
Gulf of Maine, Inshore	2183	$0	$2,400	$5,239,200
Gulf of Maine, Offshore	13	$0	$1,600	$20,800
South, Inshore	1098	$0	$2,400	$2,635,200
South, Offshore	80	$0	$1,600	$128,000
TOTAL				**$10,337,000**

These gear conversion costs are very conservative compared to the estimates from some other sources. For example, at the time when the plan was being proposed, Governor King of Maine argued that the new rules would cost the industry $40 million to $70 million in the first year.[71]

Additional gear restrictions for time/area combinations were implemented in December 2000 that were estimated to cost the lobster industry between $191K and $539K.[72] In 2001, an amendment to the plan expanded required gear modifications into the Mid-Atlantic and Southeast and required changes to the gear requirements in the Northeast for Offshore lobster waters. The amendment required vessels fishing lobster in the northern inshore, northern offshore and southern nearshore areas to attach weak links to the buoy line of appropriate breaking strength. In the northern inshore area, the average lower and upper bound cost of these gear changes per vessel in the lobster fleet is $139 and $648, respectively.[73] Given there are 5,982 vessels potentially fishing lobster gear, this costs

[70] Values obtained from NMFS Northeast Region, July 1997 or calculated from those values.
[71] *The Associated Press,* Maine governor vows to fight whale protection
[72] Federal Register: December 21, 2000. Vol. 65, No. 246
[73] NMFS, December 2001b.

the industry between $832K and $3,877K.[74] In the northern offshore area, the average lower and upper bound cost of these gear changes per vessel in the lobster fleet is $97 and $218, respectively.[75] Given there are 172 vessels potentially fishing lobster gear in this area, the cost to the industry is between $17K and $38K.[76] In the southern nearshore area, there is no additional cost to the lobster fleet under the plan. The total cost to the lobster industry from these 2001 changes in the northern offshore and nearshore areas ranges between $849K and 3,915 K.[77] It is clear that gear modifications in restricted areas are costing the lobster industry a great deal of money.

The second aspect of the ALWTRT that affects lobster fishermen is a system of restricting fishing in areas where aggregations of right whales are observed outside critical habitat, as defined by the ESA, known as Dynamic Area Management or DAM. Under this scheme, a sighting of 3 right whales, at a density of 0.04 right whales per square nautical mile, will trigger a closure to all lobster trap and sink gillnet gear. The economic costs of any one closure include the cost of removing gear from the area and forgone revenue for vessels that are not able to fish in an alternative area.[78] The total industry cost for DAM for the lobster fleet is estimated at approximately $325K annually but this varies from year to year due to variation in the location and density of the whales within potential DAM areas.

The final type of regulation in the ALWTRP affecting lobster fishermen is a system restricting fishing in areas where annual, predictable congregations of whales occur outside critical habitat known as Seasonal Area Management or SAM. The SAM program protects predictable annual concentrations of North Atlantic right whales in the waters off Cape Cod and out to the Exclusive Economic Zone line.[79] NMFS has defined two areas, called SAM West and SAM East, in which gear restrictions for lobster trap

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[74] NMFS, December 2001b.
[75] NMFS, December 2001b.
[76] NMFS, December 2001b.
[77] NMFS, December 2001b.
[78] NMFS, December 2001a
[79] Federal Register. Vol.67, No. 6.

and anchored gillnet gear are in place.[80] Several potential scenarios exist as to how the fishing industry may adapt to this proposed action. The scenarios include: 1) convert to low risk gear and continue fishing in SAM; 2) choose not to fish or convert to low risk gear; or 3) fish outside of the SAM area, do not convert to low risk gear, and move gear back into SAM when it reopens.[81] In scenario 1, vessel profits or revenues will be reduced as a result of incurring the cost of converting to low risk gear. Under scenario 2, vessels will incur the cost of removing and resetting their gear in SAM when it opens, plus forgone revenues from not fishing. Finally, under scenario 3, a vessel may increase or decrease their revenue depending on the catch rates outside of SAM.[82] Which scenario is the best for a particular vessel depends on the size of the boat and which SAM the vessel fishes in. Vessels are divided into three classes based on length. Class I includes vessels of length 35 feet or less, Class II vessels are between 35 and 49 feet, and Class III are vessels of length 50 feet or greater.[83] Most vessels fishing in SAM East are large offshore Class III vessels and the majority of the vessels in SAM West are smaller Class 1 Vessels. The Class I lobster vessels in SAM East are likely to choose scenario 1.[84] If these vessels in SAM East convert to low risk gear, the total lower and upper bound industry costs for the lobster fleet are $96.5K and $319.8K, respectively.[85] Choosing scenario 2 best suits the Class I lobster vessels in SAM West.[86] If Class I lobster vessels in SAM West chose this alternative, the vessel and industry loss in forgone revenues would be $1,869.[87] It is estimated that there are 5 class I vessels fishing in SAM West [88] so the total industry cost would be $9,345. This is a downwardly biased estimate since it does not include the cost of removing and resetting the gear in the water. Class III vessels will most likely chose scenario 3 to avoid paying the high price, up to 29K, for converting a Class III vessel to low risk gear.[89] In this case, the vessel's revenues would

