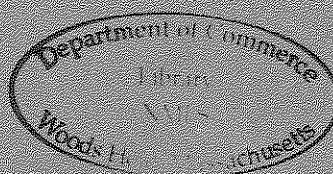


NOAA Technical Memorandum NMFS-F/NER-5

Summary of the Workshop on Harbor Porpoise Mortalities and Human Interactions

*19-20 May 1993, Smithsonian Institution
Washington, DC*



U. S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region
Northeast Regional Operations Office
Gloucester, Massachusetts

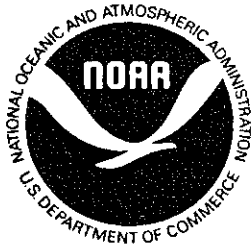
August 1993

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ERRATA

- (1.) p. iii, List of Figures, Figure 11:
change "VMSM931021" to "VMSM931017"
- (2.) p. 14, Figure 11:
change "VMSM931021" to "VMSM931017"



NOAA Technical Memorandum NMFS-F/NER-5

This TM series is used for documentation and timely communication of preliminary results, interim reports, or special purpose information, and has not undergone external scientific review.

Summary of the Workshop on Harbor Porpoise Mortalities and Human Interactions

*19-20 May 1993, Smithsonian Institution,
Washington, DC*

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Gloucester, Massachusetts

August 1993

NOTE ON SPECIES NAMES

The NMFS Northeast Region's policy on the use of species names in technical publications and reports is to follow the American Fisheries Society's (AFS) lists of scientific and common names for fishes (Robins *et al.* 1991)^a, mollusks (Turgeon *et al.* 1988)^b, and decapod crustaceans (Williams *et al.* 1989)^c, and to follow the American Society of Mammalogists' list of scientific and common names for marine mammals (Wilson and Reeder 1993)^d. This policy applies to all issues of the *NOAA Technical Memorandum NMFS-F/NEC* and *-F/NER* series.

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- ^a Robins, C.R. (chair); Bailey, R.M.; Bond, C.E.; Brooker, J.R.; Lachner, E.A.; Lea, R.N.; Scott, W.B. 1991. Common and scientific names of fishes from the United States and Canada. 5th ed. *Amer. Fish. Soc. Spec. Publ.* 20; 183 p.
- ^b Turgeon, D.D. (chair); Bogan, A.E.; Coan, E.V.; Emerson, W.K.; Lyons, W.G.; Pratt, W.L.; Roper, C.F.E.; Scheltema, A.; Thompson, F.G.; Williams, J.D. 1988. Common and scientific names of aquatic invertebrates from the United States and Canada: mollusks. *Amer. Fish. Soc. Spec. Publ.* 16; 277 p.
- ^c Williams, A.B. (chair); Abele, L.G.; Felder, D.L.; Hobbs, H.H., Jr.; Manning, R.B.; McLaughlin, P.A.; Pérez Farfante, I. 1989. Common and scientific names of aquatic invertebrates from the United States and Canada: decapod crustaceans. *Amer. Fish. Soc. Spec. Publ.* 17; 77 p.
- ^d Wilson, D.E.; Reeder, D.M. 1993. Mammal species of the world: a taxonomic and geographic reference. Washington, DC: Smithsonian Institution Press; 1206 p.

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INTRODUCTION

Sixty-four harbor porpoise (*Phocoena phocoena*) strandings were reported from Maine to North Carolina between January and June, 1993 (Table 1, Figure 1). Fifty of these harbor porpoises stranded in the Mid-Atlantic region (New York - North Carolina) between 23 February and 15 May 1993 (Figures 2-6). The majority of strandings were reported from Virginia in April (n=10, Table 2). On the basis of preliminary reports that recovered carcasses incurred strange cuts and unusual body damage, the Northeast Region of the National Marine Fisheries Service (NMFS) convened a workshop on harbor porpoise mortalities and human interactions.

Significant management interest in this species and these strandings stems from a recent proposal to list the Gulf of Maine harbor porpoise population as threatened under the Endangered Species Act.¹ NMFS submitted this proposal due to the high number of harbor porpoise mortalities in the Gulf of Maine sink gillnet fishery. The widespread occurrence of harbor porpoise strandings in 1993 along the Mid-Atlantic coast suggested that fisheries interactions might be occurring outside the Gulf of Maine and Bay of Fundy.

There were two primary goals proposed for the workshop. First, we sought to determine if any of the stranded harbor porpoises exhibited signs of human interactions. Second, we aimed to develop a reliable protocol for making objective assessments of human-induced marine mammal mortalities. We also wanted to ensure that indications of human interactions were reported consistently. Hare and Mead's (1987) report on determination of adverse human-marine mammal interactions was used as a springboard for group discussions and final protocol development.

METHODS

The two-day harbor porpoise workshop was held at the Smithsonian Institution in Washington, D.C., on 19 and 20 May 1993. Invited workshop participants included members of the Northeast Region Stranding Network and the NMFS Northeast Region. A list of all workshop attendees is shown in Appendix A. The workshop organization included: group discussion regarding recent harbor porpoise strandings and an overview of active commercial fisheries in the Mid-Atlantic, relevance of strandings to the Marine Mammal Exemption Program, and development of means of determining mortality due to human intervention. The remainder of the workshop was devoted to external examinations of harbor porpoises and a necropsy session. Appendix B is the workshop agenda.

Twenty-one harbor porpoise carcasses from the Mid-Atlantic strandings were used as workshop specimens (Table 3). The condition of the carcasses ranged from fresh to skeletal remains (conditions 2-5 on the Smithsonian Institution scale). On the first day of the workshop, car-

cases were inspected for external markings and an initial assessment of the origin of any penetrating wounds. Researchers familiar with harbor porpoise biology and necropsy techniques described various lesions and the general body condition of the animals. During the external examination, determinations were made of the general body condition, sex, and age of the specimens. Each animal was photographed, and, when possible, total length was obtained. In many cases, the carcasses were either decomposed, missing body parts, or had minimal tissues remaining on the skeletons, so that it was impossible to get a full suite of morphometric measurements on all specimens.

A necropsy session of suitable harbor porpoise carcasses and heads occurred on the second day of the workshop. Again, the poor condition of most specimens precluded a full necropsy of all specimens. Nevertheless, workshop participants collected as much data from internal examinations as possible. Necropsy protocols from Dr. Andrew Read (Woods Hole Oceanographic Institution) and the Smithsonian Institution (Appendix C) were used during the workshop.

In addition to the standardized protocols, workshop participants experimented with the use of a protocol for evaluating human interactions with marine mammals. The protocol evolved over the course of the two-day workshop based on discussions and carcass examinations.

RESULTS

Thirteen carcasses and eight harbor porpoise heads were examined during the workshop. Sex, length, and remarks for each specimen are shown in Table 3. Morphometrics, to the extent possible, and photographs were collected from each specimen. Teeth, blubber, fat, skin, gonads, skulls, and stomach contents were collected from some of the animals. Table 4 contains a list of samples collected from workshop specimens.

Forty-eight percent (n=10) of the 21 workshop specimens were male, 33 percent (n=7) were female and 19 percent (n=4) were too decomposed to determine gender. The males with complete carcasses ranged in length from 112 to 123 cm, with an average length of 114.4 cm. Total lengths from three of the male specimens were not available and were not included in this range. The females ranged in length from 108 to 121 cm, with an average length of 114.9 cm. Based on their lengths, all these animals appear to be less than one year of age (Read and Gaskin 1990).

