Atlantic Offshore Cetaceans Take Reduction Plan

Final Draft

submitted on behalf of the

Atlantic Offshore Cetaceans Take Reduction Team

to the

National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Department of Commerce

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Take Reduction Team #2

Atlantic Offshore Cetaceans Take Reduction Team
Take Reduction Plan

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INTRODUCTION

This Take Reduction Plan (TRP) is recommended by the Atlantic Offshore Cetaceans Take Reduction Team (AOCTRT) to reduce the incidental take of the following strategic Atlantic Offshore Cetaceans:

Atlantic Spotted Dolphin
Bottlenose Dolphin
Common Dolphin
Pantropical Spotted Dolphin
Pilot Whale -- long-finned
Pilot Whale -- short-finned
Beaked Whales
Right Whale
Humpback Whale
Sperm Whale

The purpose of this TRP, as described in the Team's Mission Statement, "is to reduce, within six months of its implementation, the incidental mortality or serious injury of strategic stocks of Atlantic Offshore Cetaceans incidentally taken in the course of commercial fishing operations of the Atlantic Pelagic Longline, Swordfish Driftnet, and the Pair Trawl for Tuna fisheries to levels below the potential biological removal level established for each stock. The long-term goal of this take reduction plan is to reduce, within five years of its implementation, the incidental mortality and serious injury of marine mammals incidentally taken during these commercial fishing operations to insignificant levels approaching a zero mortality and serious injury rate (the Zero Mortality Rate Goal or ZMRG[1]), taking into account the economics of the fishery, the available existing technology, and existing State or regional fishery management plans."

This plan represents the Team's best effort to meet the goals of the Marine Mammal Protection Act, as amended in 1994, while at the same time ensuring the viability of the fisheries.

This plan was developed through the hard work and dedication of all the members of the Atlantic Offshore Cetaceans Take Reduction Team:

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[1] On August 30, 1995, NMFS proposed that the ZMRG would be met when the impact from commercial fishing operations on marine mammals was biologically negligible. NMFS is currently in the process of developing a final definition of the ZMRG.

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I. BACKGROUND

A. Requirements of the Marine Mammal Protection Act, Section 118

Section 118 of the 1994 amendments to the Marine Mammal Protection Act (MMPA), established the immediate goal of reducing the incidental mortality or serious injury of marine mammals, occurring in the course of commercial fishing operations, to below the potential biological removal[2] (PBR) level within six months and a near zero mortality and serious injury rate within seven years of its enactment (i.e. April 30, 2001).

Section 118 established the following three-part strategy to govern interactions between marine mammals and commercial fishing operations:

The potential biological removal (PBR) is the maximum number of animals, not including natural mortalities, that may be removed annually from a marine mammal stock while still allowing that stock to reach or maintain its optimal population level.

preparation of marine mammal stock assessment reports;
- registration and marine mammal mortality monitoring program for Category I and II commercial fisheries; and
  preparation and implementation of Take Reduction Plans (TRP).

Section 118(f) requires that the National Marine Fisheries Service (NMFS) develop and implement TRPs to assist in the recovery, or prevent the depletion, of strategic marine mammal stock(s) which interact with Category I or II fisheries. A strategic stock is defined as:

a marine mammal species that is listed as endangered or threatened under the U.S. Endangered Species Act (ESA), or
- a marine mammal stock which is declining and likely to become listed as a threatened species under the ESA, or
  a marine mammal stock for which the human-caused mortality exceeds the potential biological removal (PBR) level, or
  a marine mammal stock or species that is listed under the MMPA as depleted.

B. Formation of the Atlantic Offshore Cetaceans Take Reduction Team

NMFS convened the Atlantic Offshore Cetacean Take Reduction Team (AOCTRT) on May 23, 1996 (61 FR 25846) because of interactions between strategic marine mammal stocks and the Atlantic pelagic driftnet, pair trawl, and longline fisheries for swordfish and tuna. Cumulatively, these fisheries incidentally take several marine mammal stocks at levels that are estimated to be above the PBR levels established for these stocks (see Review of Stock Assessment Information). The team was selected through an extended interview process conducted by Susan Podziba and Associates, a NMFS-contracted facilitator. The AOCTRT includes representatives of each of the three fisheries, environmental and conservation groups, several states, the Mid-Atlantic Fisheries Management Council, independent fisheries scientists, cetacean biologists, and NMFS. Take reduction teams are not subject to the Federal Advisory Committee Act (FACA).

The AOCTRT was charged with developing a plan within six months of its inception. If the AOCTRT had failed to reach consensus on a plan, the Secretary of Commerce would have been required to develop the plan. Upon this plan's submission, the NMFS Administrator has 60 days for its review and publication in the *Federal Register*. If the Administrator changes the AOCTRT's plan, the Administrator must note in the *Federal Register* what changes were made and why. A 90-day public comment period will be provided for review of the proposed plan, and 60 days after the comment period ends NMFS is charged with publishing a final plan and final implementing regulations. Thereafter, as long as the take of strategic Atlantic Offshore Cetaceans exceeds the PBR level, the team will meet every six months to monitor implementation of the plan.

The Team reviewed stock assessment information for each stock, appropriate marine mammal behavioral studies, available mortality and serious injury data for each of the fisheries (broken down by area and season or month), target species catch data, take reduction strategies tested in similar fisheries, and other pertinent information.

The Team held five meetings in New England between May and November, 1996. Each meeting was open to the public and facilitated by Susan Podziba.

II. REVIEW OF STOCK ASSESSMENT INFORMATION[3]

A. Sources of Observer Data

In 1986, NMFS established a mandatory logbook system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989, and since that year several fisheries have been covered by the program. In late 1992 and in 1993, the SEFSC provided observer coverage of pelagic longline vessels fishing off the Grand Banks (Tail of the Banks) and currently provides observer coverage of vessels fishing south of Cape Hatteras.

B. Fishery Summaries

1. Pair Trawl

Effort in the Atlantic swordfish/tuna/shark pair trawl fishery (pair trawl) has increased during the period 1989-1993, from zero hauls in 1989 and 1990, to an estimated 171 hauls in 1991 and then to an estimated 536 and 586 hauls in 1992 and 1993, respectively. The fishery operated from August to November 1991, from June to November in 1992, and from June to October in 1993. Sea sampling began in October 1992, and 101 hauls were sampled in that season; 201 hauls were sampled in 1993. Nineteen vessels have operated in this fishery. The fishery extends from 35°N to 41°N, and from 69°W to 72°W. Approximately 50% of the total effort was

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3 The sources of observer data, fishery summaries, and stock assessment summaries are all excerpted from U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments, NOAA Technical Memorandum NMFS-SEFSC-363, July 1995. In this document, text pertaining to fishing effort and levels of observer coverage for the pelagic fisheries (driftnet, longline, pair trawl), is contained in all species summaries where fishery interactions were documented. A 1996 revised report will be available soon and should be reviewed for updated information.

within a one degree square at 39°N, 72°W, around Hudson Canyon. Examination of the locations and species composition of the by-catch, showed little seasonal change for the six months of operation.

2. Driftnet

The estimated total number of hauls in the Atlantic pelagic driftnet fishery (driftnet) increased from 714 in 1989 to 1,144 in 1990; thereafter, with the introduction of quotas, effort was severely reduced. The estimated number of hauls in 1991, 1992, and 1993 were 233, 243, and 232, respectively. Twenty-nine different vessels reported participating in this fishery at one time or another between 1989 and 1993. Observer coverage, expressed as percent of sets observed, was 8% in 1989, 6% in 1990, 20% in 1991, 40% in 1992, and 42% in 1993. Effort was concentrated along the southern edge of Georges Bank and off Cape Hatteras. Examination of the species composition of the catch and locations of the fishery throughout the year, suggested that the driftnet fishery be stratified into two strata, a southern or winter stratum, and a northern or summer stratum. Estimates of total by-catch, for each year, were obtained using the aggregated (pooled 1989-1993) catch rates, by strata.

3. Longline

Pelagic swordfish, tunas, and oceanic sharks are the targets of the U.S. longline fishery (longline) in the U.S. Atlantic and Gulf of Mexico EEZ. This fishery has been monitored with 2 - 5% observer coverage, in terms of trips observed, since 1992. Total longline effort for the Atlantic pelagic fishery (including the Caribbean), based on mandatory logbook reporting, was 11,279 sets in 1991, 10,605 sets in 1992, and 11,538 in 1993. The fishery has been observed nearly year round within every region within the EEZ and beyond.

C. Summary Data Tables

The data in the following summary data tables are from the 1995 Stock Assessment Report (SAR) and the 1996 draft SAR, which has not yet been released. The first three tables summarize the estimated mortality of marine mammals, based on an extrapolation of observed takes, for each fishery. Table 4 summarizes the estimated mortality of marine mammals for all fisheries, based on existing data, that have interacted with Atlantic offshore cetaceans. Table 5 provides a proportional allocation of PBR for the three fisheries, driftnet, longline, and pair trawl, based on the estimated historical take of marine mammals. Table 6 provides a proportional allocation of PBR for the driftnet and longline fisheries.

Table 1.
Estimated Mortality in Pair Trawl Fishery

Species	1995 SAR PBR	Strategic in 1995 SAR?	Draft SAR PBR	Strategic in 1996 Draft SAR?	Pair Trawl 1991	Pair Trawl 1992	Pair Trawl 1993	Pair Trawl 1994	Pair Trawl 1995	Pair Trawl Avg. 1992 - 1995
Risso's dolphin	111	N	111	N	0.6	4.3	3.2	N/A	N/A	2.7*
Pilot whale	28	Y	50	Y	0	0	0	2	22	6
Common dolphin	32	Y	40	Y	5.6	32	35	0	5.6	18.2
Bottlenose dolphin, offshore	92	Y	88	N	13	73	85	4	17	45
Total MM					19.2	109.3	123.2	6	44.6	
Total strategic					5.6	32	35	2	27.6	
Total no. sets					171	536	586	407	440	
MM take/set					0.112	0.204	0.210	0.015	0.101	
Strategic take/set					0.033	0.060	0.060	0.005	0.063	
% Observer Coverage					0	9%	17%	52%	55%	

* Estimated average mortality from 1991 - 1993

Table 2.
Estimated Mortality in Driftnet Fishery

Species	1995 SAR PBR	Strategic in 1995 SAR?	1996 Draft SAR PBR	Strategic in 1996 Draft SAR?	Driftnet 1989	Driftnet 1990	Driftnet 1991	Driftnet 1992	Driftnet 1993	Driftnet 1994	Driftnet 1995	Observed Mortalities Driftnet 1996	Driftnet Avg. 1989 - 1993	Driftnet Avg. 1991 - 1995
Right whale	0.4	Y	0.4	Y	2.2	3.4	0.5	0.4	1.3	0	0	0	1.6	0.4
Humpback whale	9.7	Y	9.7	Y	0.7	1.7	0.7	0.4	1.5	0	1	0	1.0	0.7
Minke whale	16	N	16	N	0	0	0	0	0	0	4	0	0.0	0.8
Sperm whale	0.5	Y	3.2	Y	2.2	4.4	0.5	0.4	0.3	0	0	0	1.6	0.2
Dwarf sperm whale	N/A	Y	N/A	Y	0	0	0	0	0	0	1	0	0.0	0.2
Beaked whale	N/A	Y	N/A	Y	60	76	13	9.7	12	4.8	9.1	8	34.1	9.7
Risso's dolphin	111	N	111	N	87	144	21	31	14	0	0	0	59.4	13.2
Pilot whale	28	Y	50	Y	77	132	30	33	31	20	9.1	6	60.6	24.6
White-sided dolphin	125	Y	192	N	4.4	6.8	0.9	0.8	2.7	0	0	0	3.1	0.9
Common dolphin	32	Y	40	Y	540	893	223	227	238	163	84	74	424.2	187.0
Spotted dolphin	16*	Y	16*	Y	23	51	11	20	8.4	29	0	2	22.7	13.7
Striped dolphin	73	N	164	N	39	57	10	7.7	21	13	2	7	26.9	10.7
Spinner dolphin	N/A	N	N/A	N	0.7	1.7	0.7	1.4	0.5	0	0	0	1.0	0.5
Bottlenose dolphin, offshore	92	Y	88	N	72	115	26	28	22	14	5	0	52.6	19.0
Harbor porpoise	403	Y	483	Y	0.7	1.7	0.7	0.4	1.5	0	0	0	1.0	0.5
Total MM					908.9	1487.7	338	360.2	354.2	243.8	115.2	98	689.8	282.3
Total strategic					705.8	1163.2	279.4	291.3	294	216.8	104.2	91	546.7	237.1
					714	1144	233	243	232	197	164	98	513.2	213.8
					1.27	1.30	1.45	1.48	1.53	1.24	0.70	1.00	1.34	1.32
Strategic take/set					0.99	1.02	1.20	1.20	1.27	1.10	0.64	0.93	1.07	1.11
% Observer Coverage					8%	6%	20%	40%	42%	87%	99%			

N/A: Not Available

* PBR for both the Atlantic and Pantropical spotted dolphin combined would be 16.

ıble 3.
Estimated (and Observed) Mortality in Longline Fishery

Species	1995 SAR PBR	Strategic in 1995 SAR?	Draft SAR PBR	Strategic in 1996 Draft SAR?	Longline 1991	Longline 1992 (Observed)	Longline 1993 (Observed)	Longline 1994 (Observed)	Longline 1995 (Observed)	Longline Avg. 1992 - 1993
Risso's dolphin	111	N	111	N		0(0)	13 (1)	N/A (1)	N/A (0)	6.5
Pilot whale	28	Y	50	Y		0(0**)	22 (1**)	N/A (0)	N/A (0)	11
Spotted dolphin	16*	Y	16*	Y		0(0)	16***	N/A (0)	N/A (0)	1.5***
Total MM						0	51	N/A	N/A	
Total strategic						0	38	N/A	N/A	
Total no. sets					11279	10605	11538			
MM take/set						0	0.003			
Strategic take/set						0	0.0019			
% Observer Coverage						2.1%	5.3%	4.6%	5.4%	

N/A: Not Available
* PBR for both the Atlantic and Pantropical spotted dolphin combined would be 16.
** Observer data indicate the pilot whale mortality occurred in 1992.
*** Observer data do not indicate any mortalities of spotted dolphins.

Table 4.
Estimated Mortality in Northwest Atlantic Fisheries

Species	1995 SAR PBR	1996 Draft SAR PBR	Avg. Driftnet Take 1991 - 95	Avg. Longline Take 1992 - 93	Avg. Pair Trawl Take 1992 - 95*	Avg. Otter Trawl Take 1991 - 95	Avg. Sink GN Take 1990 - 95	Total Avg. Take all Fisheries
Right whale	0.4	0.4	0.4					0.4
Humpback whale	9.7	9.7	0.7					0.7
Minke whale	16	16	0.8					0.8
Sperm whale	0.5	3.2	0.2					0.2
Dwarf sperm whale	N/A	N/A	0.2					0.2
Beaked whale	N/A	N/A	9.7					9.7
Risso's dolphin	111	111	13.2	6.5	2.7			22.4
Pilot whale	28	50	24.6	11	6	0		41.6
White-sided dolphin	125	192	0.9			58.4	121.3	180.6
Common dolphin	32	40	187.0		18.2	28.4		233.6
Spotted dolphin	16	16	13.7	8				21.7
Striped dolphin	73	164	10.7			36.2		46.9
Spinner dolphin	N/A	N/A	0.5					0.5
Bottlenose dolphin	92	88	19.0		44.8	18.2		82.0
Harbor porpoise	403	483	0.5				1833	1833.5
Total MM			282.3	25.5	71.6	141.2	1954.3	2474.9
Total strategic			247.1	19.0	24.2	28.4	1833.0	2151.6

N/A: Not Available

* Estimated average mortality from 1991 - 1993

Table 5.

Proportional Allocation of PBR Between Pair Trawl, Driftnet, and Longline Fisheries, Based on Estimated Historical Take

Species	Total Avg. Take all Fisheries	1996 Draft SAR PBR	% Pair Trawl (3 fisheries)	% Driftnet (3 fisheries)	% Longline (3 fisheries)	Pair Trawl PBR Allocation	Driftnet PBR Allocation	Longline PBR Allocation
Right whale	0.4	0.4		100		0	N/A	0
Humpback whale	0.7	9.7		100		0	N/A	0
Minke whale	0.8	16		100		0	16	0
Sperm whale	0.2	3.2		100		0	0	0
Dwarf sperm whale	0.2	N/A		100		0	0	0
Beaked whale	9.7	N/A		100		0	0	0
Risso's dolphin	22.4	111	12.1	58.9	29.0	13	65	32
Pilot whale	41.6	50	14.4	59.2	26.4	7	30	13
White-sided dolphin	180.6	192		0.5		0	1	0
Common dolphin	233.6	40	7.8	80.1		3	32	0
Spotted dolphin	21.7	16		63.1	36.9	0	10	6
Striped dolphin	46.9	164		22.9		0	38	0
Spinner dolphin	0.5	N/A		100		0	0	0
Bottlenose dolphin, offshore	82.0	88	54.6	0.23		48	0	0
Harbor porpoise	1833.5	483		0.00		0	0	0
Total MM	**2474.9**					72	192	51
Total strategic	**2151.6**					10	72	19

N/A: Not Available

Table 6.

Proportional Allocation of PBR Between Driftnet and Longline Fisheries, Based on Estimated Historical Take

Species	Total Avg. Take all Fisheries Minus Pair Trawl Takes	1996 Draft SAR PBR	% Driftnet (2 fisheries)	% Longline (2 fisheries)	Driftnet PBR Allocation	Longline PBR Allocation
Right whale	0.4	0.4	N/A	N/A	0	0
Humpback whale	0.7	9.7	N/A	N/A	0	0
Minke whale	0.8	16	100	0	16	0
Sperm whale	0.2	3.2	N/A	N/A	0	0
Dwarf sperm whale	0.2	N/A	100	0	N/A	N/A
Beaked whale	9.7	N/A	100	0	N/A	N/A
Risso's dolphin	19.7	111	67.0	33.0	74	37
Pilot whale	35.6	50	69.1	30.9	35	15
White-sided dolphin	180.6	192	0.5	0	1	0
Common dolphin	215.4	40	86.8	0	35	0
Spotted dolphin	21.7	16	63.1	36.9	10	6
Striped dolphin	46.9	164	22.9	0	38	0
Spinner dolphin	0.5	N/A	100	0	N/A	N/A
Bottlenose dolphin, offshore	37.2	88	51.1	0	45	0
Harbor porpoise	1833.5	483	0	0	0	0
	2403.3				253	58
Total strategic	2117.5				79	21

N/A: Not Available

D. Stock Assessment Summaries of Strategic Atlantic Offshore Cetaceans

Under the 1994 MMPA amendments, NMFS was required to prepare stock assessments for all marine mammal populations in U.S. waters. Each assessment includes an estimate of population size, the number of animals killed and seriously injured by commercial fisheries and other human activities, and the "potential biological removal" level (PBR) that the stock can safely support. If human-related mortality exceeds the stock's estimated PBR level, or the stock is listed as endangered or threatened, or is declining and is likely to be listed as such under the Endangered Species Act, the 1994 amendments require that the stock be designated as strategic and subject to special management efforts.