[80] Federal Register. Vol.67, No. 6.
[81] NMFS, December 2001c.
[82] NMFS, December 2001c.
[83] NMFS, December 2001c.
[84] NMFS, December 2001c.
[85] NMFS, December 2001c.
[86] NMFS, December 2001c.
[87] NMFS, December 2001c.
[88] NMFS, December 2001c.
[89] NMFS, December 2001c.

be influenced by the catch rates inside and outside of the closed area.[90] If the catch rates are lower outside and there is bottom available to fish, vessel profits would be reduced.[91] In addition, the vessel would incur the extra labor and fuel cost associated with moving and resetting their gear inside and out of SAM East.[92] In conclusion, total cost of Seasonal Area Management to the lobster industry is $153K to $320K.[93]

In summary, between 1997 and 2002 closures and gear modifications established by the ALWTRT were passed requiring American lobster fishermen to take large whale bycatch reduction measures. The cumulative annual cost to the lobster fleet of these measures ranges between a lower and upper bound are $1,647,000 and $15,436,000 respectively.[94] The industry generates around $246 million/year in ex-vessel values, so at least 0.7 % - 6.3% of the U.S. American lobster industry value is spent on cetacean bycatch mitigation.

Table 3: Annual Cumulative Impacts of Large Whale Bycatch Reduction on American Lobster Fishermen[95]

Regulation	Lower Bound (In dollars)	Upper Bound (In dollars)
1997 Gear Modifications	129,000	10,337,000
2000 Gear Modifications	191,000	539,000
2001 Gear Modifications	849,000	3,915,000
2001 DAM Requirements	325,000	325,000
2001 SAM Requirements	153,000	320,000
TOTAL	**1,647,000**	**15,436,000**

[90] NMFS, December 2001c.
[91] NMFS, December 2001c.
[92] NMFS, December 2001c.
[93] NMFS, December 2001c.
[94] NMFS, December 2001c.
[95] Numbers come from Environmental Assessments related to these plans. The values for the 1997 gear modifications vary greatly because the lower bound is from the cumulative impacts chart presented in the DAM EA, while the upper bound is the value calculated in the final column of Table 2.

Foreign Bycatch Reduction

U.S. fishermen are going to great lengths to prevent the mortality of threatened and endangered baleen whales in the lobster fishery. This, however, is not the case for the country with which the U.S. competes for lobster catches and sales. Canada has established no protection for marine mammals from entanglement in their lobster fishery.

As in the U.S., North Atlantic right whales in Canada are threatened by lobster fishing due to potential entanglement in the gear. In the Bay of Fundy right whales arrive by mid June to feed for the summer. As can be seen from a comparison of the maps in Appendix B and C, there is a large right whale congregating area that falls in or near lobster fishing areas (LFA) 34, 35, 36, 37, and 38. Although the right whales are present in this area by mid-June, several of these LFAs have fishing seasons lasting through July.

Table 4: Lobster Fishing Areas and Their Open Seasons in Regions of the Bay of Fundy Known to be Congregating Sites for North Atlantic Right Whales[96]

Lobster Fishing Area	**Open Season**
34	Last Monday in November - May 31
35	Last day of February - July 31 & October 14 - December 31
36	March 31- June 29 & second Tuesday in November – January 14
37	March 31- June 29 & second Tuesday in November – January 14
38	Second Tuesday in November – June 29

The Canadian lobster fishery, like the U.S. fishery, has a problem with entanglement of right whales. However, the Canadian fishermen are not required to address cetacean bycatch and therefore have no cost associated with mitigation.