The experimental protocol for evaluating human interactions with small cetaceans was refined based on workshop discussions and necropsy observations. The final protocol (Appendix D) contains a list of external and internal signs that should be reviewed prior to making a determination of human-induced mortality.

Five animals (MMSC93-40, 93MMAOPP06, VMSM931021, VMSM931018, and VMSM931017) ex-

¹ See *Federal Register*, vol. 58, no. 4, p. 3108-3120.

hibited signs of human interaction. The condition of the remaining harbor porpoises prevented making determinations of cause of death. Several specimens that were reported as "headless" incurred extensive scavenger damage to the head, but their skulls were intact. An internal examination of specimen MMSC93-40 revealed subdermal trauma and hemorrhage in the head region (Figure 7). A small cut was also associated with this damage. Specimen 93MMAOPP06 contained probable net marks on the flukes (Figure 8). VMSM931018 had marks on the dorsal surface that may have been the result of a fishery interaction (Figure 9). VMSM931021 contained numerous penetrating wounds and was missing its dorsal fin (Figure 10). VMSM931017 was the severed posterior third of a harbor porpoise (31 cm) exhibiting unusual damage (Figure 11). It could not be determined if the damage occurred pre- or post-mortem. This harbor porpoise was discovered near the outfall of a hydraulic dredge in Virginia Beach, VA (Barco, personal communication).²

DISCUSSION

Harbor porpoises are known to be taken incidentally in gill nets along the Atlantic coast (Read and Gaskin 1988; Read, in press). Documented information regarding incidental takes of harbor porpoises or other marine mammals in the inshore Mid-Atlantic gillnet fisheries is limited. However, in recent years harbor porpoises were reported entangled in gill nets in Chesapeake Bay and along the New Jersey coast.³ It was this knowledge, along with early reports about apparent mutilation of harbor porpoise carcasses, that raised concerns that the 1993 strandings were related to a Mid-Atlantic net fishery. Furthermore, compared to previous records of harbor porpoise strandings (Polachek and Wenzel 1990), an unprecedented number of harbor porpoise strandings have occurred from New Jersey to North Carolina to date this year (Swingle, personal communication⁴; Schoelkopf, personal communication⁵; Thayer, personal communication⁶). One of the dominant fisheries in the New Jersey - North Carolina region is the American shad coastal gillnet fishery. Ocean harvest of shad usually begins in early or mid-February, and continues until mid-April or mid-May (Harris and Rulifson 1989). The seasonality of this fishery varies by state and also by year as fish migration can occur earlier or later depending on water temperature. It is often difficult to obtain conclusive evidence of a fishery interaction from stranded animals, so better information needs to be gathered to identify more precisely when and where gillnet fisheries are operating, and

whether or not harbor porpoises are being taken incidentally in the Mid-Atlantic area.

Initial reports indicated that fisheries or other human interactions contributed to the mortality of stranded harbor porpoises, but most specimens examined during this workshop were too decomposed to assign cause of death. Our findings underscore the importance of exercising caution when assessing the potential for human interactions. Careful examination of carcasses is necessary to discriminate between scavenger damage versus anthropogenic marks. Noting the overall condition of a stranded animal is also an important factor for consideration. Most of the animals examined during this workshop were in an advanced state of decomposition. Potentially, bird predation and/or decomposition could have removed any signs of human intervention.

Examples of trauma resulting from human interactions with marine mammals are described in Hare and Mead (1987), including net entanglement, vessel collision, gunshot wounds, and explosions. Hare and Mead show figures depicting examples of external marks from monofilament nets, propellers, ropes, and internal lesions. This information should be reviewed before completing the data sheet on human interactions shown in Appendix D. Other factors that should be considered when making a final determination regarding cause of death include reporting sources (*i.e.*, how reliable?), precise location of stranding, and presence of fishing gear. Photographs must be taken to document original markings in case new marks appear or original marks disappear during handling of the carcass. For example, body parts may be removed from an animal after stranding, or rope marks may appear on carcasses that are deliberately tied for transport or anchoring purposes.

Information collected from this two-day harbor porpoise necropsy workshop can be used to facilitate future investigative sessions on stranded animals. Workshop participants recommended that future research test the utility of the protocol by comparing animals that were known to have been incidentally caught in a fishery with animals whose cause of death is unknown. Further documentation of external and internal marks on incidentally caught animals is still required. Copies of the protocol data sheets will be printed and distributed by the NMFS Northeast Region to all stranding networks.

Strandings provide an important means of gathering data from cetaceans. Organized necropsy sessions allow researchers, managers, and volunteers a unique opportunity to learn about cetacean biology and mortality factors. This workshop illustrated the value of the stranding network as a reliable and timely reporting source and collector of vital information. Workshop participants were able to gather

² S. Barco, Virginia Marine Science Museum, Virginia Beach, VA.

³ See *Federal Register*, vol. 57, no. 11, p. 1900-1904.

⁴ M. Swingle, Virginia Marine Science Museum, Virginia Beach, VA.

⁵ R. Schoelkopf, New Jersey Marine Mammal Stranding Center, Brigantine, NJ.

⁶ V. Thayer, National Marine Fisheries Service, Beaufort, NC.

data from specimens even in the poorest condition. These data, in connection with life history information collected from bycatch animals, contribute to a greater knowledge of the species involved. The Northeast Region Stranding Network's participation in this workshop provided a useful opportunity to encourage members to document human-related interactions using standardized methods.

ACKNOWLEDGMENTS

The NMFS Office of Protected Resources and Northeast Region sponsored this workshop, and invited workshop participants. The Northeast Region Stranding Network members and Vicki Thayer (NMFS Beaufort Laboratory; Southeast Region Stranding Network) deserve thanks for collection, initial reporting, and transport of specimens to the Smithsonian Institution. Charley Potter (Smithsonian Institution) assisted with organizing and running the workshop. Rob Nawojchik (Mystic Marinelife Aquarium) took photographs of workshop specimens. Bruce Wyman (New England Aquarium) constructed Figures 1-6. Greg Early (New England Aquarium), Aleta Hohn (NMFS Office of Protected Resources), and Charley Potter provided expert commentary during examination of carcasses, and reviewed this report. Finally, we wish to thank all of the workshop participants for their contributions and assistance during the workshop.

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Table 1. Reported harbor porpoise strandings from Maine to North Carolina during January-June 1993