In August 1994, NMFS published draft marine mammal stock assessments for public review, and final assessments in August 1995. The stock assessments are to be updated periodically; additional surveys have been completed, and an update is forthcoming.

Table 7: Minimum Population Estimates and PBRs for Strategic Atlantic Offshore Cetaceans

Strategic Stock	Minimum Population Estimate (N_{min})	Potential Biological Removal (PBR)
Right Whale	295	0.4
Humpback Whale	4,848	9.7
Sperm Whale	226	0.5
Beaked Whales -- True's, Gervais', Blainville's, Sowerby's	unknown	unknown
Cuvier's Beaked Whale	unknown	unknown
Long-finned Pilot Whale	3,537	28
Short-finned Pilot Whale	457	3.7
Common Dolphin	3,233	32
Bottlenose Dolphin	9,195	92
Spotted Dolphin — (Atlantic and Pantropical Spotted)	4,885	unknown due to difficulty in identifying each species

1. Right Whale

Individuals of this population range from wintering and calving grounds in coastal waters of the southeastern United States to summer feeding, nursery, and mating grounds in New England waters and northward to the Bay of Fundy and the Scotian Shelf. Five major habitats or congregation areas (southeastern United States coastal waters, Great South Channel, Cape Cod Bay, Bay of Fundy, and Scotian Shelf) have been identified for the western North Atlantic right whale. The distributions of approximately 85% of the winter population and 33% of the summer population are unknown.

The minimum population for right whales is 295, and the PBR is 0.4. Based on a census of individual whales identified using photo-identification techniques, the western North Atlantic population size was estimated to be 295 individuals in 1992. Because this was nearly a complete census, it is assumed that this represents a minimum population size estimate.

The PBR of 0.4 is the product of the minimum population size (295), one-half of the maximum productivity rate (0.0125), and a recovery factor of (0.10) for endangered species.

At least one-third of all right whale mortality is caused by human activities. The principal activities impacting these whales are ship strikes and entanglement. Marks or scars from entanglement with fishing gear were reported on 57% of living right whales, and 7% had major wounds probably due to collisions with ship propellers. Of the 25 mortalities recorded, five (20%) could be attributed to ship collisions, and three (12%) were the result of entanglements. Young animals, ages 0-4, are apparently the most impacted portion of the population. Between 1975-1992, 14 right whale entanglements, including animals in weirs, entangled in gillnets, and trailing line and buoys, were documented. Three right whales entangled or trailing line were reported from waters in the Gulf of Maine and Bay of Fundy region in the summer and fall 1994. In February 1994, two, and perhaps three, right whales in southeastern U.S. coastal waters were reported injured in association with large-mesh gillnets. In July of 1993, a young animal was caught and released from a pelagic driftnet on Georges Bank. The wounding to the animal, including the tail stock, suggested a high likelihood of reduced viability. Under the assumption that this animal eventually died, the total estimated annual fishery-related mortalities (CV in parentheses) were 2.2 in 1989 (2.43), 3.4 in 1990 (2.37), 0.5 in 1991 (1.49), 0.4 in 1992 (1.44), and 1.3 in 1993 (0.63). During the period 1990-1994, the non-fishery mortality rate (ship strike) was estimated to be between 0.8 and 1.4 right whales per year.

The size of this stock is considered to be low relative to optimum sustainable population (OSP), and this species is listed as endangered under the Endangered

Species Act (ESA). A Recovery Plan has been published and is in effect (NMFS 1991). This is a strategic stock because it is listed under the ESA and estimated annual fishery-related mortality and serious injury exceeds PBR.

2. Humpback Whale

During summer there are at least five geographically distinct humpback whale feeding aggregations occurring between latitudes 42°N and 78°N; these feeding areas are (with approximate number of humpback whales in parenthesis): Gulf of Maine (400); Gulf of St. Lawrence (200); Newfoundland and Labrador (2,500); western Greenland (350); and the Iceland-Denmark strait (up to 2,000). The western North Atlantic stock is considered to include all humpback whales from these five feeding areas.

Humpback whales from all feeding areas migrate to the Caribbean in winter, where courtship, breeding, and calving occur, although some animals have been reported in the feeding regions during winter.

Feeding is the principal activity of humpback whales in New England waters and their distribution has been largely correlated to prey and bottom topography. During the past 15 years, distribution shifts in humpback whale abundance in the Gulf of Maine have been documented. These shifts have been correlated to changes in abundance and distribution of Atlantic herring, Atlantic mackerel, and sand lance. In recent years, the number of sightings of young humpback whales in the mid-Atlantic region has increased. From 1985-1992, researchers reported 38 humpback whale strandings along the mid-Atlantic and southeastern U.S. coasts.

The calculated minimum population of humpback whales is 4,848 and the PBR is 9.7. Based on photo-identification techniques and capture-recapture methods, the total humpback whale population of the North Atlantic Ocean west of Iceland during the years 1979-1990 averaged 5,543 whales (CV=0.16). The minimum estimate is the lower limit of the 60% confidence interval of the log-normal distributed abundance estimate.

The PBR of 9.7 was specified as the product of the minimum population size (4,848), one-half of the maximum productivity rate (0.02), and a recovery factor of (0.10) for endangered species.

Each year, an average of four to six entanglements of humpback whales occur in waters off the southern Gulf of Maine, as well as additional reports of ship-collision scars. Between 1975-1992, 64 entangled or injured animals were reported. Of 20 dead humpback whales, principally in the mid-Atlantic where decomposition state did not preclude examination for human impacts, six (30%) had major injuries possibly

attributable to ship strikes, and five (25%) had injuries consistent with possible entanglement in fishing gear. Humpback whale entanglements occur in relatively high numbers in Canadian waters. From 1979-1987, an average of 365 (range 174-813) humpback whale collisions with fixed gear off Newfoundland were reported. An average of 50 humpback whale entanglements (range 26-66) were reported annually between 1979-1988, and 12 of 66 animals entangled in 1988 died.

Total average annual estimated fishery-related mortality in the pelagic driftnet was (CV in parentheses) 0.7 (7.0) in 1989; 1.7 (2.65) in 1990; 0.7 (2.00) in 1991; 0.4 (1.25) in 1992; and 1.5 (0.45) in 1993. The 1989-1993 average estimated annual fishery-related mortality in the U.S. Atlantic EEZ was 1.0 humpback whales (CV=3.10).

The size of this stock is considered to be low relative to OSP and this species is listed as endangered under the ESA. There are insufficient data to determine the population trends for humpback whales. The annual rate of population increase was estimated at 9%, but the lower 95% confidence level was less than zero. This is a strategic stock because the humpback whale is listed as an endangered species under the ESA.

3. Sperm Whale

Sperm whales have a year-around occurrence in shelf-edge and oceanic waters off the U.S. Atlantic coast Exclusive Economic Zone (EEZ). Their oceanic distribution is commonly associated with Gulf Stream features. In summer and autumn, sperm whales also occur in continental shelf waters (inshore of the 100m isobath) off the New England coast. Sperm whales that occur off the eastern U.S. EEZ likely represent only a fraction of the total stock, perhaps at a lateral periphery of the entire range. Geographic distribution of sperm whales may be linked to their social structure and their low reproductive rate, and both of these factors have management implications.

The calculated minimum population for sperm whales is 226, and the PBR is 0.5. The total number of sperm whales off the U.S. or Canadian Atlantic coasts is unknown. A minimum population estimate of abundance was based on an autumn 1991 aerial survey population estimate of 337 sperm whales (CV = 0.50). The minimum estimate of 226 is the lower limit of the 60% confidence interval of the log-normal distributed abundance estimate. The PBR of 0.5 was specified as the product of the minimum population size (226), one-half of the maximum productivity rate (0.02), and a recovery factor of (0.10) for endangered species.

Between 1989 and 1993, one sperm whale was entangled in the driftnet fishery, and was released showing signs of injury in shelf-edge waters on southern Georges Bank. Total annual estimated average fishery-related mortality and serious injury

to this stock in the U.S. Atlantic EEZ during 1989-1993 was 1.6 sperm whales (CV = 2.72). This estimate is greater than 10% of the PBR.

The status of this stock relative to optimum sustainable population (OSP) is unknown, but the species is listed as endangered under the Endangered Species Act (ESA). There are insufficient data to determine population trends, and the abundance estimates were based upon a small portion of the known stock range within the U.S. EEZ. This is a strategic stock because it is listed under the ESA and estimated annual fishery-related mortality and serious injury exceeds PBR.

4. Beaked Whales [4]

Within the genus *Mesoplodon*, there are four species of beaked whales in the northwest Atlantic. These include True's beaked whale (*Mesoplodon mirus);* Gervais' beaked whale (*M. europaeus);* Blainville's beaked whale (*M. densirostris);* and Sowerby's beaked whale (*M. bidens).* Stock boundaries, social structure, and life history information are unknown for these species. It is difficult to identify species of beaked whales at sea, therefore much of the information for beaked whales refers to four whale species.

True's beaked whale is a temperate-water species that has been reported from Cape Breton Island, Nova Scotia, to the Bahamas. It is considered rare in Canadian waters.

Gervais' beaked whales are believed to be principally oceanic, and stranding have been reported from the mid-Atlantic bight to Florida, into the Caribbean, and the Gulf of Mexico. This is the most common species of *Mesoplodon* stranded along the U.S. Atlantic coast. The northernmost stranding was off New York.

Blainville's beaked whales have been reported from southwestern Nova Scotia to Florida, and are believed to be widely, but sparsely distributed in tropical to warm-temperate waters. There are two records of stranding in Nova Scotia, which probably represent strays from the Gulf Stream. They are considered rare in Canadian waters.

Sowerby's beaked whales have been reported from New England waters north to the ice pack, and individuals are seen along the Newfoundland coast in summer. A single stranding occurred off the Florida west coast. This species is considered rare in Canadian waters.

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4 Nearly all of the text contained in the individual stock assessment report for *Mesoplodon* species is identical, therefore for this report only one summary is provided. However, it is important to note that this summary provides only very limited information about four separate species.

The distribution of *Mesoplodon* off the U.S. Atlantic coast is known principally from both data collected during spring and summer sighting surveys and bycatch in the pelagic driftnet fishery. These data indicate that beaked whales occur in shelf-edge and oceanic waters, and are associated with Gulf Stream features.

The total number of beaked whales (*Mesoplodon* spp.) along the eastern U.S. or Canadian coasts is unknown, and the PBR cannot be estimated at this time because the minimum population size cannot be determined. A minimum estimate of abundance was not derived because 1990-1994 abundance estimates were based on small sample sizes, were not dive-time corrected, and most sightings could not be identified to species. Given that *Mesoplodon* prefers deep water habitats, abundance estimates that are uncorrected for dive-time are likely negatively biased and probably underestimate actual abundance.

Between 1989 and 1993, twenty-two fishery-related mortalities were observed in the pelagic driftnet fishery. Because of the uncertainty of species identification, the Atlantic Scientific Review Group (ASRG) advised adopting the risk-averse strategy of assuming that any beaked whale stock which occurred in the U.S. Atlantic EEZ might have been subject to the observed fishery-related mortality and serious injury. The estimated annual fishery-related mortality (CV in parentheses) was 60 in 1989 (0.49), 76 in 1990 (0.56), 13 in 1991 (0.57), 9.7 in 1992 (0.53), and 12 in 1993 (0.32). The 1989-1993 average estimated annual fishery-related mortality of beaked whales was 34 (0.69).

The status of the *Mesoplodon* spp. stocks relative to OSP in U.S. Atlantic EEZ waters are unknown. There are insufficient data to determine population trends, and the level of fishery-induced mortality and serious injury is unknown because of uncertainty regarding species identification in observed fisheries. If one were to assume that the incidental fisheries mortality of the four *Mesoplodon* spp. and Cuvier's beaked whale (see below) was random with respect to species (i.e., in proportion to their relative abundance), then the minimum population estimate for all of those stocks would need to sum to at least 3,400 in order for an annual mortality of 34 animals not to exceed the PBR of any one of these species. Because an assumption of unselective incidental fishing mortality is probably overly optimistic and represents a best case situation, it is likely that a combined minimum population estimate of substantially greater than 3,400 would be necessary for an annual mortality of 34 to not exceed the PBR of any one of these five stocks. The four *Mesoplodon* stocks are strategic stocks because of uncertainty regarding stock size and evidence of fishery-related mortality and serious injury.

5. Cuvier's Beaked Whale

The distribution of Cuvier's beaked whales is known principally from stranding data. Strandings have been reported from Nova Scotia to the Gulf of Mexico, and

within the Caribbean. Off the U.S. Atlantic coast EEZ, sightings have occurred principally along the shelf edge and in oceanic waters, from Cape Hatteras to the Hague Line.

The total number of Cuvier's beaked whales off the eastern U.S. coast is unknown, and there are no seasonal abundance estimates. The PBR cannot be estimated at this time because the minimum population size cannot be determined.

Beaked whales (many unidentified as to species) have been killed in the pelagic driftnet fishery off the U.S. Atlantic coast. There have been no observed takes in other shelf-edge fisheries (i.e., pelagic pair-trawl and long line).

The status of Cuvier's beaked whale relative to OSP in U.S. Atlantic coast waters is unknown. This stock is a strategic stock because of uncertainty regarding stock size and evidence of fishery-related mortality and serious injury (see *Mesoplodon* section above).

6. Pilot Whale [5]

There are two species of pilot whales in the Western Atlantic, the Atlantic or long-finned pilot whale (*Globicephala melas*), and the short-finned pilot whale (*G. macrorhynchus*). These species are difficult to identify at sea; therefore, some of the descriptive material below, particularly fishery-interaction, refers to *Globicephala* spp. The species boundary for the two species is considered to be the New Jersey to Cape Hatteras area. Sightings north of this area are likely to be long-finned; sightings south of this area are likely to be short-finned pilot whales.

Pilot whales (*Globicephala* spp.) are distributed principally along the continental shelf edge in the winter and spring off the northeast U.S. coast. In late spring, pilot whales move onto Georges Bank and into the Gulf of Maine and more northern waters, and remain there through the autumn. In general pilot whales tend to occupy habitats with complex topography.

The long-finned pilot whale is distributed from North Carolina to Iceland, and possibly to the Baltic Sea. The stock structure of the North Atlantic population is currently unknown, however several genetic studies are underway.

The short-finned pilot whale is distributed worldwide in tropical to temperate waters. The northern extent of the range of this species within the U.S. Atlantic EEZ is generally thought to be Cape Hatteras, North Carolina. Sightings of these animals in U.S. waters occur primarily within the Gulf Stream, and primarily along the continental shelf and slope in the northern Gulf of Mexico.

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[5] This summary provides information about two separate species.

The calculated minimum population of long-finned pilot whales is 3,537 and the PBR is 28. The total number of pilot whales off the U.S. and Canadian Atlantic coasts is unknown. A minimum population estimate of abundance was based on an autumn 1991 aerial survey population estimate of 5,377 long-finned pilot whales (CV = 0.53). The minimum estimate is the lower limit of the 60% confidence interval of the log-normal distributed abundance estimate, and was 3,537 long-finned pilot whales.

The PBR of 28 is specified as the product of the minimum population size (3,537), one-half the maximum productivity rate (0.02), and a recovery factor of (0.40). The recovery factor was set at 0.40 because of the high variance associated with the estimate of total annual fishery-related mortality and serious injury for *Globicephala* spp.

The calculated minimum population for short-finned pilot whales is 457, and the PBR is 3.7. The total number of short-finned pilot whales off the U.S. Atlantic coast is unknown. An estimate of abundance, based on a winter 1992 vessel survey between Cape Hatteras, North Carolina and Miami, Florida, was 749 short-finned pilot whales (CV = 0.64). The minimum estimate is the lower limit of the 60% confidence interval of the log-normal distributed abundance estimate, and was 457 short-finned pilot whales.

The PBR of 3.7 was specified as the product of the minimum population size (457), one-half the maximum productivity rate (0.02), and a recovery factor of (0.40). The recovery factor was set at 0.40 because of the high variance associated with the estimate of total annual fishery-related mortality and serious injury for *Globicephala* spp.

Between 1989 and 1993, forty-two pilot whale (*Globicephala* spp.) mortalities were observed in the pelagic driftnet fishery. Six animals were released alive but one was injured. Annual mortality in the driftnet fishery (CV in parentheses) was 77 in 1989 (1.1), 132 in 1990 (0.59), 30 in 1991 (0.76), 33 in 1992 (0.29), and 31 in 1993 (0.34); average annual mortality between 1989-1993 was 61 pilot whales (0.87).

The pelagic pair trawl fishery started in 1991. Five pilot whale mortalities were reported from logbook entries in 1993, but no fishery-related mortality or serious injury was reported by observers.

According to observer data, twenty-four animals were released alive in the longline fishery, but two were injured. One mortality was observed in 1992. January-March marine mammal interactions were concentrated on the continental shelf edge northeast of Cape Hatteras. Marine mammal interactions were recorded in this area, and north of Hydrographer Canyon during April-June. During the July-September period, interactions occurred on the continental shelf edge east of Cape

Charles, Virginia, and on Block Canyon slope in over 100 fathoms of water. The vast majority of longline/marine mammal interactions occur, throughout the year, in the Mid-Atlantic and southern New England areas. The estimated fishery-related mortality to pilot whales in the U.S. Atlantic attributable to this fishery occurred in 1992 and was 22 (CV = 0.23); average annual mortality between 1992-1993 was 11 pilot whales (0.33).