[96] Lobster Fishing.ca

Case study 3: Atlantic Cod Fisheries

Background

Americans have been fishing for Atlantic cod *(Gadus morhua)* in the Northeast, and incidentally taking marine mammals, since the first colonists arrived in the area. Even as early as the 19th Century, there are records of cetacean bycatch in the Atlantic cod fishery. For example, an 1884 United States Commission of Fish and Fisheries Report in reference to gillnets states "in addition to the various species of Gadidae which have been taken, porpoises (locally called "puffers"), monk-fish or fishing-frogs, and dogfish (Squalus) have been caught".[97] The cod fishery quickly became the root of the regions fishing culture. Record volumes of cod were landed in New England between 1976 and 1985 due to increased fishing effort and better technology.[98] As the fishery grew, so did the numbers of cetaceans being taken. During the late 1980s the fishery crashed due to over-harvest. Despite recent challenges, the U.S. Atlantic cod fishery provides over $32 million dollars of Atlantic cod annually.[99] Atlantic cod is harvested with otter trawls, sink gill nets, hand lines, and long lines but otter trawls and gill nets are responsible for most catches.[100] Bottom trawls take 25,293 mt of cod annually, which accounts for 78% of groundfish landings. Sink gillnets take 5192 mt, which accounts for 16% of groundfish landings.[101] Ex-vessel value from Atlantic cod caught by gillnet are $6,352,770 annually.[102] The states with the largest Atlantic cod sink gillnet landings are Massachusetts, New Hampshire, Maine, and Rhode Island. These states had landings worth $4,513,275, $1,100,562, $634,144 and $104,196 dollars respectively.[103]

In addition to the cod landed in the United States, the U.S. imported $16,077,361 of Atlantic cod in 2001.[104] The five largest importing countries, in order of decreasing value, were Iceland, Canada, Russia and Norway. Iceland was the largest supplier

[97] Collins, Capt. J.W. 1884
[98] PBS. Marine Protected Areas & Atlantic Cod.
[99] National Marine Fisheries Service Statistics and Economics Division
[100] National Marine Fisheries Service Statistics and Economics Division
[101] NMFS, June 2001.
[102] National Marine Fisheries Service Statistics and Economics Division
[103] National Marine Fisheries Service Statistics and Economics Division
[104] National Marine Fisheries Service Statistics and Economics Division

contributing Atlantic cod worth $8,263,570 that accounted for over 50% of all imports by value.[105]

Atlantic cod in the Northeast is managed under the Multispecies Fishery Management Plan, which includes measures to manage 15 species of demersal fish in U.S. Federal waters along the eastern seaboard.[106] The use of gillnets in New England and the Mid-Atlantic to catch species like Atlantic cod is associated with bycatch of, in order of occurrence, harbor porpoises, bottlenose dolphins, white-sided dolphins, pilot whales, minke whales, fin whales, humpback whales, and right whales. Atlantic cod fishing with sink gillnets is categorized as a category I fishery because of its high levels of cetacean bycatch.

U.S. Bycatch Reduction

Several regulations affect sink gillnet harvest of Atlantic cod, including those developed under the Gulf of Maine Harbor Porpoise Take Reduction Plan and The Atlantic Large Whale Take Reduction Plan.

The Gulf of Maine Harbor Porpoise TRT was formed to reduce the incidental take of harbor porpoises in the Gulf of Maine groundfish sink gillnet fishery. The Harbor Porpoise Take Reduction Plan closed six areas in the Gulf of Maine to gillnetting; however, during most of these closures, gillnetters may fish if they use pingers (Appendix D).[107] Like in the California/Oregon drift gillnet fishery, cost of pinger use is related to the purchase price of the pingers, the number of pingers required, battery costs and increased labor. The costs of the regulations under the Harbor Porpoise Take Reduction Plan depend on the course of action chosen by the fishermen and range from $0.609 million if all fishermen purchase pingers and continue fishing to $4.5 million if they cannot afford to purchase pingers and cannot displace to a new fishing area.[108] Total cost of compliance with these regulations is estimated to be between $0 and $12,000 per

[105] National Marine Fisheries Service Statistics and Economics Division
[106] NMFS, June 2001.
[107] NOAA Fisheries, OPR. Frequently Asked Questions about Take Reduction Teams.

gillnet vessel in the Mid-Atlantic and between $0 and $4,200 per gillnet vessel in New England.[109]