Field No.	Latitude/Longitude	Date	State	County	Length	Sex	Remarks
MH-93424Pp	42°28'70°54'	02/14/93	Mass.	Essex	120 cm	M	
MH-93426Pp	@41°46'70°05'	02/17/93	Mass.	Barnstable	115.5 cm	M	
MH-93-442-Pp	41°57'70°33'	03/14/93	Mass.	Plymouth	150 cm	M	Plymouth Beach, Plymouth, MA; weight = 125 lb
MH-93-444-Pp	N/A	03/18/93	Mass.	Barnstable	170 cm	F	Barnstable, MA
MH-93-449-Pp	N/A	03/21/93	Maine	Cumberland	138 cm	F	S. Portland, ME; weight = 90 lb; animal wrapped in net; picked up by Coast Guard
MH-93-452-Pp	42°14'70°57'	03/30/93	Mass.	Norfolk	116 cm	M	Weight = 54 lb; one of two animals found in marsh
MH-93-451-Pp	42°14'70°57'	03/30/93	Mass.	Norfolk	117.5 cm	F	Weight = 56 lb
MH-93-455-Pp	42°51'70°49'	04/02/93	Mass.	Essex	130 cm	F	Stranded alive; died as New England Aquarium was en route
MH-93-496-Pp	?	05/10/93	N.H.	Seabrook	128 cm	F	Seabrook, NH; weight = 85 lb; incidental catch; observer #01418
SUPP9307	41°46'71°22'10"	05/10/93	R.I.	Bristol	110 cm	U	East Providence, RI; much of the soft tissue on head removed; eyes missing; flukes eroded
NY1041-93	40°35'24"/73°32'19"	04/23/93	N.Y.	Nassau	116.4 cm	U	Teeth removed; internal organs removed by scavengers; large holes on sides and abdomen
MMSC93-52	39°02'21"/74°46'00"	05/15/93	N.J.	Cape May	N/A	U	No skin on head; no appendages
MMSC93-50	39°16'31"/74°34'14"	05/12/93	N.J.	Cape May	85 cm[a]	M	Head and tail missing
MMSC93-49	39°20'00"/74°29'05"	05/11/93	N.J.	Atlantic	123 cm	U	
MMSC93-48	40°38'30"/74°10'00"	05/10/93	N.J.	Cape May	115 cm	M	
MMSC93-47	39°10'00"/74°40'50"	05/06/93	N.J.	Cape May	115.5 cm	U	
MMSC93-45	39°17'44"/74°33'51"	04/26/93	N.J.	Cape May	115.4 cm	F	Lungs mottled; line cuts on leading edge of fluke; gill net entanglement; robust animal
MMSC93-44	39°13'09"/74°38'22"	04/26/93	N.J.	Cape May	69 cm[a]	U	Upper torso only (rostrum to dorsal fin); isopod damage; gill net entanglement
MMSC93-42	39°12'37"/74°38'45"	04/24/93	N.J.	Cape May	113 cm	F	
MMSC93-41	39°10'19"/74°40'44"	04/23/93	N.J.	Cape May	90 cm[a]	M	Head missing; isopods in body cavity; gill net entanglement
MMSC93-40	39°16'00"/74°35'14"	04/23/93	N.J.	Cape May	118 cm	F	Line cuts on leading edge of flukes; throat and stomach loaded with fish
MMSC93-38	39°15'25"/74°36'00"	04/18/93	N.J.	Cape May	110 cm	F	Two teeth growing alongside first row of teeth in lower right jaw; net marks on tail
MMSC93-36	40°10'35"/74°00'47"	04/17/93	N.J.	Monmouth	108 cm	F	Possible net marks on fluke
MMSC93-34	39°12'58"/74°38'50"	04/11/93	N.J.	Cape May	112 cm	M	
MMSC93-21	39°54'45"/74°04'36"	03/17/93	N.J.	Ocean	118 cm	M	
MMSC93-20	39°09'01"/74°41'25"	03/13/93	N.J.	Cape May	123 cm	M	Lung infection
MMSC93-15	39°13'05"/74°38'20"	03/07/93	N.J.	Cape May	125 cm	U	
MMSC93-11	39°12'00"/74°39'05"	02/23/93	N.J.	Cape May	120.7 cm	F	Emaciated; dead several days
93MMAOPP08	37°52'75°26'	05/23/93	Va.	Accomack	107 cm	U	Animal almost completely skeletonized
93MMAOPP09	37°52'75°26'	05/23/93	Va.	Accomack	125 cm	U	Upper and lower jaw bones exposed; two animals
93MMAOPP06	38°05'75°12'	04/21/93	Md.	Worcester	117 cm	F	Net marks on leading edge of fins; lung abscesses; not a robust animal
93MMAOPP04	38°11'75°09'	03/11/93	Md.	Worcester	73 cm[a]	U	Skeleton tangled in net with bird skeleton; head and flippers not present; gill net around caudal peduncle
93MMAOPP01	38°25'75°04'	02/26/93	Md.	Worcester	113 cm	M	Numerous line marks and indentations on carcass, especially on the head, flipper, and peduncle
VMSM931027	37°57'15"/75°18'00"	06/02/93	Va.	Accomack	110 cm	U	Right lower jaw broken; skeletal remains only

[a]Reported length reflects length with missing tissue.

Table 1. Continued.

Field No.	Latitude/Longitude	Date	State	County	Length	Sex	Remarks
VMSM931023	37°51'30"/75°22'30"	05/19/93	Va.	Accomack	133 cm	?	
VMSM931021	36°42'20"/75°55'40"	05/08/93	Va.	Va. Beach	121 cm	F	
VMSM931020	37°57'80"/75°18'25"	05/93	Va.	Accomack	107 cm[a]	M	Carcass curled; flipper and scapula removed; mandible broken
VMSM931019	37°52'20"/75°23'00"	04/30/93	Va.	Accomack	107.5 cm	M	
VMSM931018	37°52'00"/75°24'30"	05/93	Va.	Accomack	112 cm	M	
VMSM931017	36°50'05"/75°58'15"	05/02/93	Va.	Va. Beach	31 cm[a]	M	Length = fluke notch to anus; found by Army Corps of Engineers near hydraulic dredge outfall; carcass had mud in body cavity; cuts are unusual for fishery
VMSM931016	37°29'75°39'	04/26/93	Va.	N. Hampton	115 cm	U	
VMSM931015	37°29'75°39'	04/26/93	Va.	N. Hampton	112 cm	U	Wallops Island, VA; more decomposed than others; left half of lower jaw missing
VMSM931011	37°51'20"/75°28'00"	04/22/93	Va.	Accomack	110 cm[a]	F	No head: fluke notch to center of dorsal fin = 58 cm, fluke notch to genital slit = 36 cm
VMSM931012	37°51'70"/75°27'20"	04/93	Va.	Accomack	93 cm[a]	U	No head: length = vertebral length minus skull
VMSM931013	35°52'10"/75°27'10"	04/93	Va.	Accomack	115 cm	F	Cleanly cut esophagus; collected skull; fluke notch to center of dorsal fin = 56 cm
VMSM931009	37°51'30"/75°27'50"	04/93	Va.	Accomack	115 cm	F?	Head and most of anterior, ventral region of body missing; no stomach; fluke notch to center of dorsal fin = 88 cm; fluke notch to genital slit = 58 cm
VMSM931014	35°52'10"/75°27'10"	04/93	Va.	Accomack	119 cm	M	No gonads or other internal organs; lower jaw missing; fluke has possible cuts
VMSM931008	36°55'45"/76°00'15"	04/21/93	Va.	Va. Beach	N/A	U	Some vertebrae and ribs with stringy tissue; no skull; harbor porpoise size
VMSM931007	36°36'30"/75°53'00"	04/10/93	Va.	Va. Beach	112 cm	M	Carcass missing head; sand bryozoans in forestomach, fish in main stomach; otoliths in pylorus
VMSM931005	36°44'00"/75°56'20"	03/28/93	Va.	Va. Beach	114.5 cm	M	Fishery interaction: cuts on leading edge of fluke
VMSM931003	36°43'10"/75°55'55"	03/25/93	Va.	Va. Beach	124.1 cm	M	Possible net scars; very thin; abrasions on head and flippers from hitting bulkhead?
VMSM931002	36°48'15"/75°57'50"	03/10/93	Va.	Va. Beach	121 cm	M	Large bites in abdominal and genital areas -- sharks; tip of fluke lobe missing
VMSM931001	36°43'50"/75°56'15"	03/03/93	Va.	Va. Beach	125.1 cm	M	Net marks on flippers and body
14-2-93DALP	35°33'07"/75°27'08"	02/24/93	N.C.	Dare	123.8 cm	M	Specimen in poor condition
16-3-93DALP	35°45'07"/75°32'03"	03/01/93	N.C.	Dare	117.9 cm	F	
17-3-93DALP	36°08'75°44'	02/25/93	N.C.	Dare	115 cm	M	
27-3-93HNSP	35°22'75°31'	03/17/93	N.C.	Dare	113.2 cm	M	Mandible broken; badly mauled by birds
29-3-93HNSP	35°30'75°29'	03/20/93	N.C.	Dare	112 cm	M	Head separate from carcass
32-3-93DALP	35°56'09"/75°42'08"	03/23/93	N.C.	Dare	121.9 cm	M	
36-3-93DALP	35°57'75°37'	03/26/93	N.C.	Dare	119.2 cm	U	
48-4-93DALP	35°56'09"/75°37'02"	04/11/93	N.C.	Dare	119.4 cm	M	Found tied to third-floor balcony of Travelers Inn Hotel, Nags Head, NC; rope around peduncle
52-4-93DALP	35°58'05"/75°37'00"	04/11/93	N.C.	Dare	40 cm[a]	F	Most of body missing; many fish bites
59-4-93DALP	36°04'04"/75°38'04"	04/29/93	N.C.	Dare	124 cm	M	
60-4-93CULP	36°15'03"/75°48'00"	04/29/93	N.C.	Currituck	117 cm	U	