The total estimated fishery-related mortality and serious injury of pilot whales from NMFS-observed fisheries, the sum of annual mortality estimates across the pelagic longline, driftnet, and groundfish trawl fisheries, was 109 pilot whales (CV = 0.90).

The status of long-finned pilot whales relative to OSP in U.S. Atlantic coast waters is unknown, but stock abundance may have been affected by reduction in foreign fishing, and curtailment of the Newfoundland drive fishery for pilot whales in 1971. There are insufficient data to determine the population trend for this species. The total level of human-caused mortality and serious injury is believed to be significant based on current data. This is a strategic stock because the 1989-93 estimated average annual fishery-related mortality to pilot whales, *Globicephala* spp., exceeds PBR.

The status of short-finned pilot whales relative to OSP in U.S. Atlantic coast waters is unknown. There are insufficient data to determine the population trends for this stock. This is a strategic stock because the 1989-93 estimated average annual fishery-related mortality to pilot whales, *Globicephala* spp., exceeds PBR.

7. Common Dolphin

In the Atlantic, common dolphins appear to be present along the coast over the continental shelf along the 200-300 m isobaths or over prominent underwater topography from 50°N to 40°S latitude. The species is less common south of Cape Hatteras, although schools have been reported as far south as Florida. Recent research suggests there may be two species of common dolphins.

Common dolphins are distributed in broad bands along the continental slope (100 to 2,000 m), and are associated with Gulf Stream features in waters off the northeastern U.S. coast. They are widespread from Cape Hatteras northeast to Georges Bank in outer continental shelf waters from mid-January to May. Common dolphins move northward onto Georges Bank and the Scotian Shelf from mid-summer to autumn.

The calculated minimum population of common dolphins is 3,233 and the PBR is 32. The total number of common dolphins off the eastern U.S. and Canadian Atlantic coast is unknown. The minimum population estimate was based on the 1991 shipboard survey abundance estimate of 4,984 common dolphins (CV = 0.55). The minimum estimate is the lower limit of the 60% confidence interval of the log-

normal distributed abundance estimate. The PBR of 32 was specified as the product of the minimum population size (3,233), one-half the maximum productivity rate (0.02), and a recovery factor of (0.50).

Between 1989-1993, 307 common dolphin mortalities were observed in the driftnet fishery. Mortalities were observed in all seasons and areas. Five animals were released alive, but four were injured. Estimated annual mortality and serious injury attributable to this fishery (CV in parentheses) was 540 in 1989 (0.55), 893 in 1990 (0.40), 223 in 1991 (0.36), 227 in 1992 (0.20), and 238 in 1993 (0.16); average annual estimated fishery-related mortality during 1989-1993 attributable to this fishery was 424 common dolphins (0.50).

In the pair trawl fishery, nine mortalities were observed between 1991 and 1993. The estimated annual fishery-related mortality and serious injury attributable to this fishery was 5.6 in 1991 (0.53), 32 in 1992 (0.48), and 35 in 1993 (0.43). Average annual estimated fishery-related mortality during 1991-1993 was 24 common dolphins (0.52).

There was no reported fishery-related mortality or serious injury attributable to the longline fishery.

The status of common dolphins relative to OSP in U.S. Atlantic coast waters is unknown. There are insufficient data to determine the population trends for this stock. This is a strategic stock because the 1989-93 estimated average annual fishery-related mortality exceeds PBR.

8. Bottlenose Dolphin

There are two distinct forms (coastal and offshore) of bottlenose dolphin in the western North Atlantic, which may be separate species. The offshore large pelagic fisheries (driftnet, longline, and pair trawl) are believed to only interact with the offshore stock. Therefore, only summary data for that stock is presented.

Off the northeast U.S. coast, the offshore stock is concentrated along the continental shelf break and extends beyond the continental shelf into continental slope water in lower concentration. There are no distribution data available for this stock in U.S. EEZ waters south of Cape Hatteras.

The calculated minimum population for bottlenose dolphins is 9,195 and the PBR is 92. The total number of bottlenose dolphins off the Atlantic U.S. coast is unknown. The minimum population estimate of abundance was based on an autumn 1991 aerial survey population estimate of 12,194 bottlenose dolphins (CV = 0.35). The minimum estimate is the lower limit of the 60% confidence interval of the log-

normal distributed abundance estimate. The PBR of 92 was specified as the product of the minimum population size (9,195), one-half of the maximum productivity rate (0.02), and a recovery factor of 0.50.

Between 1989-1993, 39 bottlenose dolphin mortalities were observed in the driftnet fishery. Estimated bottlenose dolphin kills (CV in parentheses) extrapolated for each year were 72 in 1989 (0.59), 115 in 1990 (0.42), 26 in 1991 (0.44), 28 in 1992 (0.21), and 22 in 1993 (0.25). Mean annual estimated fishery-related mortality for this fishery in 1989-1993 was 53 bottlenose dolphins (CV = 0.56).

Twenty-one bottlenose dolphin mortalities have been observed between 1991 and 1993 in the pair trawl fishery. Estimated annual fishery-related mortality was 13 dolphins in 1991 (0.53), 73 in 1992 (0.49), and 85 in 1993 (0.41). The estimated mean annual bottlenose dolphin mortality attributable to this fishery is 57 (CV = 0.51). One bottlenose dolphin mortality was documented in 1991 for the New England multi-species trawl fishery, a Category III fishery. The average fishery-related mortality attributable to this fishery between 1989-1993 was 18 bottlenose dolphins (CV = 2.17).

There have been no reported lethal takes by the longline fishery recently, but one bottlenose dolphin was taken and released alive in 1993 in offshore waters outside of the U.S. EEZ.

The status of this stock relative to OSP is unknown. This stock is a strategic stock because estimated annual fishery-related mortality and serious injury exceeds PBR. There are insufficient data to determine population trends for this species.

9. Spotted Dolphin[6]

There are two species of spotted dolphin in the Western Atlantic, the Atlantic spotted dolphin (*Stenella frontalis*), and the pantropical spotted dolphin (*S. attenuata*). The Atlantic spotted dolphin and the pantropical spotted dolphin are difficult to differentiate at sea.

Atlantic spotted dolphins are distributed in tropical and warm temperate waters of the western North Atlantic. Their distribution is from southern New England, south through the Gulf of Mexico and the Caribbean to Venezuela. Atlantic spotted dolphins are generally distributed on the continental shelf inside the 200m isobath

6 Nearly all of the text contained in the individual stock assessment report for two species of spotted dolphin is identical, therefore for this report only one summary is provided. However, it is important to note that this summary provides only very limited information about two separate species.

along the southeastern and Gulf coasts of the United States. Off the northeast U.S. coast, spotted dolphins are widely distributed on the continental shelf and shelf-edge, and offshore over the deep ocean south of 40°N. They regularly occur in the inshore waters south of Chesapeake Bay, and have also been sighted near Gulf Stream features.

The pantropical spotted dolphin is distributed worldwide in tropical and some sub-tropical waters. This species has been sighted in the northern Gulf of Mexico over the deeper oceanic waters and rarely over the continental shelf. Pantropical spotted dolphins were seen in all seasons during aerial surveys in the Gulf of Mexico, and off the southeastern U.S. coast during a recent winter survey.

The calculated minimum population of spotted dolphins is 4,885. No PBR was calculated because of the difficulty in identifying each species. The total number of spotted dolphins off the eastern U.S. coast is unknown. The minimum population estimate of abundance was based on the CETAP (1982) abundance estimate of 6,107 (CV = 0.27) spotted dolphins. The minimum estimate is the lower limit of the 60% confidence interval of the log-normal distributed abundance estimate.

Between 1989 and 1993, 19 spotted dolphin mortalities were observed in the driftnet fishery, and occurred northeast of Cape Hatteras within the 200 m isobath in February-April and near Lydonia Canyon in October. Estimated annual mortality and serious injury attributable to this fishery (CV in parentheses) was 23 in 1989 (2.14), 51 in 1990 (1.12), 11 in 1991 (1.21), 20 in 1992 (0.35), and 8.4 in 1993 (0.79).

Interactions between the longline fishery and spotted dolphins have been reported in observer and logbook data. There was no mortality or serious injury reported in 1992, and estimated fishery-related mortality and serious injury to spotted dolphins (both species) in the 1993 fishery was 16 (CV = 0.19); average annual mortality and serious injury attributable to this fishery in 1992-93 was 8.0 spotted dolphins (0.27).

There were no reports of mortality or serious injury in the pair trawl fishery.

The status of spotted dolphin (both species), relative to OSP in the U.S. Atlantic EEZ is unknown. Both stocks are strategic because the average annual fishery-related mortality and serious injury of spotted dolphins would exceed PBR, even if the minimum population estimate for spotted dolphins were exclusively for Atlantic or pantropical spotted dolphin.

III. DESCRIPTION OF THE FISHERIES

A. Pair Trawl for Tuna

1. Description

Pair trawling for tuna involves the deployment, towing, and retrieval of a large-mesh net between two trawlers. The trawl nets used for this fishery are unusual due to their large mesh size (3.2 to 20 meters) and large overall dimensions (300 to 1200 meter circumference). In addition, unlike most trawls, these designs cannot be towed in contact with the seabed. It is a night-time fishery with tows typically 3 to 5 hours in duration.

2. History

In 1969, midwater pair trawling was first introduced in the Northwest Atlantic when it was used in the Gulf of Maine on herring. Since that time the method has come in and out of favor depending on the market for schooling pelagics. In 1991, the technique was first used on large pelagic fish when two vessels successfully paired to target swordfish. This led to participation in the fishery by several other pairs. On December 13, 1991, NMFS decided to restrict the fishery to longline, harpoon, and driftnet gear, with an exception for experimental fisheries permits.

During its first season, the participants learned that they could catch tuna effectively, and for the 1992 season eleven vessels engaged in a directed fishery on bigeye, albacore, and yellowfin tuna. All vessels operated out of southern New England. The season started in July and ended in October. Initially, the trawl nets used for this fishery were from the earlier fisheries on herring, butterfish, or *Illex* squid. By the 1992 season, all the vessels were using nets designed specifically for large pelagic fisheries. These nets are towed at speeds ranging from 2.5 to 5.0 knots. When the trawl is fully deployed, tow wire lengths can vary from 200 to 300 meters and vessel separation ranges from 150 to 200 meters. Flotation or headrope kites in combination with weights on the lower wing ends provide the vertical gape. The typical design opening for these nets is 30 meters in height and 40 meters in width.

In August 1993, NMFS published a final rule for Atlantic tunas that authorized certain types of gear and prohibited the use of non-authorized gear, including pair trawl, except under an experimental fisheries permit. As a result, an experimental fishery was organized to gather information and better characterize this method of fishing for Atlantic tunas. Eleven vessels participated, however, insufficient observer coverage and inadequate detail in reporting weakened the effort. The 1993 season was considered by some of the participants to be unusual with respect to catch levels. Uncertainties over whether the fishery was to be allowed resulted in

late gearing up by participants. In addition, some pairs quit the season early because of unprofitability.

In 1994 and 1995, an experimental fishery was organized and run by the MIT Sea Grant Center for Fisheries Engineering Research. The goals of the experiment were to determine the species and size selectivity of the gear and method, correlate catch and bycatch levels with fishing parameters, and identify methods to reduce the bycatch of marine mammals, turtles, and undersize tunas. As part of these experiments, protocols were established and demonstrated to reduce bycatch levels and the overall selectivity of the gear (Goudey 1995, Goudey 1996). Most important was the imposition of a minimum headrope depth at five fathoms designed to avoid any near-surface marine mammals. Acoustic netsounder equipment is required to be installed on the trawl to provide operators with real-time data on the position of the headrope with respect to the sea surface. In addition, time-criteria (15 minutes) were established for the time the headrope could be at the surface during setting and hauling. Vessels developed practices aimed at closing the width of the net and keeping it deep during those times. A maximum tow duration of six hours was also imposed to increase the viability of released bycatch. Extensive data taking and the use of NMFS observers yielded a great deal of information on this fishery.

The pair trawl for tuna was an experimental fishery in 1993, 1994, and 1995. Eleven vessels participated in the 1994 experiment, working in five pairs (one vessel used an alternate vessel for one of the trips) for a total of 28 paired trips. During that season, 369 tows were made. A second experimental fishery, organized by MIT Sea Grant for the 1995 season, operated under the same protocol developed for the previous season. Twelve vessels participated in this experiment making 33 paired trips for a total of 420 tows.

In September 1996, NMFS denied the pair trawl fishery authorization as an allowable gear for tuna. This decision was reportedly based on overexploitation of the target species, bigeye tuna.

B. Swordfish Driftnet Fishery

1. Description

The driftnet fishery is managed under the Swordfish Management Plan and operates outside the 100 fathom curve from the Hague Line to Cape Hatteras. It includes 16 active vessels. In 1991, regulations created a split season of January to June and July to December. The Total Allowable Catch for swordfish in 1995 was approximately 60,000 lbs. for the first season and 60,000 lbs. plus any carryover from the first season for the second season. The summer season is a derby fishery, which

means that as soon as the quota is caught, NMFS calls all the vessels back to port. This season typically lasts ten days to two weeks.

The driftnet is an entanglement net. Most boats use twenty to twenty-two inch webbing, sixty to seventy meshes deep, and one-and-a-half miles long as required under federal regulations. The gear is deployed at sunset and suspended below the surface eighteen to thirty feet with poly ball floats spaced approximately 125 feet apart. The set is made setting downwind with the boat laying on the downwind end and staying attached to the net at all times. The gear is retrieved in the morning. Only one set is made nightly.

2. History

The Atlantic Large Pelagic Driftnet Fishery started during the summer of 1980, when three boats from the West Coast started fishing in the Atlantic. The fishery took place from the southeast part of Georges Bank, east to the Northeast Peak. The gear used at that time was fourteen to eighteen-inch mesh. The Hague Decision of 1985 established a boundary line between U.S. and Canadian waters off the east coast of North America. After this decision, two of the three West Coast boats left the New England swordfish driftnet fishery.

By 1988, there were four boats driftnetting off New England; one original West coast boat and three New England boats. By 1990, there were twenty-two boats fishing with driftnet gear off the southern New England coast. Many of these boats were displaced harpoon swordfishermen. When NMFS reduced the swordfish quota in 1991, the fishery was reduced to fifteen active boats. In the years since 1991, there have been between ten and fourteen boats that seasonally fish with driftnets for swordfish.

The driftnet fishery is primarily a seasonal fishery with most of the effort starting in mid-June and running into July. The fishery is conducted east of Hudson Canyon to the Hague Line, with most of the effort from Veatches Canyon east. There is also a winter fishery that is conducted east of Cape Hatteras, beginning January first, when the first half of the driftnet quota starts. Generally, one to three boats have participated in the winter fishery.

C. U.S. Pelagic Longline Fishery

1. Description

A pelagic longline consists of a continuous mainline, suspended in the water by a series of floats, with regularly-spaced leaders attached that end with baited hooks. The style of gear in general use today consists of diameters of monofilament ranging

from 3.0 to 4.0 mm for the mainline, and 1.8 to 2.2 mm for the float lines and hook leaders. This "American" style was developed to reduce drag and visibility. Float lines and leader lengths were increased to maximize fishing depths. According to the Blue Water Fishermen's Association, the average longline is typically 30-35 miles, but can exceed 40 miles depending on individual vessel capabilities. Hook depth can range from just below the surface to 90-140 fathoms (540-840 feet), depending upon the distance between hooks creating a variable dip in the line controlled by the distance between floats and the vessel's gear setting technique. American fishermen have generally concentrated their hooks from 5 to 60 fathoms (30-360 feet). The average distance between hooks is approximately 300 feet. The US fleet has evolved to use ever lighter longline materials.

Fishing effort is focused on "edges of water" (identified by differences in currents, water temperature, color, and density) where targeted pelagic species aggregate. These naturally-occurring differences in water masses are generally found between the continental shelf and offshore slope waters.

Longline effort is reported in hooks and numbers of sets by vessel. According to different NMFS data sets, in 1994, the total number of longline boats was in the range of 282 - 495; the total number of hooks was between 8,892,526 and 10,252,000; and the total number of sets was in the range of 14,500 - 16,485. This includes vessels and hooks for all locations considered part of the pelagic longline fishery: Caribbean, Gulf of Mexico, Florida East Coast, South Atlantic Bight, Mid-Atlantic Bight, Northeast Coastal, Northeast Distant, North Equatorial, and Other.

The U.S. Pelagic Longline Fishery is comprised of five distinct fishery segments. These fisheries operate year-round throughout the Northwest Atlantic, as far east as the Mid-Atlantic Ridge and as far south as South America. Each component of the fishery is comprised of small, medium, and large vessels. Each vessel has different range capabilities due to fuel capacity, hold capacity due to vessel size and layout, and seasonal vs. year-round operations. Segments of the fishery are characterized by their differences in target catch, gear characteristics, bait, style, and deployment techniques.

The five fishery segments are briefly described below:

The Gulf of Mexico Yellowfin Tuna Fishery: These vessels primarily target yellowfin tuna year-round; however, each port has one to three vessels that direct effort to swordfish either seasonally or on a year-round basis. Many of these vessels participate in other Gulf of Mexico fisheries during allowed seasons, including shrimping, shark, snapper, and grouper.

The South Atlantic — Florida East Coast to Cape Hatteras Swordfish Fishery: These pelagic longline vessels primarily target swordfish year-round. Smaller vessels fish in the Straits of Florida up to the bend in the Gulf Stream off Charleston, South

Carolina. Mid-sized and larger vessels migrate seasonally from the Yucatan to the West Indies and Caribbean Sea and sometimes as far north along the U.S. East coast as the Mid-Atlantic to target bigeye tuna and swordfish during the late summer and autumn.

The Mid-Atlantic and New England Swordfish and Bigeye Tuna Fishery: This fishery has evolved during recent years to almost year-round directed tuna trips. However, depending upon a vessel's berth on the water edges during a trip, substantial numbers and weight of swordfish are produced year-round. Some vessels participate in the directed bigeye/yellowfin tuna fishery during the summer and fall months then switch to bottom longline fisheries and/or shark fishing during open winter seasons.