The Atlantic Large Whale Take Reduction Plan (ALWTRP) altered the multispecies gillnet fishery by requiring gear modifications and restricting the use of such gear at certain times of the year in areas where right whales are likely to congregate.[110]

The first aspect of the Atlantic Large Whale Take Reduction Plan that affects gillnetters is required modifications of fishing gear. The initial gear restrictions of the ALWTRT passed in 1997 affected the only the Northeast and varied by area. Due to this, cost of the gear restrictions on a fisherman was dependent on where he fished. Table 5 shows the regulated areas and the cost to individual fishing vessels from gear modifications in each area.[111] Values for number vessel owners affected and costs per firm were obtained from the Environmental Assessment and Regulatory Impact Review of the ALWTRP and Implementing Regulations and total cost to industry was obtained by multiplying the cost per firm by the number of vessels affected.

Table 5: The cost to the gillnet fishery of gear modifications and closures under the original ALWTRT[112]

Fishery Area	# Vessel Owners Affected	Cost Per Vessel (due to lost fishing opportunity)	Cost Per Vessel (due to required gear modifications)	Total Industry Cost
Cape Cod Bay Critical Habitat	?	$3,400	$300	?
Great South Channel Critical Habitat	8	$26,600	$500	$216,800
Stellwagen Bank/Jefferys Ledge Restricted Area	119	$0	$100	$11,900
Northeast	131	$0	$100	$13,100
Mid-Atlantic	43	$0	$100	$4,300
Southeast U.S.	10	$1,950	$120	$20,700
TOTAL		**>232,300**	**>34,500**	**>$266,800**

108 NMFS, November 1998
109 NMFS, November 1998
110 NMFS, June 2001
111 The Economic Analyses contained in the EA prepared for the Lobster Emergency Rule (NMFS 1997b) and in Framework 23 to the Multispecies FMP (NMFS 1997a) addressing sink gillnet and lobster pot gear are incorporated into this analysis so that a consistent picture of the costs of large whale take mitigation on individual entities is presented.
112 Values obtain from NMFS Northeast Region, July 1997 or calculated from those values.

Additional gear restrictions for time/area combinations were added in December 2000 that were estimated to cost the gillnet industry approximately $109K annually.[113] In 2001, an amendment expanded existing gear modifications into the Mid-Atlantic and Southeast. This amendment required vessels fishing sink gillnet gear to attach a weak link at the buoy line and the middle of each 50-fathom net panel, or every 25 fathoms longer panels, and fish with an appropriate anchor.[114] In the Mid-Atlantic (southern nearshore and southern offshore area) under the plan the cost of gear conversion is per vessel was $657 and the total industry cost was $98.6K per year.[115]

The second part of the ALWTRT that affects sink gillnetters is Dynamic Area Management (DAM), the system of restricting fishing in areas where unexpected aggregations of right whales are observed. The economic costs of any one closure include the cost of removing gear from the area and forgone revenue for vessels that are not able to fish in an alternative area.[116] The total industry cost for DAM for the sink gillnet fleet is around $275K annually but this varies from year to year due to location and density of the whales within potential DAM areas.[117] It is estimated that 31 sink gillnet vessels will be affected by this regulation.[118] This means that each vessel being affected by this regulation will lose $8870.97 annually. So DAM will cost $0-8870.97 depending on how a particular vessel is affected.

Under the ALWTRP, Seasonal Area Management (SAM) affects sink gillnetters. NMFS has defined two areas, called SAM West and SAM East, in which gear restrictions for anchored gillnet gear are required.[119] Several potential scenarios exist as to how the sink gillnet fishing industry may adapt to this proposed action. The scenarios include: 1) convert to low risk gear and continue fishing in SAM; 2) choose not to fish or convert to low risk gear; or 3) fish outside of the SAM area, do not convert to low risk gear, and