[a]Reported length reflects length with missing tissue.

Table 2. Summary by state and month of reported harbor porpoise strandings from Maine to North Carolina during January-June 1993

State	Jan	Feb	Mar	Apr	May	Jun	Total
Maine	0	0	1	0	0	0	1
New Hampshire	0	0	0	0	1	0	1
Massachusetts	0	2	4	1	0	0	7
Rhode Island	0	0	0	0	1	0	1
Connecticut	0	0	0	0	0	0	0
New York	0	0	0	1	0	0	1
New Jersey	0	1	3	8	5	0	17
Delaware	0	0	0	0	0	0	0
Maryland	0	1	1	1	0	0	3
Virginia	0	0	4	10	7	1	22
North Carolina	0	2	5	4	0	0	11
Total	0	6	18	25	14	1	64

Table 3. Harbor porpoise specimens necropsied at the Workshop on Harbor Porpoise Mortalities and Human Interactions held 19-20 May 1993

Field No.	Skull Only	Length	Sex	Remarks
MMSC93-50	No	85 cm ^a	M	Strange marks on lower half of animal; dorsal fin looks to have been cut, but hard to say because of decomposition; animal was in worst shape: no teeth, no flesh on head
MMSC93-49	No	123 cm	U	"Headless" animal; upper and lower jaws present; also missing its dorsal fin, could be rotting; thick blubber and nuccal fat.
MMSC93-48	No	115 cm	M	Very decomposed, looks to have been floating for some time based on "cooked" appearance; no teeth; left side of reproductive system missing; immature animal
MMSC93-47	Yes	115.5 cm	U	Head only
MMSC93-45	No	115.4 cm	F	9-10 mo old based on hollowness of tooth
MMSC93-40	Yes	118 cm	F	Subdermal trauma to head; internal hemorrhaging in head region associated with small cut; not much fat
MMSC93-38	Yes	110 cm	F	Harbor porpoise skull; good layer of nuccal fat--sign that animal was in excellent condition
MMSC93-36	Yes	108 cm	F	Head only
MMSC93-34	Yes	112 cm	M	Head only
MMSC93-20	Yes	123 cm	M	Head only
93MMAOPP06	No	117 cm	F	Immature animal; little fat; very thin
VMSM931021	No	121 cm	F	Weight = 23.75 kg; immature; part of head tissue gone; nuccal fat present; robust animal; dorsal fin missing; heavy bird damage on head; looked like it had an empty stomach
VMSM931020	No	107 cm ^a	M	
VMSM931019	No	107.5 cm	M	
VMSM931018	No	112 cm	M	Weight= 19.75 kg; full stomach, had just vomited before death; cuts behind head; cuts along leading edge of pectoral fins; no bruising underneath; much nuccal fat present
VMSM931017	No	31 cm ^a	M	Half of an animal -- severed posterior end; odd wounds
VMSM931014	Yes	119 cm	M	
VMSM931013	Yes	115 cm	F	
VMSM931012	No	93 cm ^a	U	
VMSM931008	No	N/A	U	
VMSM931007	No	112 cm	M	

^a Reported length reflects length with missing tissue.

Table 4. Summary of samples collected from necropsied harbor porpoise specimens at the Workshop on Harbor Porpoise Mortalities and Human Interactions held 19-20 May 1993

Field No.	Photos	Morpho- metrics	Teeth	Blubber	Fat	Skin	Gonads	Skull	Stomach
MMSC93-50	Yes	Yes	Absent	No	No	Yes	Yes	Absent	Yes
MMSC93-49	Yes	Yes	No	No	No	No	No	No	Yes
MMSC93-48	Yes	Yes	No	No	No	Yes	Yes	No	No
MMSC93-47	Yes	Yes	Yes	No	No	No	No	No	Yes
MMSC93-45	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
MMSC93-40	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes
MMSC93-38	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No
MMSC93-36	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No
MMSC93-34	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No
MMSC93-20	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
93MMAOPP06	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
VMSM931021	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
VMSM931020	Yes	Yes	Yes	No	No	No	No	No	No
VMSM931019	Yes	Yes	Yes	No	No	No	No	Yes	No
VMSM931018	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
VMSM931017	Yes	Yes	No	No	No	Yes	No	No	No
VMSM931014	Yes	Yes	Absent	No	No	No	No	Yes	No
VMSM931013	Yes	Yes	Yes	No	No	No	No	No	No
VMSM931012	Yes	Yes	No	No	No	No	No	No	No
VMSM931008	Yes	Yes	No	No	No	No	No	No	No
VMSM931007	Yes	Yes	No	No	No	No	No	No	No

Figure 1. Locations of reported harbor porpoise strandings from Maine to North Carolina during January-June 1993. (Each triangle represents one stranding.)