The U.S. Atlantic Distant Water Swordfish Fishery: This fleet's fishing grounds range virtually the entire span of the Western North Atlantic to as far east as the Azores and the Mid-Atlantic Ridge. Vessels operate out of Mid-Atlantic and New England ports during the summer and fall months, with many vessels moving to Caribbean ports during the winter and spring months. Historically, many of the current distant water operators were among the early participants who began the U.S. directed Atlantic Swordfish industry. These are larger vessels with greater ranges and capacities than the coastal fishery.

The Caribbean Island Tuna and Swordfish Fishery: This fleet is similar to the Southeast coastal fisheries in that both are primarily smaller vessels making short trips relatively near-shore. This fishery is typical of most pelagic fisheries, being truly a multi-species catch with swordfish as a substantial portion of the total catch. Directed tuna trips land a substantial number of swordfish.

Data provided to the AOCTRT from 2,695 observed pelagic longline sets document that 97.1% of sets had no marine mammal interactions. Of the 2.9% of sets (77) with observed marine mammal interactions, 82 of the 85 observed animals involved (96.4%) were documented to have been released alive.

2. History

For centuries in Europe, fishermen used baited hooks attached to mainline coiled in wooden tubs as hand-gear to harvest such bottom species as codfish. The Europeans brought this method of harvest to the New World. Asian fisheries expanded upon this commercial method by using glass balls to float the gear, in order to target pelagic species. Since that time, baited hooks and various types of floats attached to a longline have evolved into the primary worldwide method to commercially harvest large pelagic fish, such as swordfish, tunas, billfish, and sharks.

Although some pelagic longlining occurred earlier, the US fishery developed in earnest during the early 1960s and continuously expanded into the late 1980s. Since that time, the number of boats has generally declined, although the number of hooks in use (effort) has fluctuated by year and by area. The success of this fishery, and all others targeting highly migratory species, is affected by Atlantic-wide overfishing of the target species and international conservation measures are necessary to stabilize the fish populations and the fisheries that depend on them.

D. Regulatory/Management Structure

1. Atlantic Swordfish

a. Management for Atlantic Swordfish

The Atlantic swordfish fishery is managed under the Fishery Management Plan for Atlantic Swordfish (FMP) and its implementing regulations at 50 CFR part 630, under authority of the Magnuson Act and Atlantic Tunas Convention Act (ATCA). The FMP was implemented in September 1985. Regulations to govern the Atlantic swordfish fishery also are authorized under ATCA, which directs the Secretary to promulgate such regulations as may be necessary to carry out International Commission for the Conservation of Atlantic Tuna (ICCAT) recommendations.

At the November 1990 meeting of ICCAT, member nations agreed, for the first time, on international measures to reduce fishing mortality on swordfish. These measures included: (1) a prohibition on taking and landing swordfish less than 25 kg, whole weight, with provision for a 15 percent tolerance by number of fish landed per trip for smaller swordfish, and (2) for major fishing nations, a 15 percent reduction in fishing mortality from 1988 levels on fish 25 kg and larger, whole weight. Currently, the U.S. has reduced its landings by 37% since 1989 in response to ICCAT management recommendations.

NMFS implemented these recommendations initially through emergency regulations that included specification of the Total Allowable Catch (TAC), directed-fishery quotas by season and gear type, a bycatch quota, bycatch trip limits, and a minimum size limit (see 56 FR 26934, 56 FR 28349, and 56 FR 29905 for more detailed description). The emergency regulations were effective June 12, 1991 through December 9, 1991. To provide for continued regulation of the fishery after expiration of the emergency regulations, the Secretary issued regulations, compatible with the ICCAT recommendations, under authority of ATCA on December 10, 1991 (56 FR 65007).

b. Quotas for Swordfish

Quotas established in 1991 and 1992 in response to ICCAT recommendations, 6.9 million pounds and 7.56 million pounds, respectively, were primarily responsible for reductions in swordfish landings. Approximately 98 percent of the directed-fishery quota is allocated to the longline and harpoon fisheries, and 2 percent is allocated to the driftnet fishery. Pair trawlers are not allowed to target swordfish but do capture them at a bycatch rate of less than one per set. A two swordfish per boat per trip limit is in place. Reported landings in 1992 and 1993 have been below the TAC by 15 to 17 percent; preliminary landings information for 1994 indicates landings will likely be below TAC by a similar or greater amount. While the 1995 TAC adopted in the final rule was higher than estimated landings for 1994, NMFS closed the directed longline fishery on October 31, 1995, the first such premature closure. The 1996-97 TAC may also result in early closure of the fishery.

2. U.S. Atlantic Tuna

Regulations governing the conduct of the U.S. Atlantic tuna fisheries are currently under the authority of the Atlantic Tunas Convention Act (ATCA) (16 U.S.C. 971 et seq). The ATCA authorizes the Secretary of Commerce to promulgate regulations necessary to carry out the recommendations of ICCAT. Implementing regulations are found at 50 CFR part 285. The Fishery Conservation Amendments of 1990 (FCA), Public Law 101-627, also authorizes management of Atlantic tuna under the Magnuson Fishery Conservation and Management Act (MFCMA or Magnuson Act) (16 U.S.C. 1801 et seq). The Secretary will continue to issue regulations governing the tuna fisheries under the authority of the ATCA until such time as a Fishery Management Plan (FMP) is developed and permanent regulations are issued under the Magnuson Act.

3. Shark Management Structure[7]

In April, 1993, NMFS implemented a Fishery Management Plan (FMP) for sharks. The objectives of the FMP were to:

- prevent overfishing of shark resources;
- encourage management of stocks throughout ranges;
- establish data collection, research and monitoring; and
- increase benefits to US while reducing waste.

The FMP directs the management of 39 shark species in 3 groups; large coastal sharks (22 species), pelagic sharks (10 species) and small coastal sharks (7 species). NMFS regulations require annual permits for shark fishing in the U.S. EEZ, with reports to be submitted by owners/operators of permitted vessels or persons conducting shark tournaments, and placement of observers by NMFS. They also prohibit finning, establish quotas for commercial landings of large coastal and

7 Fishery Management Plan for Sharks of the Atlantic Ocean, NMFS, February 25, 1993.

pelagic sharks, and provide for closures when quotas are reached. There are also trip limits for commercial vessels and recreational bag limits.

a. Species in the Management Unit

The shark management unit consists of 39 species in the western North Atlantic Ocean. The management unit extends across state, Federal, and international jurisdictional boundaries. The species in the management unit were chosen for one or more of the following reasons: 1) they are frequently caught in commercial or recreational fisheries, 2) their low fertility and/or slow growth make them particularly vulnerable to overfishing, and 3) their habits make them vulnerable to indiscriminate killing.

The large coastal shark group is considered overfished and includes: sandbar, blacktip, dusky, spinner, silky, bull, bignose, narrowtooth, Galapagos, night, Caribbean reef, tiger, lemon, sand tiger, bigeye sand tiger, nurse, scalloped hammerhead, great hammerhead, smooth hammerhead, whale, basking, and white sharks. The pelagic shark group is considered fully fished and includes: shortfin mako, longfin mako, porbeagle, thresher, bigeye thresher, blue, ocean whitetip, sevengill, sixgill, and bigeye sixgill sharks. The small coastal shark group is considered fully fished and includes: Atlantic sharpnose, Caribbean sharpnose, finetooth, blacknose, smalltail, bonnethead, and Atlantic angel sharks.

b. Description of User Groups

Sharks, as both food and gamefish, increased in popularity in the 1970s. In recent years, economic changes in Asia broadened the sharkfin market. The increased demand for shark flesh and the high price of their fins encouraged entry into the shark fishery. Fishermen in other fisheries, such as tuna and swordfish, began to retain sharks for their fins, instead of releasing them alive as was previously done. Both directed and nondirected commercial fisheries, as well as recreational anglers, now exploit shark resources.

Users of shark resources may be divided into two broad categories: recreational and commercial. Recreational users are anglers who pursue sharks for sport; this has become popular in the last 15 years. Commercial fishermen, who derive some portion of their income by selling their shark catch, are grouped as those engaged in directed fisheries (targeting sharks), or those involved in indirect fisheries (targeting other species with sharks as bycatch).

c. Directed Fisheries

Commercial fishermen in directed shark fisheries use either longlines or gillnets. Longliners use modified swordfish lines in coastal waters during a long season, often following stocks as they move north or south along the Atlantic coast. The primary species caught by longlines are sandbar, blacktip, bull, bignose, tiger, sand tiger, lemon, spinner, scalloped hammerhead, and great hammerhead sharks.

Gillnet fishing for sharks in the southeast U.S. has existed for many years. These fishermen operate small boats predominantly from May to November when sharks are in shallow water. Some of these estuarine waters, 2-5 meters deep, are nursery areas for many species of sharks.

Gillnet fishermen catch sandbar, blacktip, finetooth, blacknose, bull, spinner, dusky, sharpnose, sand tiger, scalloped hammerhead, and others. Legislation in South Carolina and Georgia and a ballot initiative in Florida essentially terminated the use of commercial gillnets in State waters. This action has forced fishermen into deeper Federal waters where their gillnets are less effective.

d. Indirect Fisheries

Tuna and swordfish longline fisheries catch large numbers of sharks as bycatch. Dominant in the tuna fisheries are blue, porbeagle, hammerhead, and "unidentified" sharks. In the domestic swordfish fishery, mako and thresher dominate, and unidentified sharks are the major species recorded in logbooks. These unidentified sharks are probably bignose, dusky, silky, and night sharks. Other fisheries also take sharks as bycatch in the summer months. Shallow-water shrimp trawls catch large quantities of Atlantic sharpnose sharks and the juveniles of several species. Shrimping is common in areas that serve as nurseries, and many newborn sharks are caught at this time. Gillnet vessels in the New England multi-species fishery catch and land sharks during the summer and early fall, with porbeagle and mako the dominant species.

E. Foreign and other Domestic Fisheries that Interact with Atlantic Offshore Cetaceans

1. Domestic Fisheries and Related-Activities

The AOCTRT has little information on the extent of known interactions of strategic stocks of Atlantic Offshore Cetaceans with other domestic fisheries and related activities. US Department of Commerce documents, including the *US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments,* NOAA Technical Memorandum #363, review available information regarding interactions with each marine mammal species.

The AOCTRT recommends that, with respect to strategic stocks, NMFS should consider the extent of, or lack of, definitive information on these interactions when it assigns observer coverage and/or develops monitoring and reporting programs. The potential for other domestic fisheries to interact with Atlantic Offshore Cetaceans should also be recognized and monitored. Finally, the AOCTRT recommends that vessel traffic and other sources of human-related mortality be monitored and reduced along with fishery-related mortality.

2. Foreign Fisheries

The AOCTRT has little current information on the fisheries of Canada, Mexico, the Caribbean Islands, Central and South America, or foreign high-seas distant water fisheries that interact with the Atlantic Cetacean strategic stocks impacted by this plan. NMFS should attempt to obtain information on these interactions and the degree to which these international fisheries interact with strategic Atlantic Offshore Cetaceans.

IV. RESEARCH AND DATA RECOMMENDATIONS

A. Calculating Minimum Population Estimates

1. Background

The Atlantic Offshore Cetaceans Take Reduction Team (AOCTRT) has been charged with drafting a Take Reduction Plan that will reduce the serious injury and mortality of affected marine mammal stocks in the large-pelagics fisheries to below PBR within six months of implementation. One of the difficulties faced by the Team is that the current abundance estimates for several stocks are in all probability substantially lower than the actual stock sizes. Reasons for these discrepancies include surveys which did not cover the entire range of a particular stock, surveys restricted in time so as to miss the season(s) of maximum abundance, and stochastic factors related to the typically patchy spatial distributions of cetaceans.

The stock with the most dramatic difference between the current estimate of stock size (N-best) in the 1995 Stock Assessment Reports (Blaylock et al., 1995) and other available estimates is common dolphin *(Delphinus delphis)*. It is not likely that the difference is due primarily to lack of geographic overlap between common dolphin distributions and the recent NMFS surveys. Those surveys seem to have fairly well covered the known summer habitats of common dolphins (CETAP, 1982; Selzer and Payne, 1988). The primary difficulty is lack of temporal agreement between survey coverage and the time of maximum common dolphin abundance. Common dolphins' pattern of occupancy on the northeast shelf is opposite all of the other cetaceans - least abundant in the summer and most abundant in fall and winter (Table 8).

Table 8: Summarized seasonal common dolphin *(Delphinus delphis)* abundance estimates off the northeast U.S. from several sources.

Source	Winter	Spring	Summer	Fall
CETAP, 1982	31,124	17,259	2,884	24,828
Kenney et al., 1985	36,400	25,800	7,300	27,200
Blaylock et al., 1995	--	--	4,984	
Kenney et al., 1995	45,103	19,078	4,201	30,665

The estimates in Blaylock et al. (1995) are based on the most recent NMFS surveys, and are the basis for the calculation of N-min = 3,233 and PBR = 32. All three of the other sets of estimates are based on the same survey data - the CETAP aerial surveys from 1979 through 1981 - using somewhat different methods of pooling surveys and calculating three-year average abundances. Kenney et al. (1995) assigned a proportion of all of the unidentified dolphin sightings to *Delphinus*. Despite the differences in methods, and the gap of a decade between the CETAP and NMFS surveys, all of the summer estimates are within the same order of magnitude.

However, there are no current abundance estimates for fall, winter, and spring. The CETAP data, regardless of analytical method, show that all three seasons have higher common dolphin abundance than in summer, by a factor of more than ten times in the winter. But the fisheries which are presently taking common dolphins are not similarly restricted to the summer. Another factor which makes the discrepancy between the estimated N-min and the actual population size more obvious is that fishers working in common dolphin habitats sometimes report encountering single herds of animals which they believe contain more dolphins than the estimated N-min. Such herds are possible, since *Delphinus* is known to occur in very large groups at times. CETAP observers reported herds of up to 2,000 (CETAP, 1982), and Selzer and Payne (1988) reported herds of over 3,000 on Georges Bank in the fall. In other areas, herds of over 10,000 have been reported (Jefferson et al., 1994). (The high variability of herd size in *Delphinus* compared to other dolphin species has the effect of increasing the C.V. of abundance estimates, making N-min a smaller fraction of N-best than in other dolphins and further exacerbating the problem of a small N-min based on only summer surveys).

2. Recommendations

Given the presumption that the abundance of common dolphins off the northeast U.S. is substantially greater than the current estimates of either N-min or N- best based on summer surveys, and the fact that fisheries incidentally taking common dolphins operate in other seasons than summer, the AOCTRT offers the following three recommendations.

1. The AOCTRT recommends that NMFS conduct surveys to estimate cetacean stock abundances in seasons other than summer. The ideal solution would be to conduct one full year of intensive aerial and/or shipboard surveys, similar to the CETAP survey program. This would be a very costly undertaking, and would likely require an addition to or major reprogramming within the Commerce/NOAA budget. At minimum, surveys should be conducted in each season and area where significant numbers of takes of strategic stocks occur. The common dolphin is the most critical case, where the current NMFS summer surveys occur during the season of minimum abundance. However, other cetacean species, notably pilot whales, are also present in high abundance in some seasons other than summer, and such

surveys would likely produce more realistic estimates of abundance and PBR for those species also. Despite being too old for use in PBR calculations, the CETAP data would be useable in validating relative abundance levels and scaling factors.

2. The fishing industry has expressed some willingness to provide monetary or other contributions toward furthering the take reduction process (e.g. support for increased observer coverage in some fisheries). It could be possible to conduct some abundance survey program with industry financial support. An abundance survey conducted by someone other than NMFS may prove to be extremely valuable since the extensive surveys planned by NMFS for 1997 (which were intended to expand their geographic coverage to better assess offshore cetacean stocks) have now been deferred until 1998 (See also recommendation in section IV.D.). It is unlikely that the industry could support a full-blown survey program as discussed in recommendation (1), however a smaller project would be feasible. This would be particularly true if matching support for portions of the project could be obtained. Such support could include university or other support for portions of the research, foundation or similar matching funds, or federal agency support for the project in the form of matching funds, consulting on survey design, and/or performance of data analysis. NMFS involvement would be absolutely necessary, at minimum, to ensure that the design was compatible with the current NMFS surveys and that the results would be acceptable for inclusion in the stock assessments. To be completely sure about this, detailed survey designs and data collection protocols will be submitted for NMFS review prior to planning or execution of surveys. The AOCTRT recommends that NMFS provide all possible support for any acceptable survey program that industry may develop.

3. In the absence of more extensive stock surveys, we recommend that NMFS explore alternative methods of estimating N-min for pelagic dolphins. The fishermen who have observed large herds of common dolphins would like to have fishery observer log data recording such sightings included in calculating stock abundance. Because of the strict requirements of line-transect survey methods, that would not be possible. However, alternate methods to arrive at N-min are already in use for some stocks where data are available which are more realistic than the 20th percentile of the log-normal distribution around N-best estimated from survey data. The minimum number of right whales in the western North Atlantic stock was estimated from the catalog of photographically identified individual animals (Blaylock et al., 1995). The minimum numbers of pinnipeds in several Pacific stocks were estimated by censuses of animals of all age classes hauled out on breeding beaches or by doubling the count of pups born (Barlow et al., 1995).

NMFS should investigate the feasibility of developing more creative methods of estimating N-min by other than the standard abundance surveys, which would be scientifically acceptable.

B. Observer Coverage

1. Background

All three fisheries covered by the Atlantic Offshore Cetacean Take Reduction Plan have been sampled by a NMFS observer program. For the driftnet fishery, NMFS intends to continue a level of observer coverage approaching 100%. For the pair trawl fishery, observer coverage will be maintained at current levels (if the fishery were to be authorized in the future). However, the longline fishery continues to experience fairly low levels of observer coverage primarily because of the size and scope of the fishery (approximately 350 active participants spread throughout the Atlantic and Gulf of Mexico), funding constraints, and contract logistical constraints.

The sampling design for each fishery has been based on a simple random sampling scheme, i.e., each set has an approximately equal probability of being observed. This has resulted in varying degrees of confidence associated with the mortality/serious injury estimates for each stock of marine mammal. In general, the "confidence" associated with mortality/serious injury estimates is related to the precision of the estimate in representing the actual level of serious injury/mortality occurring in the fishery. Large samples are needed for precise estimates of the total incidental mortality or serious injury for a particular species of marine mammal. Simple random sampling, or any method of sampling that is adapted for general purposes, is an expensive method of estimating the occurrence of rare events.