[113] Federal Register: December 21, 2000. Vol. 65, No. 246
[114] NMFS, December 2001b.
[115] NMFS, December 2001b.
[116] NMFS, December 2001a
[117] NMFS, December 2001c.
[118] NMFS, December 2001c

move gear back into SAM when it reopens.[120] If scenario 1 is chosen, the cost for a Class I vessel to convert to low risk gear in the northern nearshore area ranges from $779-$1,358 and the cost for a Class II vessel in the northern offshore area ranges from $4,642-$6,389.[121] The total lower and upper bound industry gear conversion costs for the vessels in the sink gillnet fishery are $43.0K and $435.8K, respectively.[122] Scenario 2, not converting gear or fishing, is unlikely to be chosen because profit reductions due to converting gear will not be great enough to prevent gillnet vessels from making a profit. If scenario 3 is chosen, the vessel's revenues would be influenced by the catch rates inside and outside of the closed area.[123] If the catch rates are lower outside and there is bottom available to fish, vessel profits would be reduced.[124] In addition, the vessel would incur the extra labor and fuel cost associated with moving and resetting their gear.[125] It is most likely that all gillnet vessels will chose scenario 1 because they will still be making a profit by converting to low risk gear and continuing to fish.[126] This means that the likely cost to the gillnet fishery is between $43K and $435.8K.[127]

A conservative estimate of the total annual cost of gear modifications and closures related to the ALWTRP is $ 792,400-1,185,200. On a more individual level, annually, each fisherman will end up paying approximately $100 - $27,800 per vessel for gear modifications, $0 - $8,900 per vessel for Dynamic Area Management, $800 - $6,300 per vessel for Seasonal Area Management. Thus, the total cost of ALWTRP per vessel ranges from approximately $900 - 43,000 annually.

When this is added to the costs of the HPTRT, The total cost of cetacean bycatch reduction per vessel is in the range of $900 - $55,000 each year and the cost to the sink gillnet fishery is $1.4-5.7 million each year. The sink gillnet fishery had an ex-vessel

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119 Federal Register. Vol.67, No. 6.
120 NMFS, December 2001c.
121 NMFS, December 2001c.
122 NMFS, December 2001c.
123 NMFS, December 2001c.
124 NMFS, December 2001c.
125 NMFS, December 2001c.
126 NMFS, December 2001c.
127 NMFS, December 2001c.

value of $42,996,436 in 2001.[128] Between 3.3% and 13.3% of the ex-vessel landings of a sink gillnet vessel fishing Atlantic cod is going to cetacean bycatch mitigation.

Table 6: Annual Cumulative Impacts of Cetacean Bycatch Reduction on Sink Gillnet Fleet

Regulation	Cost Estimate (In dollars)
HPTRP	609,000 – 4,500,000
ALWTRP 1997 Gear Modifications/ closures	266,800
ALWTRP 2000 Gear Modifications/ closures	109,000
ALWTRP 2001 Gear Modifications/ closures	98,600
ALWTRP 2001 DAM Requirements	275,000
ALWTRP 2001 SAM Requirements	43,000-435,800
TOTAL	1,401,400 - 5,685,200

Foreign Bycatch Reduction

The U.S. fishermen are competing mainly against Iceland, Canada, Russia, and Norway for Atlantic cod sales. These countries all have cetacean bycatch problems associated with their gillnet fisheries, such as Atlantic cod.

Canadian sink gillnetters, for example, experience bycatches of harbor porpoises. The Canadian sink gillnet fishery occurs mostly in the western portion of the Bay of Fundy during the summer and early autumn months, when the density of harbor porpoises is highest.[129] Between the years 1996-2001 the mean annual mortality of harbor porpoises in Canada's sink gillnet fishery was 21 animals.[130] However, during these years, part of the summer sink gillnet fishery season was closed because quotas were reached. There is

[128] National Marine Fisheries Service Statistics and Economics Division
[129] NOAA, Stock Assessment Program. January 2002. HARBOR PORPOISE

a great deal of variation in estimates of annual harbor porpoise take by Canadian vessels in the Bay of Fundy, partially because fishery closures vary from year to year. Estimates range anywhere from 0 to 424 harbor porpoises taken annually.[131] Canada and the U.S. have a bilateral agreement to mitigate harbor porpoise bycatch in the Gulf of Maine and Bay of Fundy but the Canadian management plan states that bycatch will be kept less than 110 individuals[132]. Since Canadian bycatch is usually believed to be less than 100 porpoises a year, no mitigation methods are required.[133]

There is also evidence that white-sided dolphins are also taken as bycatch in Canadian waters. Two white-sided dolphins were reported caught in groundfish gillnet sets in the Bay of Fundy during 1985 to 1989.[134] Humpback whale entanglements also occur in relatively high numbers in Canadian waters. Reports of collisions with fixed fishing gear set for groundfish around Newfoundland averaged 365 annually from 1979 to 1987 (range 174-813).[135] An average of 50 humpback whale entanglements (range 26-66) were reported annually between 1979 and 1988, and 12 of 66 humpback whales that were entangled in 1988 died.[136]