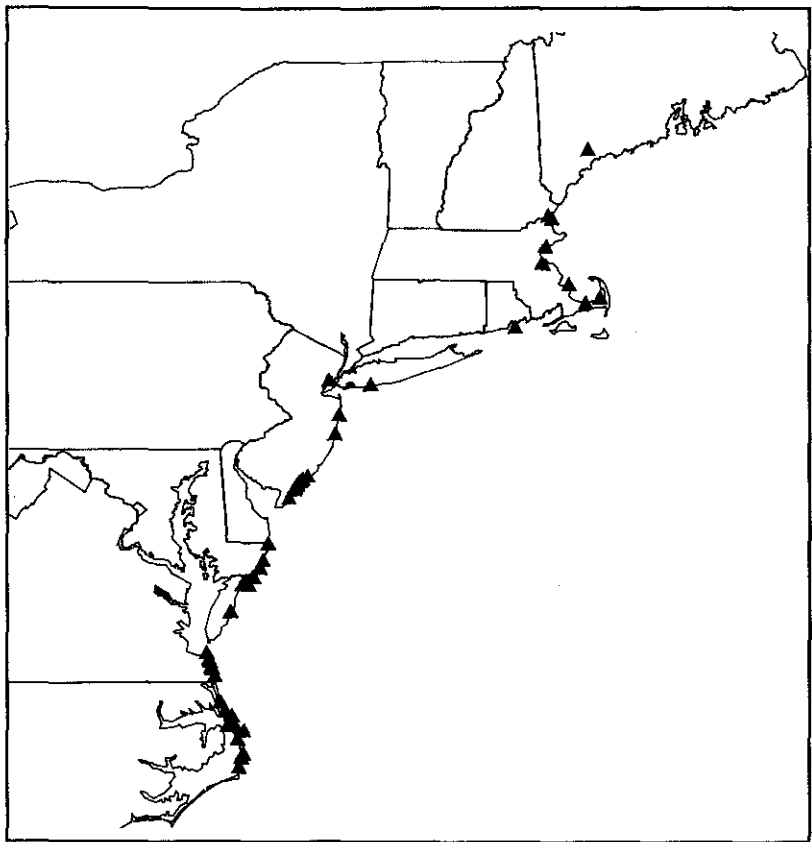
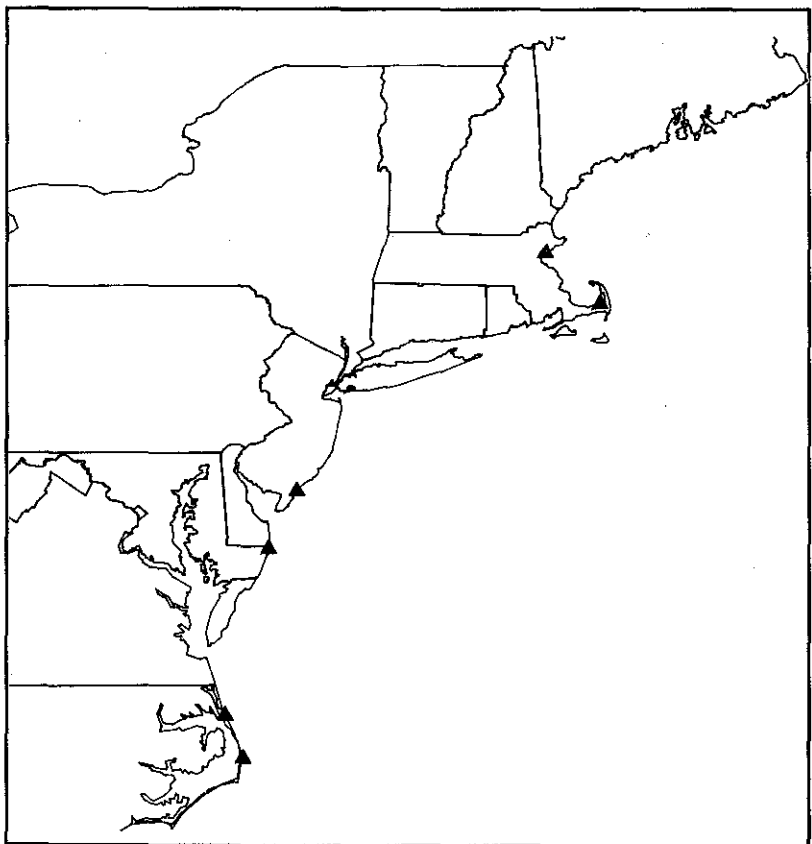


Figure 2. Locations of reported harbor porpoise strandings from Maine to North Carolina during February 1993. (Each triangle represents one stranding.)



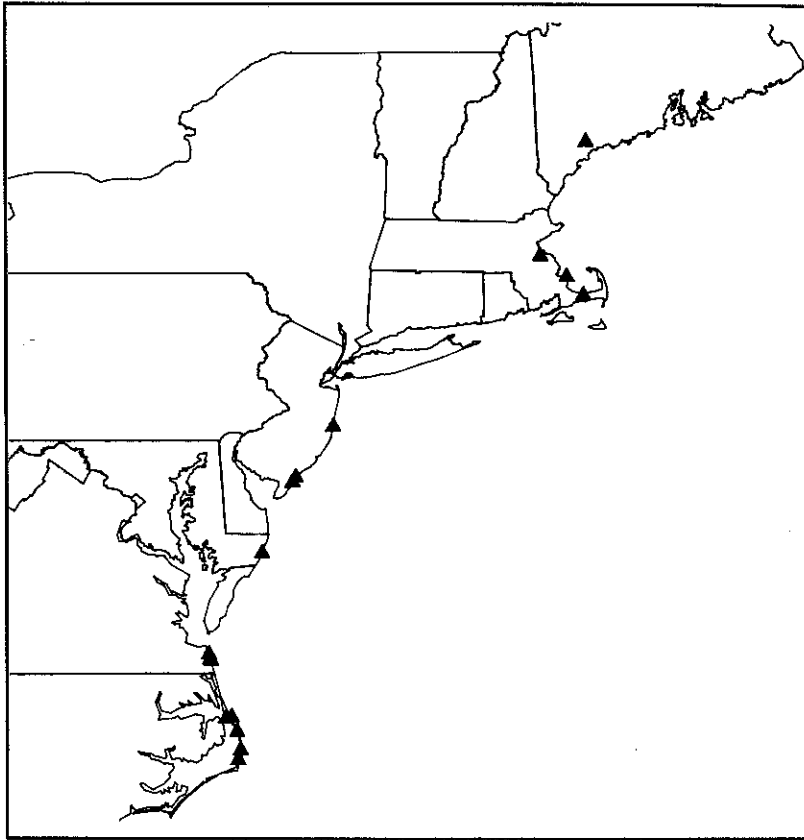


Figure 3. Locations of reported harbor porpoise strandings from Maine to North Carolina during March 1993. (Each triangle represents one stranding.)

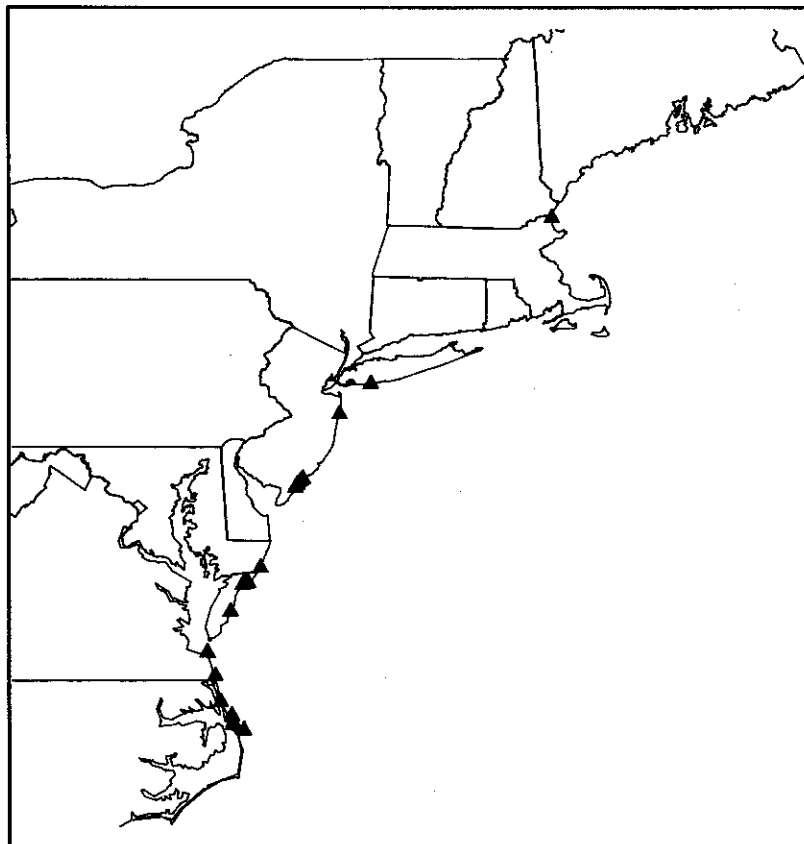


Figure 4. Locations of reported harbor porpoise strandings from Maine to North Carolina during April 1993. (Each triangle represents one stranding.)