These sampling methods are also subject to observer effects since fundamental to the reliability of the data is that it is representative of a typical fishing trip. In a fishery where sampling rates are low and vessel fishing locations are diverse, the presence of an observer may have an effect on the fishing practices and on take rates.

However, because the random sampling scheme for the longline fishery has revealed that certain strata (areas and/or seasons) have a higher incidence of a mortality or serious injury than others, it is preferable to adjust the sampling scheme so that a greater percentage of the total sampling effort is focused on that particular stratum, rather than just increase overall observer coverage. Focused sampling of this type is called "stratified random sampling". Theoretically, when coverage rates are proportional to the mortality/serious injury rates, a stratified random sampling scheme will result in greater precision in estimates of those rates.

2. Optimal Allocation of Observer Coverage in the Longline Fishery

In the case of the longline fishery, the mid-Atlantic Bight appears to have the greatest level of observed interactions (70% of the total), and interactions occur primarily in the months from August through November. In order to increase the precision of the mortality/serious injury estimates in the longline fishery, the team recommends that NMFS develop a stratified random sampling scheme that:

1. Places X% of the total available observer coverage, in proportion to the level of mortality/serious injury, in the Mid-Atlantic Bight from September to December (where X relates to the stock of the highest priority) and,
2. Places 100% - X% of the total remaining available observer coverage throughout the rest of the fishery and throughout the rest of the year.

This will ensure the most efficient use of available funds and given its focus on the strata with the highest rates of marine mammal interactions, a move toward an optimal allocation of observer coverage for the longline fishery.

The AOCTRT also recommends that an intra-agency working group, composed of representatives from the NMFS marine mammal program, sea turtle program, highly migratory species program, and the northeast and southeast science centers be convened to develop a stratified sampling scheme that addresses priorities for each program in such a way that the collection of observer data on protected species is optimized relative to marine mammals, turtles, and fish. The team recognized that increasing the precision of mortality/serious injury estimates for marine mammals and/or sea turtles may decrease the precision of data collected for fishery management purposes.

The AOCTRT also recommends increased funding for observer coverage for the longline fishery. [8] Suggested observer coverage should be at least 10% in the mid-Atlantic and Northeast Coastal areas from August through November, and at least 5% in the rest of the fishery.

C. Developing Criteria for Assessing Marine Mammal Injuries

The mortality and injury information derived from current marine mammal interaction documentation should be enhanced by expanding the details reported concerning the circumstances surrounding the interaction, the injury, and the subsequent condition of the mammal. A complete description of the injury would involve any attached gear, wounds, location of the wound, bleeding, and marine mammal behavior upon release.

The Atlantic Offshore Cetaceans Take Reduction Team recommends that the current injury categories on the MMPA reporting form be reviewed for determining the nature and seriousness of injuries of marine mammals as a result of interactions. Further, the Atlantic Offshore Cetaceans Take Reduction Team recommends that NMFS convene a workshop with representatives from the fishing industry, the conservation community, the scientific community, and the marine mammal veterinary community to review all existing information (observer logs,

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8 Currently, NMFS estimates each observer day in the longline fishery to cost approximately $700. Estimating the cost of the program for any calendar year depends on the total effort in the fishery.

fishing logs, stranding data) to develop (1) guidelines for determining and recording serious injury, (2) recommendations for changes and/or additions to observer logs or reporting forms, (3) recommendations for further research including how to monitor past entangled animals, and (4) recommendations to the fleet on operating procedures when interactions occur to minimize injury and maximize survivorship.

Finally, the Atlantic Offshore Cetaceans Take Reduction Team recommends that NMFS review how injuries are recorded within the science centers as collected by observers and by fishermen on reporting forms with the objective of standardizing the data collection and reporting.

D. Comprehensive Cetacean Surveys

The AOCTRT finds the estimates of the abundance of common dolphins and pilot whales used in stock assessments and PBR calculations to probably be negatively biased because of incomplete survey coverage of the range of these species in the Northwest Atlantic. The AOCTRT agreed that new, comprehensive surveys of these and other pelagic cetacean species would provide information critical to the take reduction process. NMFS indicated that the comprehensive survey of pelagic cetaceans, originally scheduled for the summer of 1997, has been postponed until the summer of 1998 to combine it with a Southeast Fisheries Science Center cetacean survey and to save costs. While the AOCTRT recognizes the importance of combining and minimizing survey costs, this information is essential to the accurate assessment of these marine mammal stocks and to the future work of the Team. The AOCTRT recommends, therefore, that NMFS conduct a comprehensive survey of common dolphins and pilot whales during 1997 and make every effort possible to ensure the timely analysis and review of these survey data. The AOCTRT believes that such 1997 surveys are critical for the take reduction process.

V. STRATEGIES FOR REDUCING INTERACTIONS WITH STRATEGIC ATLANTIC OFFSHORE CETACEANS

The AOCTRT developed comprehensive strategies for each fishery -- pair trawl for tuna, swordfish driftnet, and pelagic longline. Each comprehensive strategy includes a number of activities that are designed to reduce the serious injury and incidental take of strategic stocks of marine mammals. This section of the plan begins with general strategies that will be undertaken by all three fisheries and continues with fishery-specific strategies.

A. General Strategies

1. Education and Outreach[9]

The AOCTRT recommends an education and outreach program to inform the fishing industry of the problem and potential solutions for reducing marine mammal bycatch. The program will include factsheets, newsletters, workshops, and guidelines for animal releases.

a. Factsheets

The Office of Protected Species of the National Oceanic and Atmospheric Administration (NOAA) should provide factsheets on the MMPA, the Take Reduction Team process, and tactics for avoiding marine mammals and distribute the Marine Mammal Identification Guide. Working with the Technical Advisory Group (Section V. 2.), NMFS will determine the appropriate means for distributing this information.

b. Newsletter/MMPA Bulletin

NOAA, with assistance from industry and conservationists, will continue to include in the MMPA bulletin, or supplements, developments in reducing marine mammal take, updated stock assessments and PBRs, and other relevant information.

c. Workshops

Industry workshops for each fishery will be held to educate Captains, crew, and vessel owners about the problems of marine mammal bycatch, the MMPA and its regulations, strategies for reducing interactions, and guidelines for releasing entangled mammals. The workshops will be designed to inform fishermen and to get feedback from participants regarding successful strategies they have observed or developed for reducing marine mammal interactions.

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9 The AOCTRT recommends that materials developed for education and outreach be made available to all the Take Reduction Teams convened by NMFS.

Workshops will be held at annual Fish Expos and Fishermen's Forums or at other times and places that are convenient for the fishermen. The AOCTRT recommends that the Sea Grant program[10], with offices in all coastal states, and the Technical Advisory Work Group work with industry, NMFS, and conservationists to design and deliver these workshops for the fishing industry.

d. Guidelines for Release of Entangled Mammals

The AOCTRT recommends that NMFS develop and distribute a set of guidelines for releasing entangled mammals. These guidelines will need to be fishery-specific. (See Appendix D for draft pair trawl guidelines developed by the pair trawl fishery and draft longline guidelines developed by Blue Water Fishermen's Association.)

2. Technical Advisory Work Group[11]

The AOCTRT may form an ad hoc work group of the AOCTRT to assist in the implementation of education and outreach strategies, engage in ongoing discussions of strategies to reduce incidental take of marine mammals, and identify gear and technique modifications. This work group will be comprised primarily of industry and scientists and will include conservationists, academics, and other specialists as required. NMFS should support the development of this group.

3. Research on Cetacean Behavior

The AOCTRT recommends that NMFS conduct research on cetacean behavior, as it relates to fishery interaction, including migration patterns, behavior around fishing gear, auditory responses[12] and feeding patterns (depth, time of day, prey preferences, etc.). The Naval Undersea Warfare Center (NUWC) is committed to making its

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10 Sea Grant has a successful track record of offering workshops with regional coordination. A recent example is the F/V Safety program, which is a partnership between the fishing vessel industry, the Coast Guard, and Sea Grant. Sea Grant, with NMFS and the Coast Guard support, has developed training manuals, curricula, and offered workshops on aspects of fishing vessel safety. The AOCTRT recommends that a similar partnership be developed for marine mammal issues.

This group, like the AOCTRT, would be exempt from FACA requirements.

12 In March 1996, a workshop was held in Seattle, Washington to assess and identify critical uncertainties concerning the effectiveness and possible side effects of acoustic devices that have been and might be used to minimize the adverse impacts of marine mammal-fishery interaction. A report entitled, Acoustic Deterrence of Harmful Marine Mammal-Fishery Interactions: Proceedings of a Workshop held in Seattle, Washington, USA, 20-22 March 1996, can be obtained from NMFS and the Marine Mammal Commission. (See Appendix E for the Executive Summary of this report.)

technical expertise available to the three fisheries of the AOCTRT to work toward the mutual goal of reducing marine mammal interactions.

4. Northern Right Whale and other Endangered Whales[13]

The AOCTRT recognizes that no fishery is authorized to take a right whale or any other endangered whale in any location. The AOCTRT recommends, for the pair trawl, driftnet, and longline fisheries, time-area closures of Critical Habitat of the right whale to prevent these fisheries from expanding into these areas, which they have not fished in the past. These areas have been designated by NMFS and have been listed in the Federal Register, Vol. 59, No. 106 (Appendix C). The times for the closures of each area based on the expected presence of right whales are as follows:

a) GA-FL Coastline: December 1-March 31
b) Cape Cod Bay and Massachusetts Bay: Feb 1-April 30
c) Great South Channel: March 1 - June 30

5. Coordination of Fishery Management Measures

Interactions with marine mammals during offshore pelagic fishing operations can be affected by management regulations that impact, and often change, fishing patterns. The entities that are responsible for setting fishing quotas, seasons, gear specifications, geographic boundaries, and other regulatory requirements should, as much as possible, integrate actions to meet the goals of target species management and the reduction of serious injury and incidental mortality of marine mammals and other bycatch issues.

The AOCTRT recommends the coordination among fishery management authorities to integrate marine mammal protection measures with other fisheries management and conservation activities. Such coordination can be implemented by forwarding this Take Reduction Plan to appropriate International Commissions (such as US ICCAT Advisory Committee and Plan Development Teams for Atlantic highly migratory species), Fishery Management Councils, and States. NMFS, as the agency responsible for monitoring the implementation of the Take Reduction Plan, should review proposals and suggestions offered by such entities, forward such proposals to the AOCTRT, and consult with or reconvene the AOCTRT should these suggestions require changes to the TRP.

13 The AOCTRT could not reach a consensus on recommending that NMFS strictly enforce the MMPA and ESA with respect to fishery and non-fishery, human-related sources of serious injury and mortality of right whales and other endangered whales.

B. Pair Trawl Strategies[15]

The AOCTRT recognizes the successful efforts of the pair trawl fishery to reduce its marine mammal bycatch. Based on historical takes and existing common dolphin data, the goal of the pair trawl fishery is to reduce its take of common dolphin by 83%, based on its allocation of PBR. Common dolphin is the only strategic stock in which improvement is required for this method because pair trawl takes of all other strategic stocks of marine mammals are below its PBR allocation. The required percentage reduction may need to be modified if there are changes in minimum population estimates and/or changes in proportional takes by other fisheries. Based on past performance, the pair trawl fishery expects that the strategies described below will result in the necessary level of reduction of interactions with strategic stocks of marine mammals.

The pair trawl comprehensive strategy includes the following combination of activities, all of which must be implemented to be effective:

- operator qualifications
- certification of nets
- research on cetacean behavior and target species
- establish an industry panel to review fishing activities relative to takes
- industry trigger to alleviate poor performance

1. Operator Qualifications

The AOCTRT recommends that any new entrants into the pair trawl fishery be required to demonstrate their ability to operate their vessel and gear in accordance with the handling criteria described in Section III. A. 2. including the ability to set and retrieve the net quickly while assuring a minimal horizontal opening whenever the head rope is at or approaching the sea surface. In addition, a proficiency needs to be demonstrated for keeping control of the net both during normal straight towing and while executing maneuvers such as turns, speed changes, and warp-length changes. For a trial period, cod ends will be required to remain open until new operators have shown that they can abide by the above restrictions. In the event that new operators are unable to properly control their vessels and gear within a reasonable period of time, they would be unable to participate in the fishery. Furthermore, new operators would be placed on probation for one full season during which 100% observer coverage would be mandatory.

The ability to successfully deploy and retrieve a pelagic pair trawl while avoiding marine mammal interactions is directly related to the experience of the operators.

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15 In September 1996, NMFS denied the pair trawl fishery's petition for rulemaking to consider authorizing the fishery in the Atlantic tuna fishery. The pair trawl representatives, at the request of NMFS officials, continued to participate on the TRT. These strategies are recommended for implementation if the pair trawl decision is reversed or in the event that it is classified as an experimental fishery.

Many aspects of seamanship and fishing gear technology must be taken into consideration during pelagic pair trawl operations. During the setting and hauling processes, when there is the greatest chance of marine mammal interactions, the two vessels must be maneuvered in close proximity to one another. The distance between the vessels is commonly ten to fifty feet. While maintaining control of the vessel to avoid a collision, the operator must also supervise the rapid deployment of the net and associated gear in order to minimize the amount of time the net is on the surface, where marine mammals are more likely to be found. At the present time, all the operators of the vessels involved in the pelagic pair trawl fishery for tuna, have demonstrated the ability to maintain control of their vessel and its gear.

The establishment and implementation of this qualification program would be directed by the industry advisory panel described in subsection 4 below.

2. Certification of Nets

The AOCTRT recommends that any new net designs for the pair trawl fishery be subjected to test tank observation before the construction and deployment of a full size net. During tank testing, the new design will be scrutinized and adjusted to ensure the shape is consistent with gear protocol developed in the 1994 and 1995 experimental pair trawl fisheries dealing with minimum depth and the ability to monitor that depth with the required netsounders. Particular attention would be paid to the uniformity of depth of the headrope, and assurances are needed that no part of the headrope nor any mesh of the trawl fished shallower than the center of the headrope.

Upon successful completion of the tank testing, the new net will be required to undergo thorough at sea testing to determine if the net is in accordance with minimum depth requirements. At sea testing with NMFS observers will include, but not be limited to, headrope and wing end monitors. In addition, cod ends will be left open during testing to avoid injury or deaths of marine mammals. Upon successful completion of at sea trials, the net will be certified for use in the pelagic pair trawl fishery.

The requirement for certifying pair-trawl nets is a result of the introduction of a new net design during the 1995 season. Two of the three new nets of this design experienced an unusually high take of mammals. It is believed that the new nets assumed a slightly different shape while deployed than did the traditional nets. Due to the location of net-mounted monitors, it was difficult to determine the actual shape and location of various parts of the net in relation to the surface. The nets that were in use prior to the 1995 season were in accordance with the petition requirements and resulted in a low take of marine mammals.

3. Research on Cetacean Behavior

The AOCTRT recommends the long term strategy of researching cetacean behavior around nets through the use of low light net cameras and passive listening devices.

Pair trawlers will mount low light net cameras in an attempt to view mammals in and around the pair trawl. Tests conducted in the U.S. and Canada have been successful in viewing fish in nets during periods of low light. Individuals involved in these tests in both countries have agreed to provide technical assistance and equipment. Information gathered about what marine mammal behavior when encountering nets, could result in gear and/or techniques modifications to reduce the risk of serious injury or mortality.

Pair trawlers will mount passive listening devices on their vessels to attempt to detect the presence or absence of mammals during fishing operations. The listening devices would alert the operator that there were mammals in the area. NUWC has done some tests with such devices and has agreed to help develop an experiment and possibly supply the devices. The AOCTRT recommends that any gear modification and/or techniques found to be effective in reducing marine mammal takes, as a result of this research, become standardized gear and technique practices.

4. Establish an Industry Panel to Review Fishing Activities Related to Takes

The pair trawl fleet will organize an industry panel, consisting of experienced pair trawl fishermen and others (NMFS, Scientists, Conservationists), to review the conditions and activities associated with marine mammal takes. This panel will work to suggest ways for the vessels involved to alter their procedures to avoid marine mammal takes and make suggestions on research areas. It will also be responsible for ensuring operator qualifications and net certification.

The AOCTRT recommends that any gear modification and/or techniques for reducing marine mammal takes, recommended by this panel, become standardized gear and technique practices.

5. Industry Trigger to Alleviate Poor Performance

The AOCTRT recommends that the industry panel develop an industry trigger to alleviate poor performance relative to interactions with strategic stocks of marine mammals. The panel will set a standard for an acceptable level of marine mammal interactions for each pair[16], which will facilitate the entry of new participants while fairly treating participants with an historical involvement in the fishery. If a pair exceeds this standard, it would cease participating in the fishery for the remainder of the season. A strong incentive would therefore be in place for clean fishing since the present-year effort would be at stake. This would also protect the rest of the fishery from a pair that was unable to limit its marine mammal interactions.

The panel will set a standard consistent with the MMPA, which requires that the total number of marine mammal interactions for all pairs cannot exceed the pair trawl allocation of PBR for any stock.

C. Driftnet Strategies

The AOCTRT set a goal of reducing driftnet interactions with strategic stocks of marine mammals by 82%. This number represents the necessary reduction to meet the driftnet PBR allocation. In addition to the reductions in take that are expected from the time area closure, the AOCTRT expects the driftnet fishery to reduce its take of common dolphin by 68% as a result of the elimination of the derby fishery and the pinger experiment. If these reductions are not realized, the AOCTRT will consider additional measures to reduce serious injury and mortality of strategic stocks of marine mammals.

Implementation of the driftnet strategies will require 100% observer coverage. NMFS will address those issues related to placing observers on vessels deemed unsafe for observer coverage under the existing observer program. If NMFS is unable to place an observer on a vessel due to overwhelming safety concerns, such a vessel will be excluded from the fishery.

The driftnet comprehensive strategy includes the following combination of activities, all of which must be implemented for the plan to be effective:

Educational workshops and outreach
Real time monitoring and evaluation of marine mammal takes
Pinger experiment
Implementation of standardized gear modifications based on existing data

- Limited Entry
- Time Area Closure
- Eliminate the derby fishery by allocating sets per vessel

Buyout program

It is the understanding of the AOCTRT that NMFS will review this draft Take Reduction Plan and issue proposed regulations to implement it, including any changes that may be necessary and reasons for any changes, by January 23, 1997. In accordance with the schedule outlined in Section 118 of the MMPA, it is the expectation of the AOCTRT that after ample opportunity for public comment on the proposed TRP and regulations, NMFS will publish a final rule by May 23, 1997.