Like Canada and the U.S., Norway, Iceland and Russia all experience harbor porpoise bycatches in gillnet fisheries. Bycatch has been documented in the Norwegian North Sea and off the coast of Western Norway but neither of these areas have bycatch reduction measures. In addition, Norway has documented bycatch in Kattegat and the North Sea. These areas are covered by the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBAMS), but Norway is not a party to this convention and therefore does not have to comply.[137] According to an International Whaling Commission report, at least 130 harbor porpoises were reported as taken as bycatch in

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[130] NOAA, Stock Assessment Program. January 2002. HARBOR PORPOISE
[131] NOAA, Stock Assessment Program. January 2002. HARBOR PORPOISE
[132] Tolley, K.A., 2001
[133] Tolley, K.A., 2001
[134] NOAA, Stock Assessment Program. WHITE-SIDED DOLPHIN
[135] NOAA, Stock Assessment Program. Humpback Whale
[136] NOAA, Stock Assessment Program. Humpback Whale
[137] Tolley, K.A., 2001

Norway during a two year time period.[138] Iceland's bycatch of harbor porpoises occurs along the entire coastline, but there is no management plan to address this problem.[139] Harbor porpoise bycatches also occur in the Barents Sea, which borders Norway and Russia on the north.[140] Bycatch is known to occur in this region but has not been quantified.[141] It is thought that approximately 9000 harbor porpoises live in this area, with no management plan to reduce marine mammal bycatch.[142]

Iceland, Canada, Russia, and Norway do not have cetacean bycatch reduction regulations so their fishermen do not incur the costs borne by U.S. fishermen. Fishermen in the United States landed $32,048,526 of Atlantic cod in 2001 while other countries imported $16,077,361 worth of Atlantic cod to the U.S.[143] This means that other countries hold one third of the U.S. market for Atlantic Cod. One sixth of this market is controlled by Iceland alone.

[138] IWC, 1996
[139] Tolley, K.A., 2001
[140] Tolley, K.A., 2001
[141] Tolley, K.A., 2001
[142] Tolley, K.A., 2001
[143] National Marine Fisheries Service Statistics and Economics Division

Conclusions and Future Directions

The three case studies show that the domestic fishermen are paying for a large portion of cetacean bycatch reduction measures. Foreign Competitors are not taking cetacean bycatch reduction measures. Therefore, U.S. fishermen have higher costs and are placed at a disadvantage.

It is clear that there is a problem that needs to be addressed, but like most international issues, there is no simple solution. It is not possible to restrict imports from countries with cetacean bycatch problems because of complications related to the General Agreement on Tariffs and Trade and the World Trade Organization.

The General Agreement on Tariffs and Trade, also known as GATT aims to reduce tariffs and other barriers to trade and to eliminate discriminatory treatment in international trade relations.[144] The World Trade Organization or WTO is an international organization that grew out of GATT in 1994 and deals with the rules of trade between nations.[145]

In the past, the U.S. has tried to use embargos on fishery products as a conservation measure. Two examples of such are the dolphin/tuna and turtle/shrimp cases. In these cases the U.S. tried to restrict imports of shrimp and tuna from countries that did not have turtle and dolphin protection measures equal to those of the U.S. In both cases, these restrictions were overturned because GATT and WTO rules do not allow one country to take trade action for the purpose of attempting to enforce its own domestic laws in another country. The WTO and GATT have ruled against both Dolphin-Safe tuna regulations and turtle excluder device regulations resulting in weakened standards.[146] One would expect that if the U.S. tried to stop fish imports from countries with cetacean bycatch problems, the same fate would be met.

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144 The World Trade Organization
145 The World Trade Organization
146 Seaturtles.org

One solution to this problem is to address cetacean bycatch reduction on a global level. The World Wildlife Fund (WWF) is working to make this a reality through a new program called the Global Cetacean Bycatch Reduction Initiative. As part of this initiative they have developed a virtual resource center that compiles information about bycatch and makes it available to stakeholders working to reduce cetacean bycatch. The initiative also created a Cetacean Bycatch Task Force, a Call to Action for reducing cetacean bycatch and a draft strategy for bycatch mitigation.