Figure 5. Locations of reported harbor porpoise strandings from Maine to North Carolina during May 1993. (Each triangle represents one stranding.)

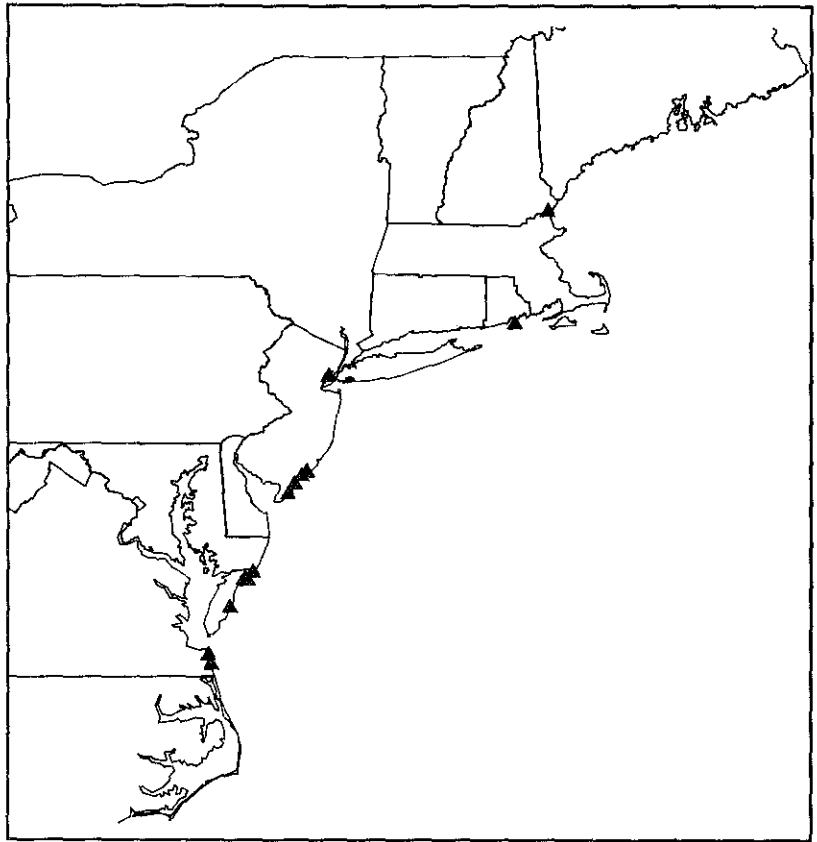
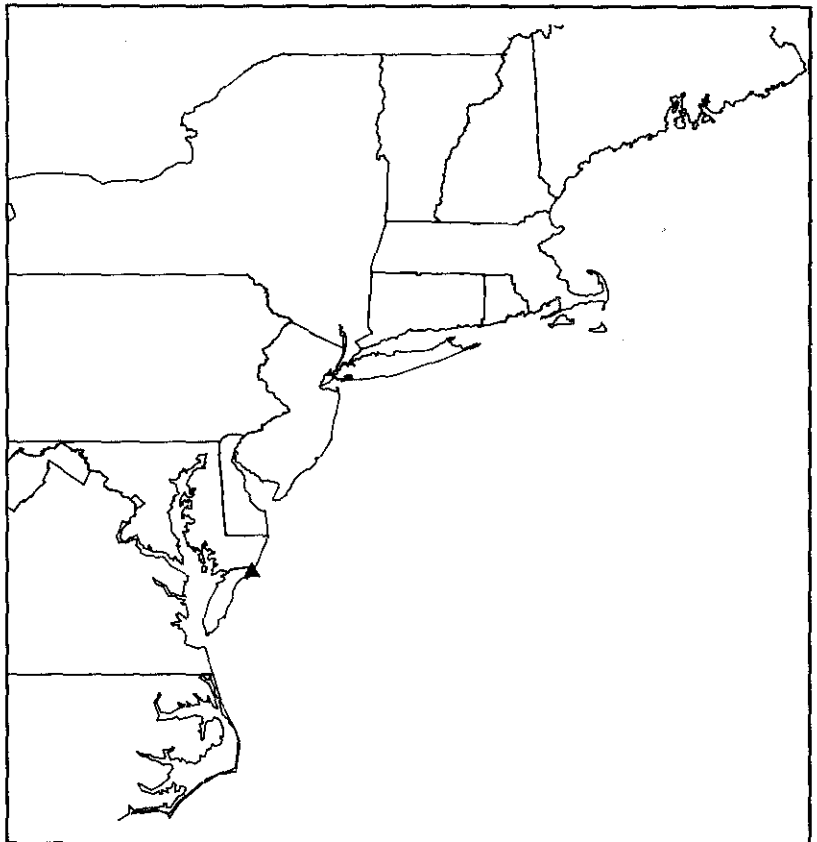


Figure 6. Locations of reported harbor porpoise strandings from Maine to North Carolina during June 1993. (Each triangle represents one stranding.)