Two key components of the TRP for the large pelagic driftnet fishery are the closure of the "winter" fishery from Hudson Canyon south from December 1 through May 31 and an allocation of sets to eliminate the derby fishery. The AOCTRT recognizes the importance of having the TRP implemented as a package in 1997. Therefore, the AOCTRT recommends that a closure of the winter fishery be effective immediately, **before** the plan has been implemented by NMFS. This may require either the issuance of emergency regulations by NMFS or a voluntary agreement by all of the fishermen in the driftnet fishery. If fishing were to occur in this area before the plan is in place, the number of sets allocated to each fisherman in 1997, under the plan's set allocation scheme, would necessarily be reduced. This would affect the potential fishing effort available to all large pelagic driftnet fishermen during the summer

fishery and would disadvantage virtually all of them. It would also undermine efforts to conduct a statistically valid pinger experiment and, in general, to evaluate the effectiveness of the AOCTRT's recommended plan to reduce the take of marine mammals in the driftnet fishery.

1. Educational workshops and outreach

The AOCTRT recommends a program of education and outreach that will include newsletters, workshops, factsheets, and guidelines for animal releases. This strategy has been further defined under Section V.A, General Strategies.

In addition, the driftnet fishery will establish a clearinghouse for communication of hot spots and/or areas with concentrations of mammals, via single sideband and VHF radios, FAX, and phone.

2. Real time monitoring and evaluation of marine mammal takes

The AOCTRT recommends that NMFS provide real time monitoring and evaluation of marine mammals as it has for the swordfish quota.

3. Pinger Experiment

The AOCTRT recommends that the fishery undertake a scientifically designed and statistically valid experiment to determine the effectiveness of acoustical devices (pingers) in deterring marine mammal interactions in the offshore pelagic driftnet fishery. All vessels operating in the driftnet fishery for 1997 would be required to meet all criteria for participation in the experiment.

The AOCTRT recommends that NMFS supply adequate observer coverage, as it has indicated it would, to ensure the experiment is statistically valid. Past experiments with pingers were promising but inconclusive due to inadequate sampling size, statistical design, the variability of catches due to spatial and temporal differences, faulty pingers, and the derby nature of the fishery.

At the end of one year, the AOCTRT will review the results of the experiment. If pingers are determined to be effective, the AOCTRT will recommend mandatory pinger usage for the driftnet fishery and follow up studies to address habituation and displacement.

4. Research on standardized gear modifications based on existing data

The AOCTRT recommends research on driftnet gear design and deployment methods from the existing sea sampling database to develop standardized gear modifications for reducing incidental take of marine mammals. Among other factors, this research will review: 1) Individual vessel ball drop length as related to the frequency and type of interaction to determine the optimum depth below the surface for deterring marine mammals; 2) Gross take rates for vessels using escape

panels and location of the panels; and 3) Mesh size deployed as related to bycatch by species.

The AOCTRT recommends that any gear modification and/or techniques found to be effective in reducing marine mammal takes, as a result of this research, become standardized gear and technique practices.

5. Limited Entry

The AOCTRT recommends a limited entry program for the swordfish driftnet fishery. This means that no new entrants would be allowed into the fishery as defined in NMFS proposed rule for Amendment 1 to the Swordfish and Shark Fishery Management Plans.

Limited entry is necessary to implement the allocation of sets per vessel. It is also required because the fishery will operate under open access, controlled by limited entry and the total number of sets, to the general swordfish quota.

6. Time Area Closure

The AOCTRT recommends a time area closure for the driftnet fishery from Hudson Canyon south from December 1 through May 30. This effectively eliminates the traditional winter season of the driftnet fishery. According to existing data, the winter fishery has consistently had a higher marine mammal take per set than the summer fishery. The elimination of the winter fishery through a time area closure is expected to result in a significant decrease in marine mammal mortality for some species.

7. Eliminate the Derby Fishery by Allocating Sets Per Vessel

When the driftnet season opens, a "derby-style" fishery ensues. The limited opportunity for each fisherman to catch a share of the overall quota has precluded the consideration of avoiding marine mammal interactions and therefore, results in a high bycatch rate. The elimination of the derby fishery will allow fishermen to move when mammals are present in a fishing area and to experiment to find ways to avoid mammals.

To eliminate the derby, the AOCTRT recommends an allocation of transferable sets per vessel and open access, controlled by limited entry and the total number of sets, to the general swordfish quota, that is, the removal of the subquota for the swordfish driftnet fishery.

The AOCTRT agreed that the total number of sets for the fishery will be 213. This number reflects the average annual number of sets from 1991-95, the years the fishery has been under a reduced quota. The expectation is that this number of sets will yield approximately 103,000 lbs of swordfish. However, there will be no

revision to the total number of sets unless the total catch of the fishery is more than 50% higher than the past quota of 103,395 lbs.

The AOCTRT recommends that NMFS not shut down the longline fishery as a result of excess driftnet swordfish catch. Under no circumstance will the driftnet catch lead to an exceedance of the ICCAT swordfish quota. ICCAT mandated reductions to the swordfish quota will result in proportional reductions in the total number of sets and the benchmark for recalculation of the total number of sets.

Effort distribution to individual fishermen will be expressed as a specific number of sets. An arbitrator[15] will determine the set allocation for each vessel. With the exception of restrictions placed by the ESA, MMPA, the time area closure, or other relevant Acts, each fisherman will have the option of making his sets at any time and in any place he chooses, with an understanding that there will be cooperation among fishermen on common fishing grounds. Sets may be given, traded, or sold. However, before using any transferred sets, vessels must return to port and notify NMFS of the transfer of sets through the existing protocol of notification of a vessel's proposed fishing activities.

Initially, all qualifying vessels would receive, via letter from NMFS, an allocation of sets for the year. The letter would be carried on board the vessel and, as always, the on board observer would record the number of sets made on that trip. An approved transfer to another driftnet vessel would entitle the receiving vessel to an increased number of sets. However, the vessel would have to return to port to receive that authorization of transfer to be carried on board the vessel.

This recommendation will require a regulatory change to remove the subquota of the swordfish driftnet fishery to allow the allocated number of sets under open access, controlled by limited entry and the total number of sets, to the general swordfish quota and to establish the system of allocated sets per vessel. If the regulatory changes are not completed within the necessary time frame or are denied, the AOCTRT recommends that NMFS still implement all the remaining driftnet strategies.

8. Buyout Program

The driftnet fishery is a small fishery with a relatively high marine mammal bycatch as compared to other gear types (longline, harpoon) targeting swordfish. One method of reducing marine mammal bycatch in the fishery is to buy out fishing effort. The vessel buyback program established under the reauthorized MFCMA is not likely applicable to the driftnet fishery because of the requirement that the

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15 The arbitrator will be selected and retained with assistance from the American Arbitration Association. The decision of the arbitrator will be binding and not subject to appeal. The arbitrator will be an individual acceptable to all the parties that will present before him/her, and will be hired by the industry.

fishery be under a rebuilding program. The fishery cannot be under a rebuilding program because it is an ICCAT quota fishery. Since for most vessels, the driftnet fishery is only a seasonal component of a mix of fishing activities, a permanent measure may not be attractive.

The AOCTRT recommends the establishment of an alternative buyout program that would allow each driftnetter the opportunity to sell his allocation of effort (i.e., sets) to other driftnet vessel operators, swordfish vessels outside the driftnet fishery, or interested parties outside the fisheries altogether. NMFS will investigate funding mechanisms for such a buyout including the raising of funds as allowed under Section 118(j) of the MMPA. If a buyout occurs, the swordfish Total Allowable Catch would still be available for fishing by other gear types, but the total number of sets that can be fished by driftnetters would be reduced.

Transactions in driftnet sets would be overseen by NMFS. In the case of permanent transfers, NMFS would ensure that those sets are permanently removed from the fishery's total allocation. The purchase of sets may be by anyone who has interest in reducing effort in the driftnet fishery (e.g., buy out by an environmental group to retire the effort). The purchase price must be agreed to by both buyer and seller before NMFS would authorize the transfer of any sets or removal of those sets from the total allocation.

D. Longline Strategies

The AOCTRT set a goal of reducing U.S. pelagic longline marine mammal serious injury and incidental mortality of strategic stocks by 70%. The AOCTRT recommends an increase in observer coverage of the longline fishery to ensure comparable precision of estimated marine mammal interaction. If the goal of a 70% reduction is not met, the AOCTRT will consider additional measures to reduce serious injury and incidental mortality of strategic stocks of marine mammals. In addition, marine mammal interactions should be given priority attention within the framework of the Comprehensive Management System for the Atlantic pelagic longline fishery established in the Magnuson-Stevens Fishery and Conservation Management Act. The longline comprehensive strategy includes the following activities:

- Education and outreach to enhance existing avoidance techniques
  - Workshops for Captains, Crew, and Vessel Owners
  - Develop and implement guidelines for interactions and disentanglement
  - Enhanced communications among Captains at sea
- Limited entry
- Research
  - Modification of gear and/or operating procedures
  - Cetacean behavior and acoustical systems
- Limit the maximum length of pelagic longline gear in the mid-Atlantic area
- Reduce soak time by hauling gear in the order in which it was set
- Move after one entanglement

1. Educational Outreach to Enhance Existing Avoidance Techniques

The education and outreach strategy will include a factsheet, workshops, guidelines for disentanglement, and guidance concerning interactions. These activities are further outlined in Section V.A, General Strategies.

a. Workshops for U.S. Pelagic Longline Captains and Vessel Owners

The longline industry, in cooperation with NMFS, will conduct captain and vessel owner workshops. Priority for these workshops will be given to those vessels that fish in the mid-Atlantic Bight during the third and fourth quarters of the year though such workshops will be conducted for each segment of the pelagic longline fishery. These workshops will:

- Educate participants about the MMPA and the problem of marine mammal interactions;
- Promote open communication at sea concerning interactions;
- Encourage feedback from those that have experienced interactions first hand;
- Provide draft guidelines on handling procedures during an interaction; and
- Provide marine mammal identification keys.

b. Guidance for Interactions with and Disentanglement of Mammals with U.S. Pelagic Longline Gear

The AOCTRT recommends that NMFS work with the Blue Water Fishermen's Association (BWFA) to develop draft guidelines for disentangling marine mammals from longline gear. NMFS will provide the draft guidelines to participants of the planned serious injury workshop for review. NMFS will then revise the guidelines based on the comments received. Once final, NMFS will provide the guidelines to all permitted longliners. (See Appendix D for BWFA's proposal for draft guidelines.)

c. Enhanced Communications among Captains

The AOCTRT recommends enhanced communications among the longline fleet to enhance an existing real-time, effective, voluntary time/area closure system for marine mammal interactions in all areas fished. Currently, when a longline vessel experiences interactions with marine mammals, the Captain customarily alerts other vessels by radio to avoid the area or technique that resulted in an interaction. Vessel Captains and crews will be educated about marine mammal interactions and encouraged to communicate with the fleet when encounters occur. Preliminary data analysis indicates that marine mammal interactions with pelagic longline gear tend to be clustered events within a single trip.

2. Limited Entry

The AOCTRT recommends a limited entry program for the pelagic longline fishery. Limited entry in fisheries should not be considered solely to address the issue of reducing serious injury and incidental mortality of strategic stocks of marine mammals; however, limited entry for fishery management reasons would be expected to reduce the possibility of increased marine mammal interactions. Active participants in the fishery will attend workshops to learn of the problem of, and strategies for, reducing serious injury and incidental mortality of strategic stocks of marine mammals.

3. Research on modifications of gear and/or operating practices, cetacean behavior, and acoustical systems

a. Modifications of gear and/or operating procedures

The AOCTRT recommends that NMFS review observer records prior to March 1997 to identify possible gear modifications for reducing marine mammal interactions and increasing survival probabilities after disentanglement.

This will include a review of data on the different frequencies of interactions with gear components (mainlines, float lines, or hook lines); specific types of gear (mono-filament vs. multi-filament mainlines, circle vs. J hooks, bait types, and lightstick use); and operating styles such as night vs. day sets, set and haul timing, soak durations, rig configurations (designed to affect fishing depth); season/area (temperature) deployment decisions, and continuous cycling radio beacon buoys.

The AOCTRT recommends that any gear and/or procedure modifications deemed to be useful in deterring interactions with marine mammals and/or increasing the survivability of marine mammals after interactions become standard for the pelagic longline fishery, if appropriate and necessary.

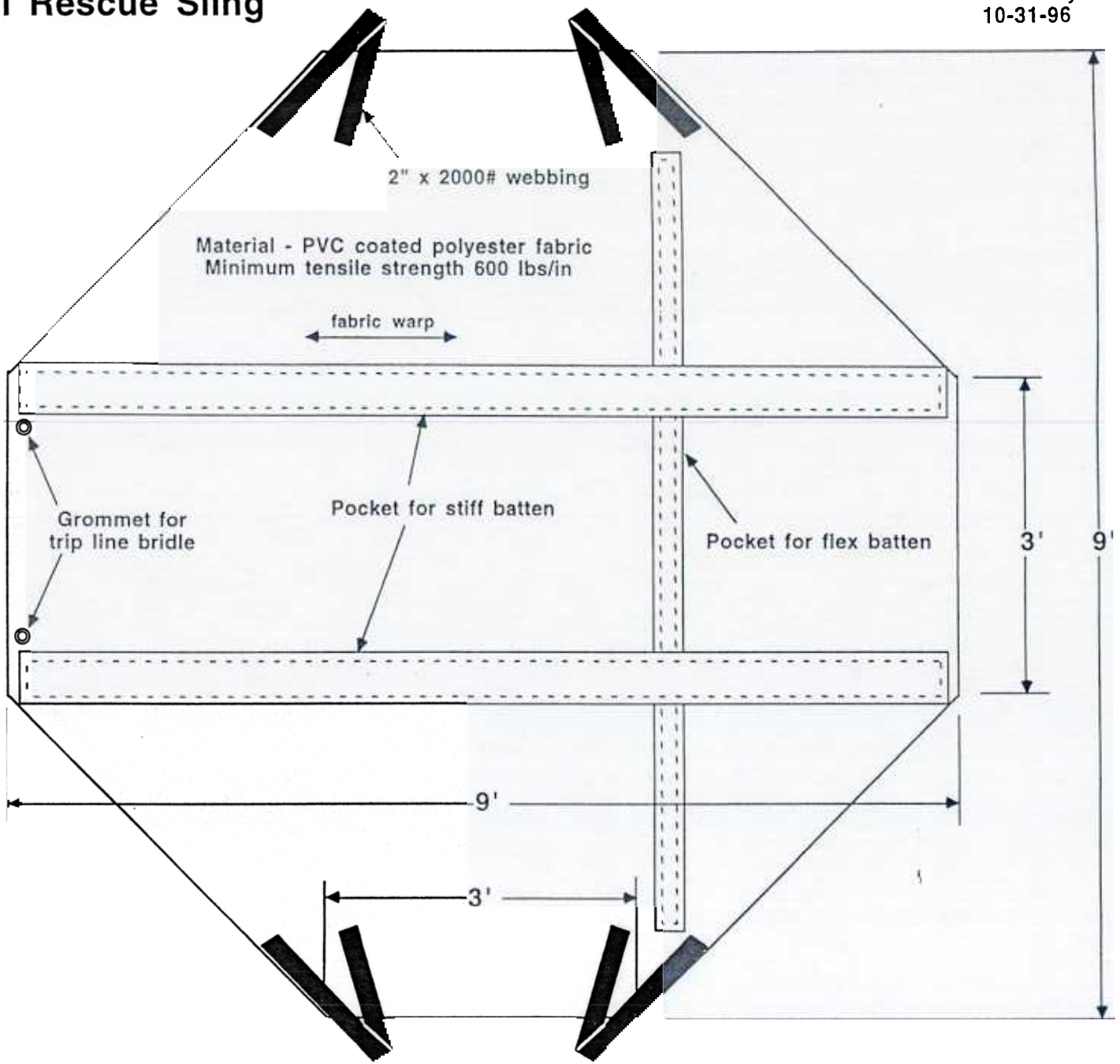
b. Cetacean behavior and acoustical systems

The AOCTRT recommends that research be conducted on the use of acoustic devices to mask the sounds of vessels setting and hauling gear in an effort to minimize the interactions of pilot whales with longline gear. In addition, the AOCTRT recommends that research be conducted on pilot whale behavior, auditory systems, and other acoustical devices not designed to cause pain, but designed to reduce interactions.

Marine Mammal Rescue Sling

C. Goudey
10-31-96

Underside view



4. Limit length of pelagic longline gear in the mid-Atlantic area[16]*

Unless strategy #3A identifies more effective gear modifications, the AOCTRT recommends that the length of the longline used in the mid-Atlantic area be limited to a maximum length of 24 nautical miles during the months of August through November 1997, as an interim strategy. According to BWFA, the current average length of the mainline for vessels fishing in the mid-Atlantic area is approximately thirty to thirty-five nautical miles during this time period. BWFA projects that restricting gear length to 24 nautical miles will result in a 20-30% reduction in serious injury and incidental mortality of strategic stocks of marine mammals in this area during this time.

This strategy requires a NMFS regulation and strict attention to enforcement. This regulation would be in effect in the mid-Atlantic Bight for the period of August through November of 1997. When it is reconvened, the AOCTRT would evaluate the benefits of the reduced longline length and determine whether it should be continued or if other strategies would provide greater benefits.

5. Reduce maximum soak time by hauling gear in the order in which it was set*

The AOCTRT recommends that fishermen using pelagic longline gear be encouraged to reduce their maximum soak time by retrieving their gear in the same order in which it was set (run back on the gear) in the mid-Atlantic Bight from August through November 1997. This may result in the retrieval of live tuna, which may reduce the predation of pilot whales and the resultant entanglements. Fishermen may also be able to release entangled marine mammals sooner, thereby improving survivability. BWFA estimates that this strategy will result in a 10-15% reduction in serious injury and incidental mortality of strategic stocks of marine mammals.

This strategy requires a NMFS regulation and strict attention to enforcement. This regulation would be in effect in the mid-Atlantic Bight for the period of August through November of 1997. When it is reconvened, the AOCTRT would evaluate the benefits of the reduced maximum soak time and determine whether it should be continued or if other strategies would provide greater benefits.