WWF's strategy has two immediate goals. The first is to convince the U.S. Congress to take action. The U.S. needs to pressure countries that have the capacity to mitigate cetacean bycatch (i.e. developed countries) to do so. They also need to assist countries that lack the capacity to mitigate cetacean bycatch (i.e. developing countries) by providing training, research and funding. To accomplish these goals, there need to be Congressional appropriations to support global cetacean bycatch reduction programs.

The second goal is to initiate an International Plan of Action (IPOA) at the Food and Agriculture Organization of the United Nations. The IPOA is modeled after the IPOA for Reducing Incidental Catch of Seabirds in Longline Fisheries. This IPOA describes concrete and specific steps for reducing seabird bycatch at the national, regional, and global levels.[147] Countries are to conduct assessments of seabird bycatch and, if necessary, develop National Plans of Action.[148] Attached to the IPOA are technical notes to provide assistance to countries in developing their National Plans of Action and in identifying appropriate technical and operational mitigation measures to reduce seabird bycatch.[149] An IPOA for cetacean bycatch would help to raise this issue globally, promote research on the topic, encourage cooperation among nations and encourage action by individual countries. In addition, the IPOA would be a true international effort.

International effort is clearly needed to address the problem of cetacean bycatch. Cetaceans are highly migratory species that regularly cross national boundaries and

[147] Rivera, Kim S. and Wohl, Kenton D. 1999
[148] Rivera, Kim S. and Wohl, Kenton D. 1999
[149] Rivera, Kim S. and Wohl, Kenton D. 1999

therefore must be protected multilaterally. Additionally, it presents a competitive disadvantage for fishermen from only select countries to do cetacean bycatch mitigation. It is for these reasons that it is time for the world to start to work together on this complicated issue before it is too late.

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Appendix A:
Species Descriptions

Cetaceans threatened with extinction due to death as bycatch

Common Name	Scientific Name	Location
Vaquitas	*Phocoena sinus*	Gulf of California
Hector's dolphins	*Cephalorhynchus hectori*	New Zealand
Irrawaddy dolphins	*Orcaella brevirostris*	The Philippines
Harbor porpoises	*Phocoena phocoena*	Baltic and Black Seas
Franciscana dolphin	*Pontoporia blainvillei*	South America
North Atlantic right whale	*Eubalaena glacialis*	North Atlantic Ocean

Case-study species descriptions

Fishery	Common Name	Scientific Name
CA/OR drift gillnet	Swordfish	*Xiphias gladius*
CA/OR drift gillnet	Shortfin mako shark	*Isurus oxyrinchus*
CA/OR drift gillnet	Common thresher shark	*Alopias vulpinus*
CA/OR drift gillnet	Albacore tuna	*Thunnus alalunga*
CA/OR drift gillnet	Opah	*Lampris guttatus*
CA/OR drift gillnet	Louvar	*Luvarus imperialis*
CA/OR drift gillnet	Bigeye thresher shark	*Alopias superciliosus*
CA/OR drift gillnet	Common dolphin	*Delphinus capensis*
CA/OR drift gillnet	Risso's dolphin	*Grampus griseus*
CA/OR drift gillnet	Dall's porpoise	*Phocoenoides dalli*
CA/OR drift gillnet	Pacific white-sided dolphin	*Lagenorhynchus obliquidens*
CA/OR drift gillnet	Northern right whale dolphin	*Lissodelphis borealis*
CA/OR drift gillnet	Sperm whale	*Physeter macrocephalus*
CA/OR drift gillnet	Short-finned pilot whale	*Globicephala macrorhynchus*
American lobster	American lobster	*Homarus americanus*
American lobster	North Atlantic right whale	*Eubalaena glacialis*
American lobster	Fin whale	*Balaenoptera physalus*
American lobster	Humpback whale	*Megaptera novaeangliae*
American lobster	Minke whale	*Balaenoptera acutorostrata*
Atlantic cod	Atlantic cod	*Gadus morhua*
Atlantic cod	Harbor porpoise	*Phocoena phocoena*
Atlantic cod	Bottlenose dolphin	*Tursiops truncatus*
Atlantic cod	Atlantic white-sided dolphin	*Lagenorhynchus acutus*
Atlantic cod	Atlantic pilot whale	*Globicephala melas*
Atlantic cod	Minke whale	*Balaenoptera acutorostrata*
Atlantic cod	Fin whale	*Balaenoptera physalus*
Atlantic cod	Humpback whale	*Megaptera novaeangliae*
Atlantic cod	North Atlantic right whale	*Eubalaena glacialis*