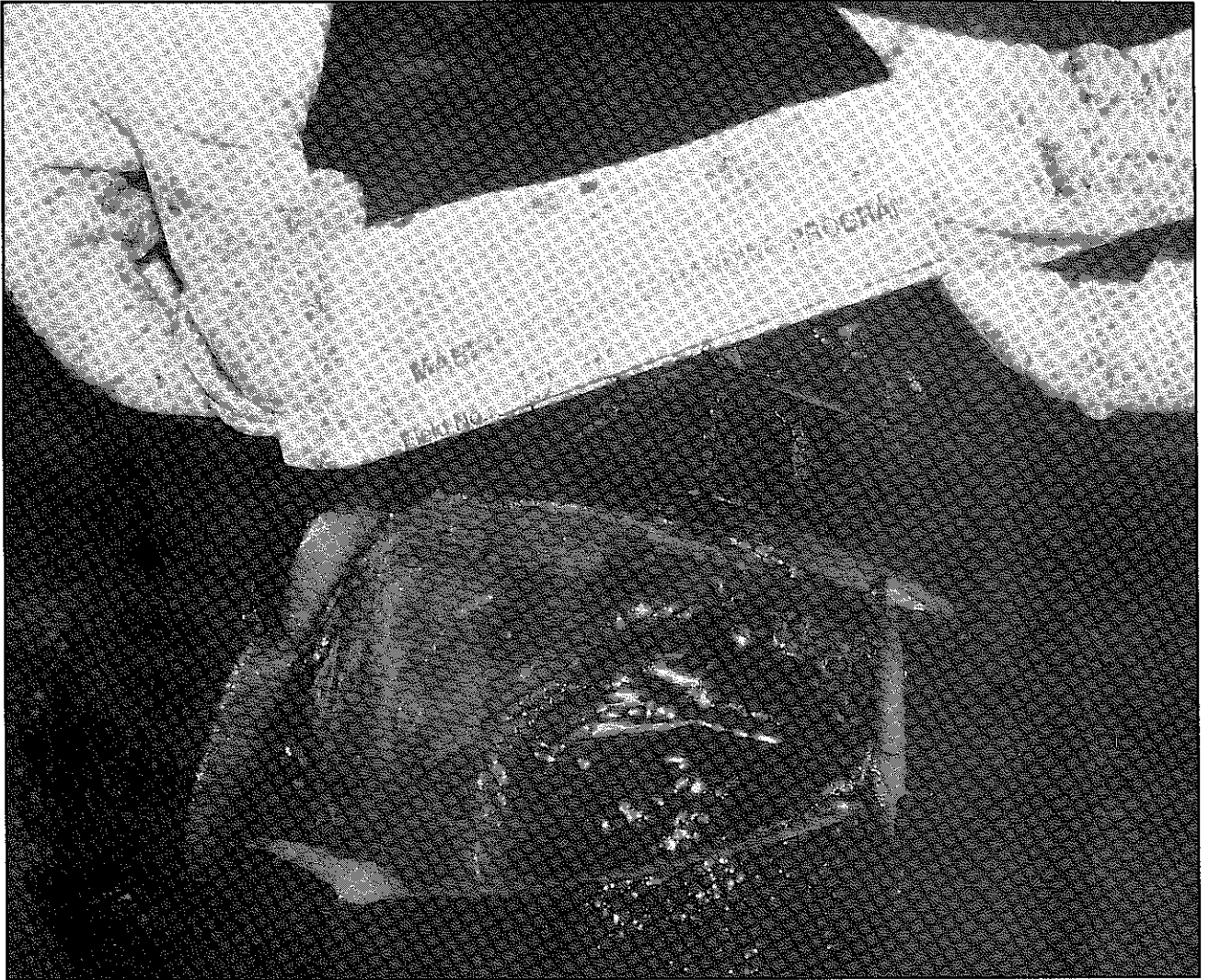


Figure 7. Subdermal trauma on harbor porpoise specimen MMSC93-40.

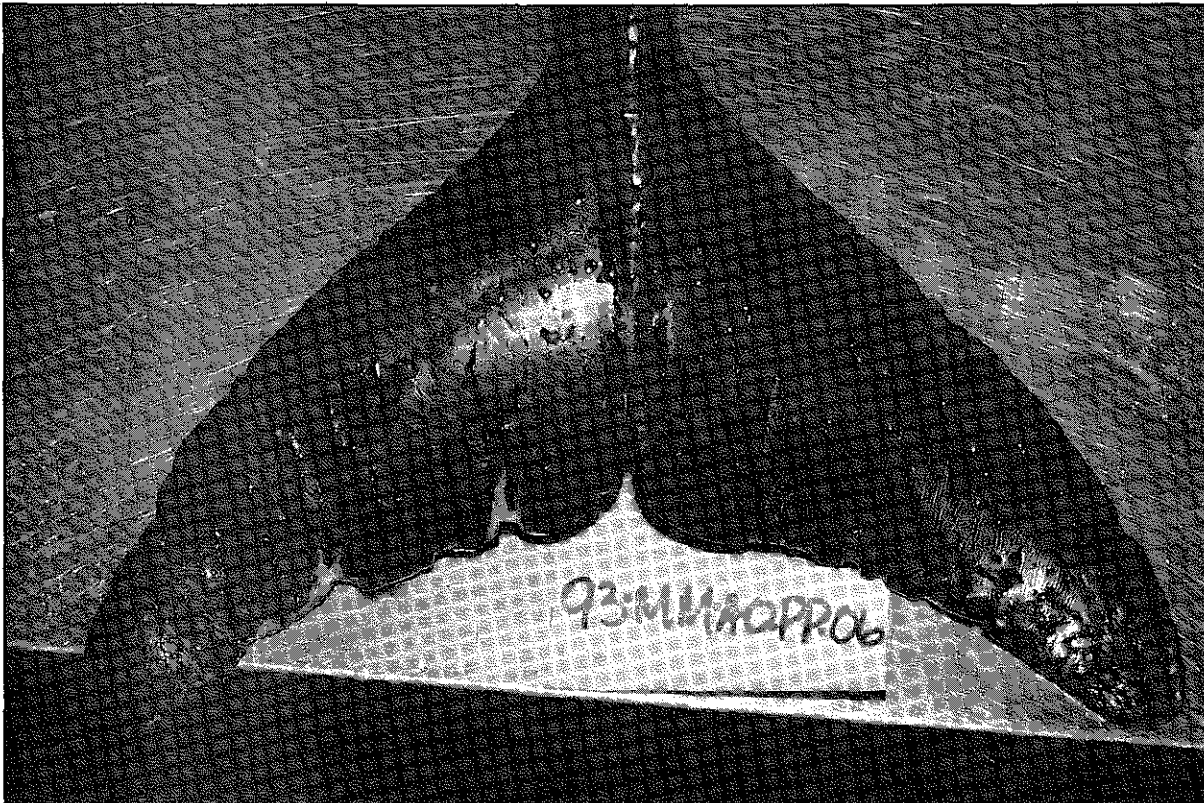
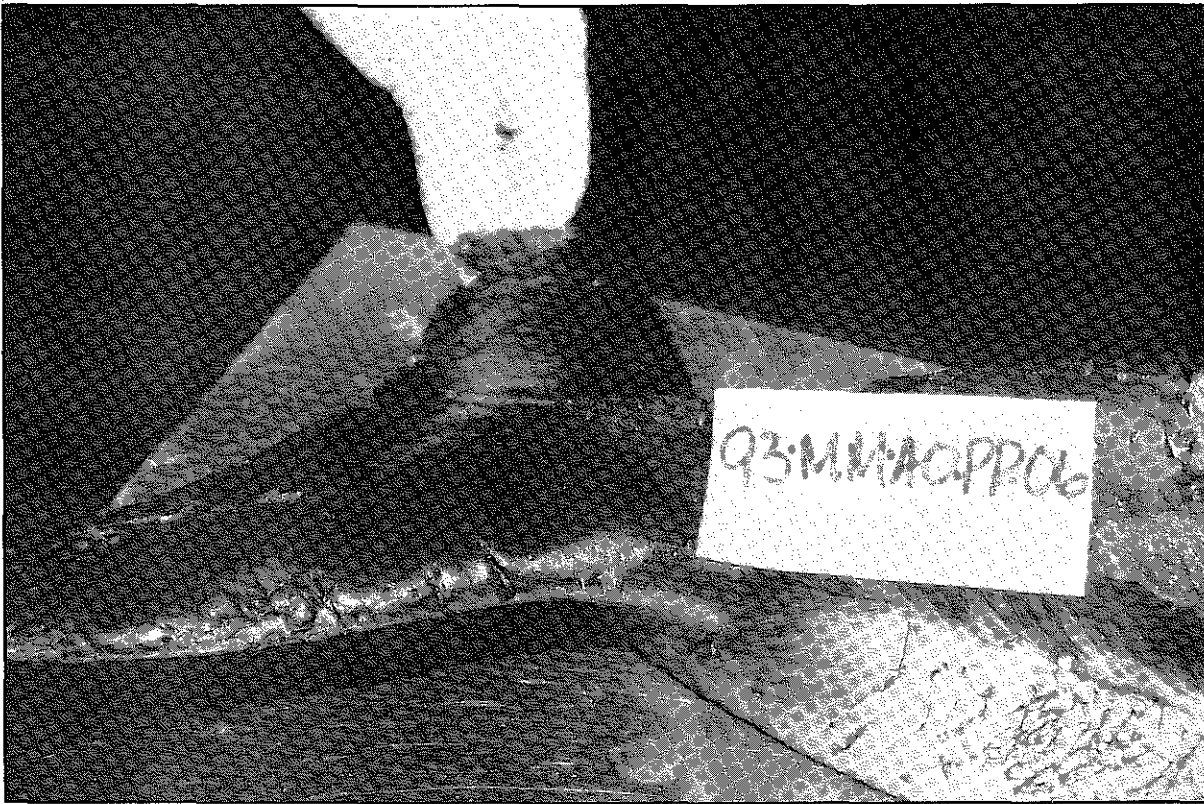


Figure 8. Possible net marks on harbor porpoise specimen 93MMAOPP06.