6. Move after one entanglement

Data have shown that if a longliner has one marine mammal interaction, he is likely to have another if he stays in the same area. The AOCTRT recommends that longliners be required to move after one entanglement and alert other vessels in the

16 * Concurrent with the implementation of Strategies #4 and 5, the AOCTRT recommends that NMFS aggressively pursue the recommendations regarding research as spelled out in Strategy #3 and the serious injury workshop (Section IV.C.)

immediate area. BWFA estimates that this strategy will result in a 40% reduction in serious injury and incidental mortality of strategic stocks of marine mammals. This strategy requires a NMFS regulation and strict attention to enforcement.

VI. EVALUATION OF ATLANTIC OFFSHORE CETACEAN TAKE REDUCTION PLAN

The immediate objective of this TRP is to reduce the incidental mortality and serious injury of strategic stocks to levels below the PBRs estimated for these stocks within 6 months of the implementation of the final Plan. Nevertheless, the TRT recognizes that the strategies outlined in this Plan may not achieve this objective. Therefore, the AOCTRT will reconvene to monitor the implementation of the final AOCTRP. When the AOCTRT reconvenes, its duties will include reviewing information on the latest minimum population and PBR estimates for strategic Atlantic offshore cetaceans, mortality estimates for strategic stocks, and any measures implemented to reduce the incidental mortality and serious injury of strategic stocks. If at the time the AOCTRT reconvenes, the TRP objectives have not been met, the AOCTRT will evaluate and recommend methods to reduce marine mammal interactions to reduce take levels to below PBR.

The AOCTRT will reconvene in February 1998 to review and evaluate the efficacy of the strategies described in this TRP. The AOCTRT will reconvene every 6 months to monitor the implementation of the final TRP, until such time that NMFS determines that the objectives of the TRP have been met.

The AOCTRT recommends that prior to each evaluation, NMFS provide the AOCTRT with the following information:

Updated stock assessments and PBRs for strategic stocks of Atlantic Offshore Cetaceans;
Observer data on marine mammal interactions by area and month for each fishery;
Mortality estimates for strategies stocks;
Information from each fishery on the impact of the strategies;
Results of the Workshop on serious injuries;
Results of the driftnet pinger experiment;
Daily logbook summaries for effort and sets by area and month; and
Updates on research.

APPENDICES

A: Glossary of Acronyms

B: Determining Appropriate Coefficients of Variation (CV) Relative to Observer Coverage

C: Maps of Critical Habitat of the Right Whale

D: Draft Procedures for Handling Marine Mammal Bycatch in Pelagic Trawl Nets
Draft Guidance for Marine Mammals Interactions with U.S. Pelagic Longline Gear

E: Executive Summary of *Acoustic Deterrence of Harmful Marine Mammal-Fishery Interactions: Proceedings of a Workshop held in Seattle, Washington, USA, 20-22 March 1996*

F: Strategies Discussed But Not Selected

G: References

Appendix A

Glossary of Acronyms

AOCTRP: Atlantic Offshore Cetaceans Take Reduction Plan

AOCTRT: Atlantic Offshore Cetaceans Take Reduction Team

ASRG: Atlantic Scientific Review Group

ATCA: Atlantic Tuna Convention Act

BWFA: Blue Water Fishermen s Association

CETAP: Cetacean and Turtle Assessment Program

Coefficient of Variation

DWF: Distant Water Fleet

Endangered Species Act

Exclusive Economic Zone

FACA: Federal Advisory Committee Act

Fishery Conservation Amendments

FMP: Fishery Management Plan

FR: Federal Register

ICCAT: International Commission for the Conservation of Atlantic Tuna

MFCMA: Magnuson Fishery Conservation and Management Act

MMPA: Marine Mammal Protection Act

NMFS: National Marine Fisheries Servide

NEFSC: North East Fisheries Science Center

Minimum Population Estimate

NOAA: National Oceanic and Atmospheric Administration

NUWC: Naval Undersea Warfare Center

OSP: Optimum Sustainable Population

PBR: Potential Biological Removal

SAR: Stock Assessment Report

SEFSC South East Fisheries Science Center

TAC: Total Allowable Catch

TRP Take Reduction Plan

ZMRG: Zero Mortality Rate Goal

Appendix B

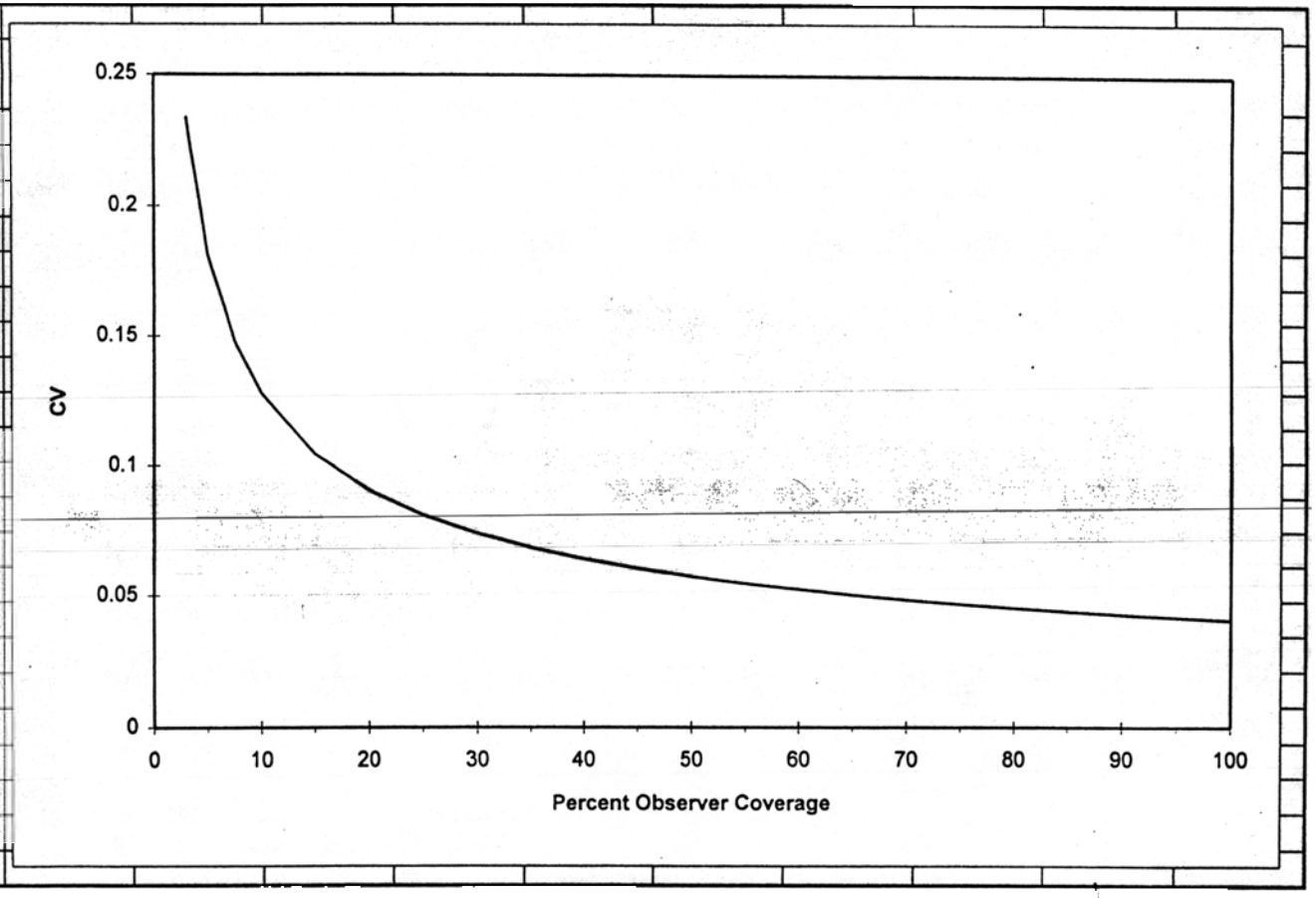
Calculating the Coefficient of Variation (CV)

The coefficient of variation of a mortality/serious injury estimate represents the ratio between the standard deviation and the mean of an estimate. A CV of 30% or less for mortality/serious injury estimates and a CV of 20-35% for abundance estimates are considered minimum levels of precision that were considered acceptable for all marine mammal stocks. Levels of observer coverage necessary to obtain CVs for certain marine mammal stocks can be calculated; however, the final sampling design should be based on only one or two high-priority species since the CVs associated with different levels of observer coverage vary from stock to stock.

The shape of the CV curve generally follows the formula CV = A / square root of N, where CV is the coefficient of variation, A is a constant, and N is the sample size. To determine the shape of the CV curve for the longline fishery as an example, consider the 1992 data for pilot whales. In 1992, the observed effort in the longline fishery was 329 sets and the total effort, estimated from logbooks, was 10,605 sets. The estimated mortality of pilot whales was 22 and the CV = 0.23. A is then equal to CV * square root of N, or 0.23* 329, or 4.17. The observed effort represents 3% of the total effort. This allows a calculation of a generalized curve to determine what levels of CVs may be obtained at varying levels of observer coverage (see Figure 1). One can see that at a certain point (after about 10%), increasing observer coverage does little to reduce corresponding CVs. If NMFS were to design a sampling scheme to address takes of pilot whales as a priority, 10-20% observer coverage would probably be adequate. If NMFS were to design a sampling scheme to address takes of some other marine mammal species, a different curve would need to be generated.

Observer Coverage and Associated CVs in the Longline Fishery
(based on 1992 data)

Percent Coverage	Sets	CV
3	318.15	0.233787
5	530.25	0.181091
7.5	795.375	0.14786
10	1060.5	0.12805
15	1590.75	0.104553
20	2121	0.090545
25	2651.25	0.080986
30	3181.5	0.07393
35	3711.75	0.068446
40	4242	0.064025
45	4772.25	0.060364
50	5302.5	0.057266
55	5832.75	0.054601
60	6363	0.052276
65	6893.25	0.050225
70	7423.5	0.048398
75	7953.75	0.046757
80	8484	0.045273
85	9014.25	0.043921
90	9544.5	0.042683
95	10074.75	0.041545
100	10605	0.040493



V. Cori. 10/10/96

Appendix C

Maps of Critical Habitat of the Right Whale

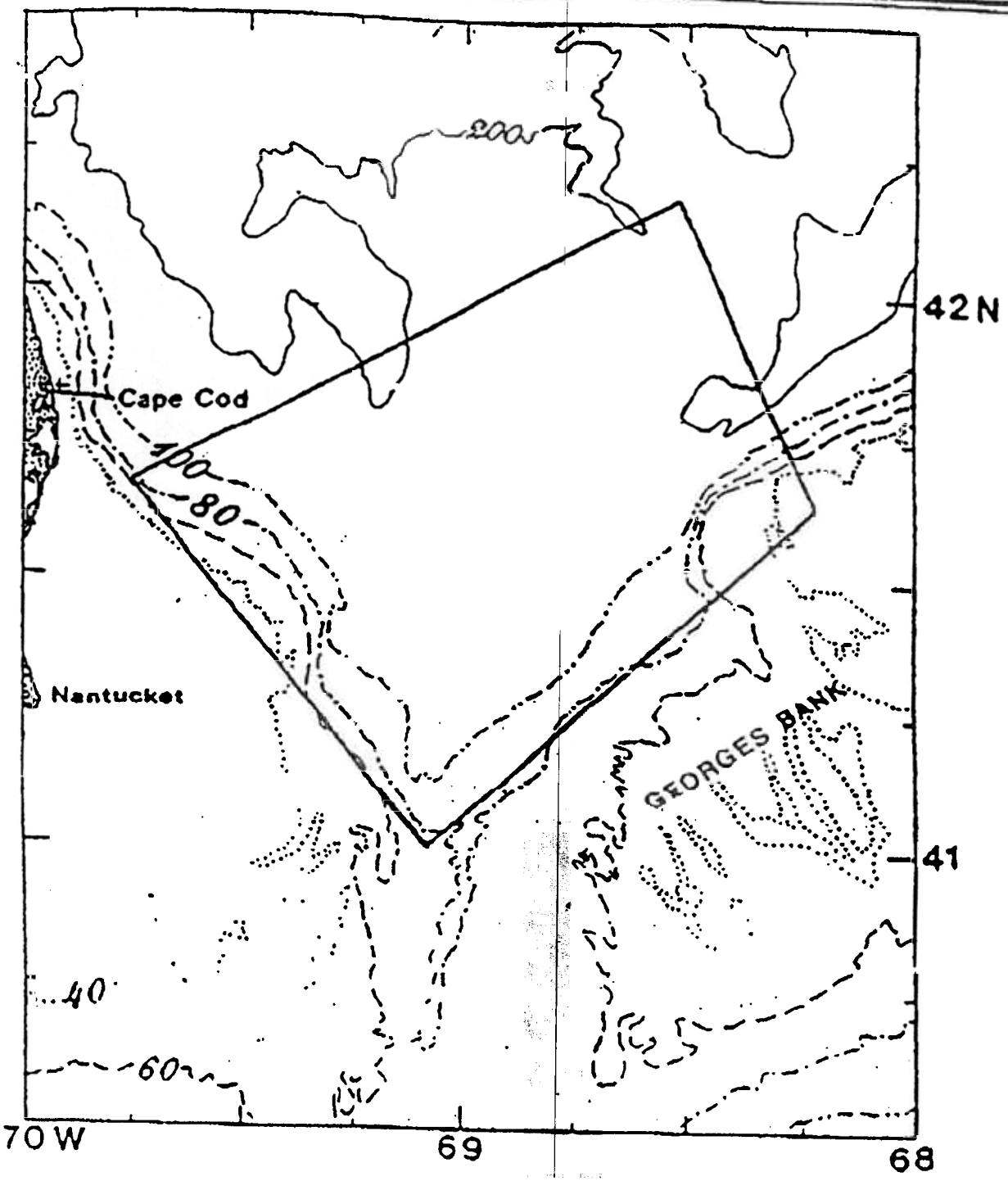


Figure 6: The area designated as critical habitat in the Great South Channel includes the area bounded by 41°40'N/69°45'W; 41°00'N/69°05'W; 41°38'N/68°13'W; and 42°10'N/68°31'W.

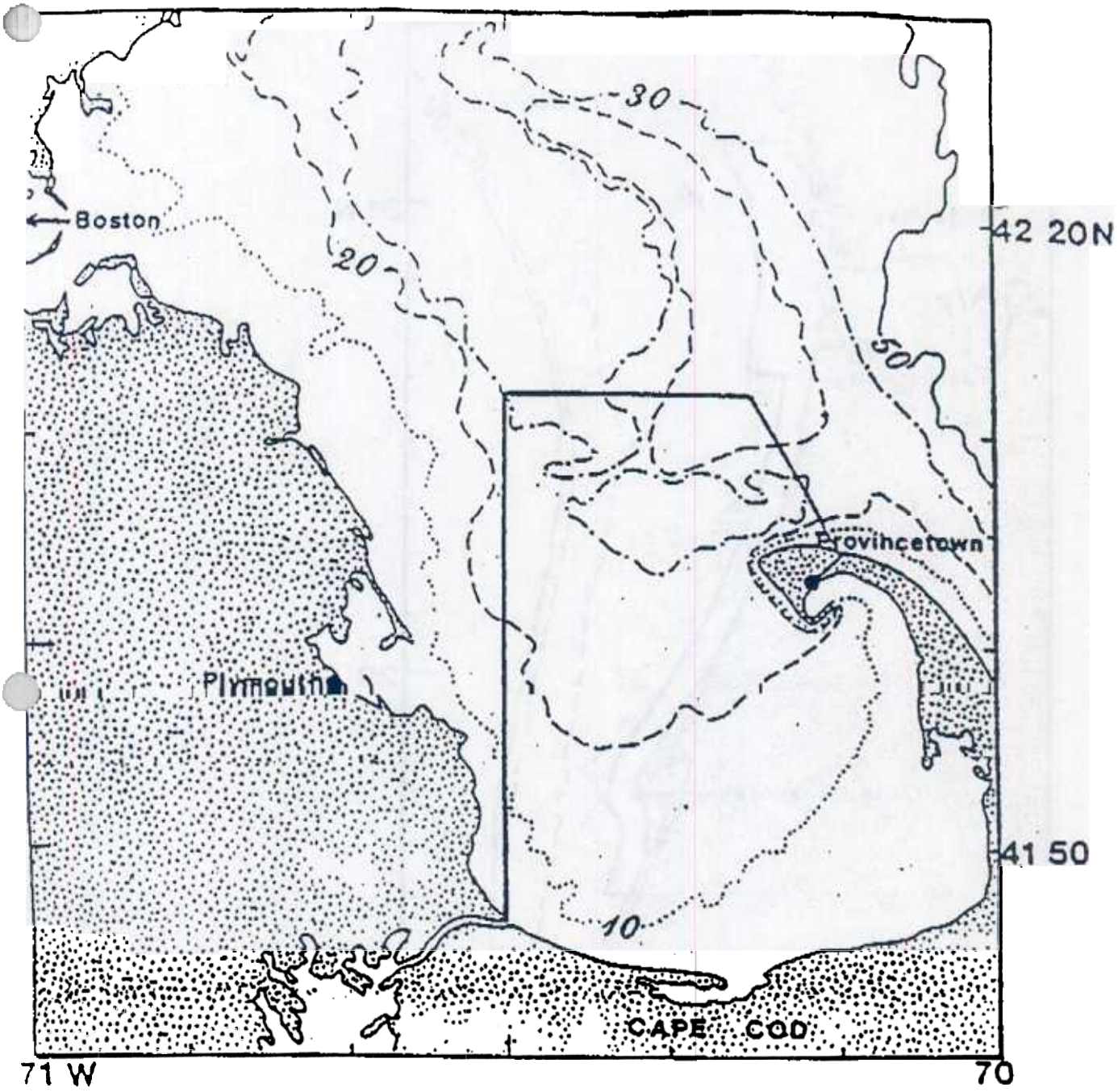


Figure 7. The area designated as critical habitat in Cape Cod Bay/Massachusetts Bay includes the area bounded by 42°04.8'N/70°10'W; 42°12'N/70°15'W; 42°12'N/70°30'W; 41°46.8'N/70°30'W; and on the south and east by the interior shore line of Cape Cod, MA.

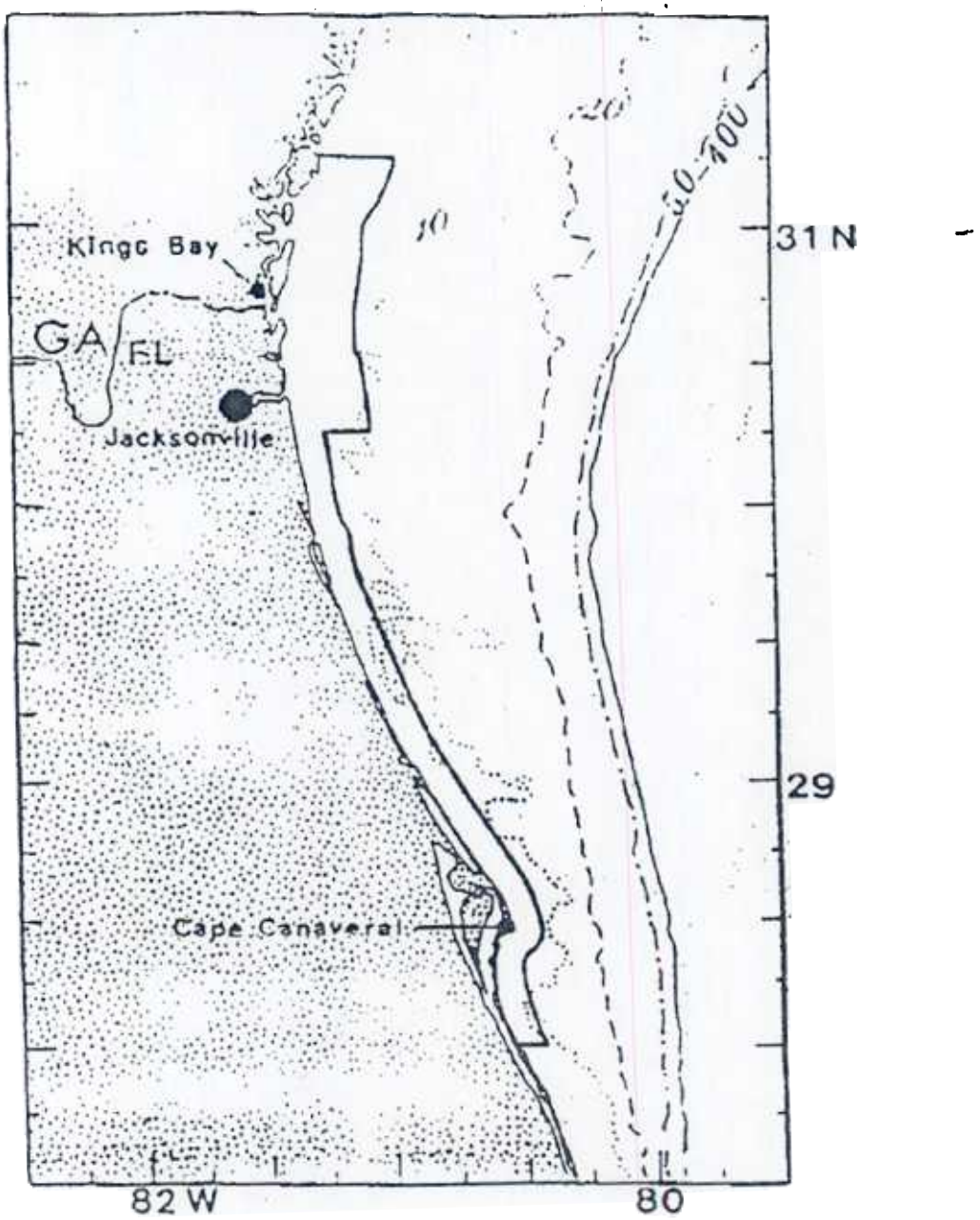


Figure 8. The area designated as critical habitat in the Southeastern United States includes waters between 31°15'N (approximately located at the mouth of the Altamaha River, GA) and 30°15'N (approximately Jacksonville, FL) from the shoreline out to 15 nautical miles offshore, and the waters between 30°15'N and 28°00'N (approximately Sebastian Inlet, FL) from the shoreline out to 5 nautical miles.

Appendix D

Draft Procedures for Handling Marine Mammal Bycatch in Pelagic Trawl Nets

1. Early detection of a marine mammal in the net is the key to enhancing its chance of survival. If a mammal-like or suspicious mark is detected on the net-sounder, haul back immediately.

2. During haul back, adhere to the fishery requirements for keeping the open net away from the surface. During net retrieval, always observe the codend carefully for the presence of a marine mammal. Do not hoist the bag out of the water if one is detected.

3. If the marine mammal appears viable and conditions allow, open the codend and release the mammal while it is still in the water. The risk of losing all or part of a catch is not a consideration here, only vessel and crew safety. If it is not possible to safely do this, retrieve the codend in a way that causes a minimum compression and stress on its contents. Split the catch, if appropriate, to allow individual handling of the marine mammal. If special hardware is required for this process, make sure it is rigged and available.

4. When on deck, do not hoist or dump the marine mammal. Instead, keeping the codend on deck, open it (cut meshes, if necessary) and ease the animal out and onto a marine mammal rescue sling (MMRS). This fabric sling should be used to protect the mammal from abrasion on the deck and support it during its return to the water.

5. If the marine mammal is carrying entanglements from fixed gear and it can be removed without further injury to the animal, then do so.

6. Identity the species of marine mammal and obtain information needed to complete the NMFS Marine Mammal Report Form.

7. Using the MMRS system, carefully return the marine mammal to the water by easing the animal and sling down the stern ramp or over the side, as appropriate. Use the MMRS trip line to pull the sling out from under the animal.

8. Observe the behavior of the marine mammal after release for entry in the Marine Mammal Report Form.

Draft Guidance for Marine Mammals Interactions with U.S. Pelagic Longline Gear*

1. Slow down or begin to stop vessel at first sighting or indication that a marine mammal may be on the line.

2. Alert crew members to man the rail in case they are needed. Two long gaffs should be available to recover the opposite side of the mainline as soon as it is accessible.

3. Proceed cautiously and smoothly then stop the vessel within range of the marine mammal.

4. Gently bring marine mammal alongside.

5. If a tangle exists, gaff up the other side of mainline and attach it to the vessel or a float ball in order to isolate the vessel and marine mammal from tension caused by gear remaining in the water.

6. Work the tangle off the marine mammal as smoothly and quickly as possible. Avoid sharp actions that may panic the animal. If a hook is involved, attempt to cut off the barb of the hook with long-handled bolt cutters, then cut the line as close to the hook as possible.

7. Remove all line from the marine mammal.

8. Designate a man to stand-by with an Identity Guide, a tape measure and, if possible, a camera to photograph the entangled marine mammal. Record as much information about the marine mammal as possible including: length, approximate girth, approximate weight, any sores or peculiarities, and tag numbers, if tagged.

9. Immediately following clearance of animal and securing to remainder of gear in the water, properly record all pertinent information concerning this interaction on the Marine Mammal Mortality/Injury Report Form. Include the following:

   Specifics of marine mammal (above)
   Details of interaction
   - tangled/hooked
   - specifics of any possible injuries:
   - was skin broken?
   - how did the animal act during interaction and upon release?
   - position on gear/mainline/ball drop/gangion
   - probable depth of segment involved

These guidelines are a draft to be circulated among active longliners for comment.

Observations in area
Other vessels reporting interactions with marine mammals in area

10. ***Move!*** The data show that if you have one marine mammal interaction, you are likely to have another if you stay in the same area. If you have one marine mammal interaction in a haulback or on consecutive days, or if by observation or via radio communication, other interactions have occurred on this particular edge or piece of water **Move**, rather that risk further interactions.

Appendix E

Executive Summary of

Acoustic Deterrence of Harmful Marine Mammal-Fishery Interactions: Proceedings of a Workshop held in Seattle, Washington, USA, 20-22 March 1996

Acoustic Deterrence of Harmful Marine Mammal-Fishery Interactions:

Proceedings of a Workshop held in Seattle, Washington, USA, 20-22 March 1996

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EXECUTIVE SUMMARY

A workshop was held in Seattle, Washington, 20-22 March 1996, to consider problems and uncertainties related to the use of acoustic deterrents in the conservation and management of marine mammals. Acoustic deterrent devices have been used to help solve two distinct types of fishery-marine mammal conflict: (1) bycatch of marine mammals in fishing gear, and (2) depredation by marine mammals on fish caught in fishing gear, confined in aquaculture enclosures, or aggregated or constrained at "choke points" in river systems. Acoustic alarms (mainly small, low-intensity sound-generators called "pingers") have been developed for "alerting" marine mammals to the presence of fishing gear, with the goal of reducing bycatch rates. High-intensity acoustic "harassment" devices (AHDs) have been used widely to reduce depredation on fish, especially by pinnipeds.

The workshop's main objectives were to: (a) evaluate experimental and other evidence concerning the efficacy of acoustic deterrents in preventing or reducing interactions between marine mammals and fisheries, including aquaculture operation; (b) identify critical uncertainties about the effectiveness of acoustic deterrent devices and their effects on marine mammals and other biota; (c) identify and establish priorities for relevant research; and (d) develop guidelines for when, how, and under what conditions acoustic deterrents should be incorporated into management. Workshop participants included representatives of the fishing industry, environmental groups, and manufacturers of acoustic deterrent devices, staff members from government agencies in the United States, Canada, and Australia, and scientists from seven countries and 21 institutions. Participants broke into working groups with specific terms of reference, and the reports of the working groups are included as part of the overall workshop report.

Bycatch Issues

The results of a controlled experiment with pingers in the Gulf of Maine sink gillnet fishery in 1994 were the focus of the bycatch discussions. In this experiment, nets with active pingers caught significantly fewer harbor porpoises than control nets. It was generally agreed that pinger use offers a promising means of reducing the bycatch of harbor porpoises in this type of fishery. The results of another experiment off Washington and an experimental fishery in the Gulf of Maine in 1995 were consistent with those of the 1994 Gulf of Maine study. There was a strong consensus that pinger use should be incorporated immediately into the management regime for the Gulf of Maine sink gillnet fishery. It was expected that full-scale pinger deployment could achieve a sufficient reduction in the harbor porpoise bycatch to meet the requirements of the 1994 amendments to the Marine Mammal Protection Act (MMPA). However, higher than anticipated numbers of harbor porpoises were caught in experimental fisheries in Massachusetts Bay and on Jeffreys Ledge in spring 1996, following the workshop. Thus, the expectation may not be valid. If pingers are not efficacious, the only other apparent means of meeting the requirements would involve large-scale, time-area fishery closures in the Gulf of Maine.

Although pingers are already being used extensively by fishermen outside the Gulf of Maine on an *ad hoc* basis, there is much uncertainty about their long-term efficacy and about their efficacy in fisheries that involve marine mammal species other than the harbor porpoise.

Participants strongly urged against regarding the pinger as a panacea for reducing bycatch. They pointed out that, in the Gulf of California (Mexico) where the critically endangered vaquita is threatened by fishery bycatch, the introduction of pingers as a substitute for fishery closures would be ill-advised (and possibly disastrous). For the present, the only situations where pingers can reasonably be expected to significantly reduce bycatch are fixed gillnet fisheries in which the harbor porpoise is the main species of concern.

It is uncertain how long-lasting the efficacy of pingers will prove to be in a given fishery. Will the target animals (e.g., harbor porpoises) become less responsive to the alarm effect of the pingers over time? It also is uncertain how pingers may affect non-target species. While the potential benefits of a pinger program seem fairly clear – reduced harbor porpoise mortality, continuation of the fishery – the environmental costs are less clear. Until the uncertainties are resolved, both the bycatch and the status of the affected marine mammal populations should be closely monitored.

The workshop concluded that this is an appropriate time for carefully designed pinger experiments in the drift gillnet fisheries for swordfish and other pelagic species off California and New England. These fisheries differ in many ways from sink gillnet fisheries and involve bycatch of a greater variety of marine mammal species (including some that are endangered or threatened). The experimental design should include: use of the currently standard pinger, placed and deployed according to the particular conditions in these fisheries; randomization of active and dummy pingers between sets from the same vessel; power analysis, in advance, to determine necessary sample sizes and observer coverage; and single-blind controls, with only the on-board observers knowing whether the pingers on a given set are active or not.

The workshop also concluded that pinger experiments in coastal gillnet fisheries along the U.S. east coast south of the Gulf of Maine would be premature at present. Substantially more information is needed about fishery characteristics and bycatch before scientifically rigorous experiments can be designed.

The use of acoustic devices to reduce baleen whale mortality in fishing gear (particularly humpback whales in Newfoundland cod traps) was not discussed in detail. Available information indicates that entanglement and mortality have been substantially reduced due to a combination of factors, including the routine use of acoustic devices by fishermen. The workshop concluded that there were no critical uncertainties requiring priority attention in this regard.

Depredation Issues

Although the MMPA originally allowed fishermen and fish farmers to use lethal force against predators to protect their catch, gear, and stock, they are no longer allowed to do so under the 1994 amendments to the Act. Thus, the pressure to develop non-lethal deterrent methods has increased. As wild fish stocks decline, and aquaculture enterprises and pinniped populations increase, the conflicts are bound to become more numerous and more intense.

Since the early 1980s, AHDs have been used throughout the aquaculture industry in North America to combat depredation by otariids (California and Steller sea lions, west coast only) and phocids (harbor seals, both coasts; gray seals, east coast only). They have also been used in some fisheries to keep pinnipeds away from caught fish and from natural or artificial aggregations of fish. Workshop discussion centered on two aspects of the use of AHDs: (1) whether it achieves the desired result, and (2) the degree to which it may negatively affect marine mammals, including ones that are not involved in the depredation, and other biota.

AHDs used during the 1980s and early 1990s typically had the desired effect of keeping pinnipeds away from the protected sites, but only for a relatively short time. After several weeks of effective deterrence, the pinnipeds would become less responsive to the AHDs. In fact, the acoustic signal of an AHD often was interpreted as having a "dinner bell" effect, alerting predators to the presence of a fish pen, trap, or net. It then became necessary to alter the signal (which usually meant increasing the output), move the transducers, or resort to other means of deterrence., including shooting the animals. New, very high-intensity AHDs (e.g., a device now being marketed by Airmar Technology Corporation transmits a signal of 10 kHz at an average output of 194 dB re 1μPa at 1 m) are reported to have remained effective for at least two years. (Reference to brand names or companies is not intended to be a product endorsement.)

Pinnipeds are difficult to deter by acoustic means. They tend to accommodate reasonably quickly to loud noise, which may be explained either by threshold shifts in hearing or by "habituation," perhaps both. The new high-intensity AHDs have greater potential for causing hearing damage and for affecting non-target species. They therefore should be used cautiously until their effectiveness and potential side-effects are determined.

A problem involving depredation by killer whales on longline catches of sablefish (black cod) in Prince William Sound and the Bering Sea was also discussed briefly. It was suggested that changes in fishery practices and gear modifications were more likely than the use of AHDs to resolve this conflict.

General Issues

Workshop participants concluded that there was reasonable evidence that pingers significantly reduce the bycatch of harbor porpoises in gillnets and that AHDs, when properly deployed and of sufficient power output at appropriate frequencies, may be effective in reducing levels of pinniped depredation on fish. Also, it was recognized that pingers, possibly in combination with acoustic reflectors of some kind, may prove useful in reducing bycatch of other marine mammal species in other types of fisheries. Participants repeatedly emphasized, however, that artificial sound should be introduced into the underwater environment only when the costs and benefits of doing so are clearly understood and only after the potential ecological consequences have been carefully considered. The state of knowledge about marine mammal hearing abilities and behavior in response to various types of sound is limited. It is therefore extremely difficult to evaluate either the long-term effectiveness or the side-effects of any acoustic deterrent device. Much more research and monitoring is required before such evaluations can be made with a high degree of confidence. A number of suggestions were made regarding the potential future use of acoustic deterrent devices.

To meet the intent and provisions of the MMPA, without at the same time causing severe economic distress in fishing communities, approaches to management should be both inclusive and adaptive. Much of the responsibility for developing and implementing solutions to the problems of marine mammal-fishery interactions resides with the fishing and aquaculture industries themselves. Thus, fishermen and fish farmers need to be included in the planning and conduct of research, the interpretation of results of field experiments, and the development of management measures. Moreover, management regimes need to be adaptive in nature. In other words, regulatory measures need to be updated routinely to incorporate new knowledge and new technologies. Long-term monitoring is an essential element of adaptive management. Innovation should be supported and encouraged, and rigorous testing should be required before new technologies are deployed as part of fishery and marine mammal management programs.

Appendix F

Strategies Discussed But Not Selected

Vessel Incentives Program : Demonstration of meeting marine mammal bycatch goal would lead to incentives such as tax credits, fish quota

Days at sea: Quota on time at sea, develop regulations based on historical effort to determine number of days at sea, could be linked to marine mammal takes

Individual Transferable Quotas (ITQs) for Target Species: Each vessel gets a certain fish quota that can be caught, sold, or traded.

Fishing according to lunar cycles: Driftnet season would be controlled by the lunar cycles such that there would be no fishing for 5 days on either side of the full moon. The seasons would begin six days after the full moon closest to the usual start dates of January 1, for the winter season, and July 1, for the summer season. Throughout the season, no fishing would occur during the 5 days before and the 5 days after the full moon.

Reduce fishery infrastructure: Reduce the onshore infrastructure that supports the fisheries through buyouts of shipbuilding and repair yards. This strategy would also include re-training.

Research and development of Active Acoustical Deterrent Devices: Support longline efforts to research and develop an active acoustical deterrent to reduce pilot whale predation

Define three geographical pelagic longline regions within the U.S. EEZ: Divide the Atlantic Ocean, Caribbean, and Gulf of Mexico pelagic longline fisheries for swordfish, tuna, and sharks into three regional fisheries on NMFS s List of Fisheries

Tagging released mammals: Generate data on survivability and general migration routes for strategic marine mammal stocks

Marine Mammal Caps: Set a limit on the number of strategic marine mammals that a vessel can interact with and require cessation of fishing for the balance of the season for a vessel that reaches that limit.

Appendix G

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