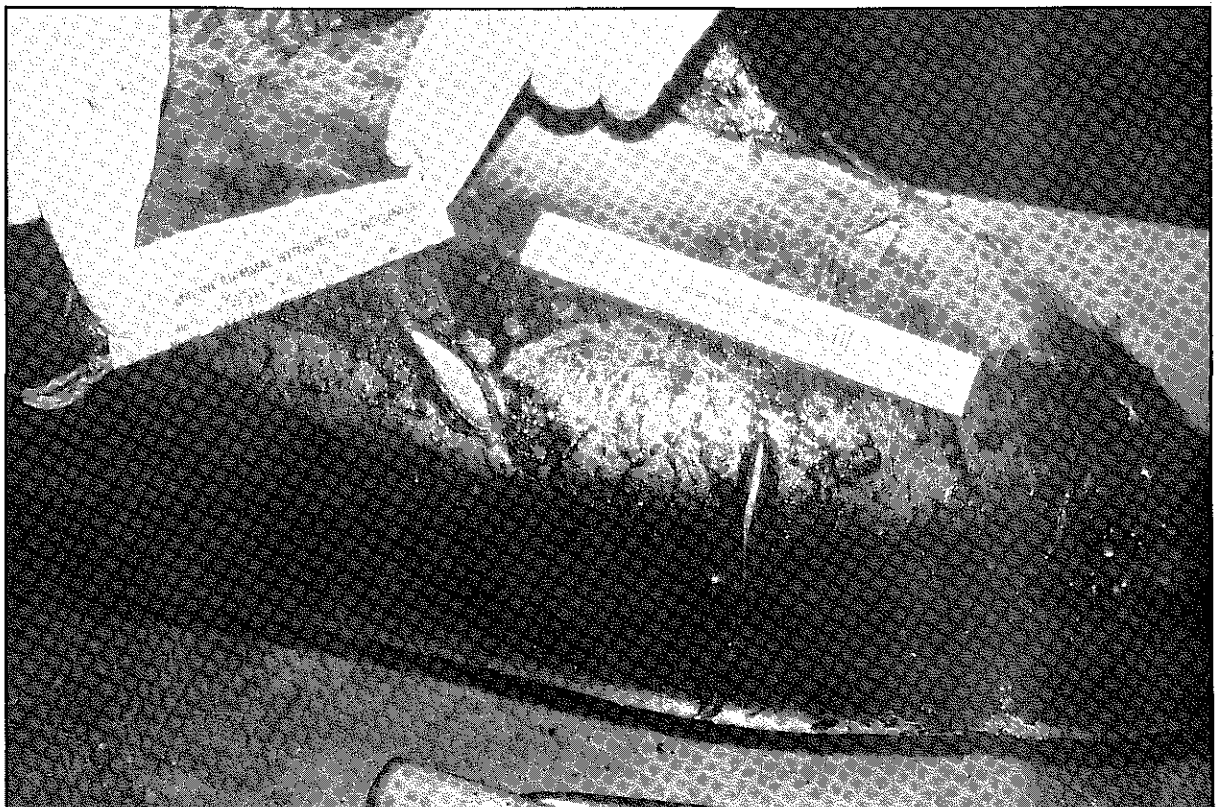
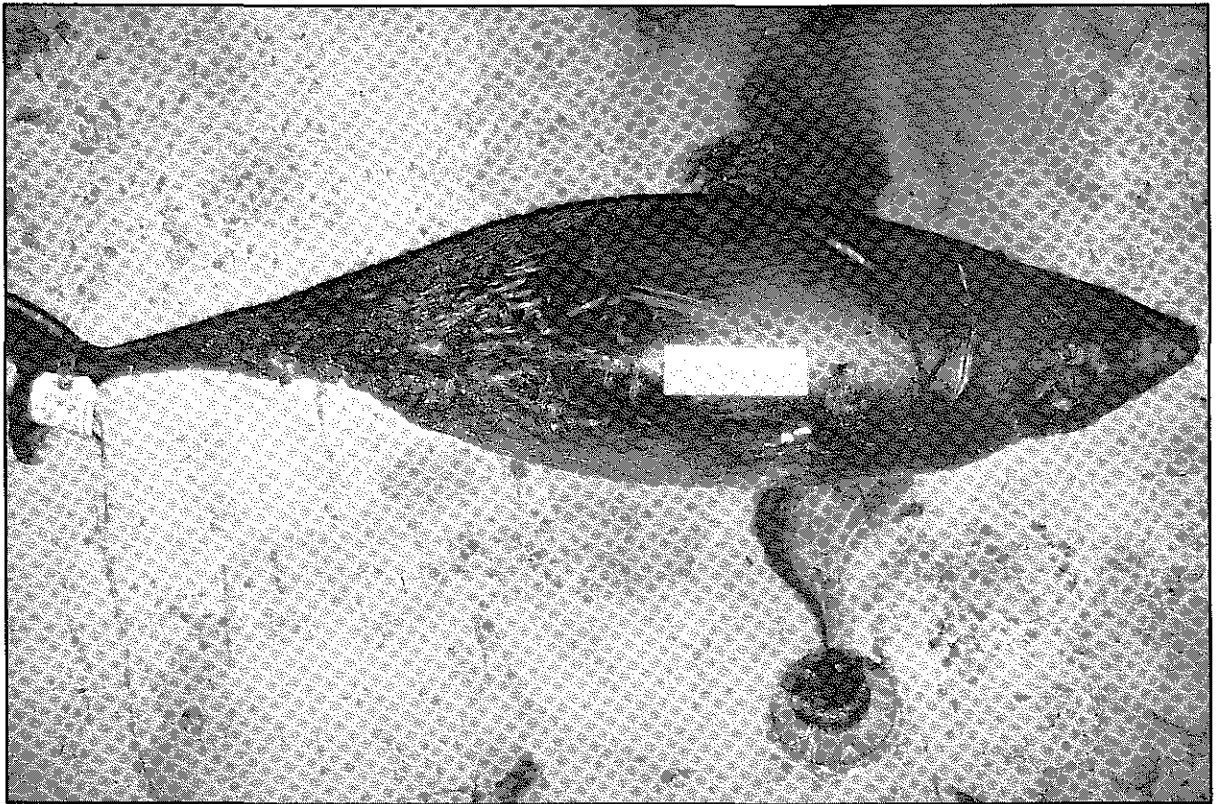


Figure 9. Possible net marks on harbor porpoise specimen VMSM931018.

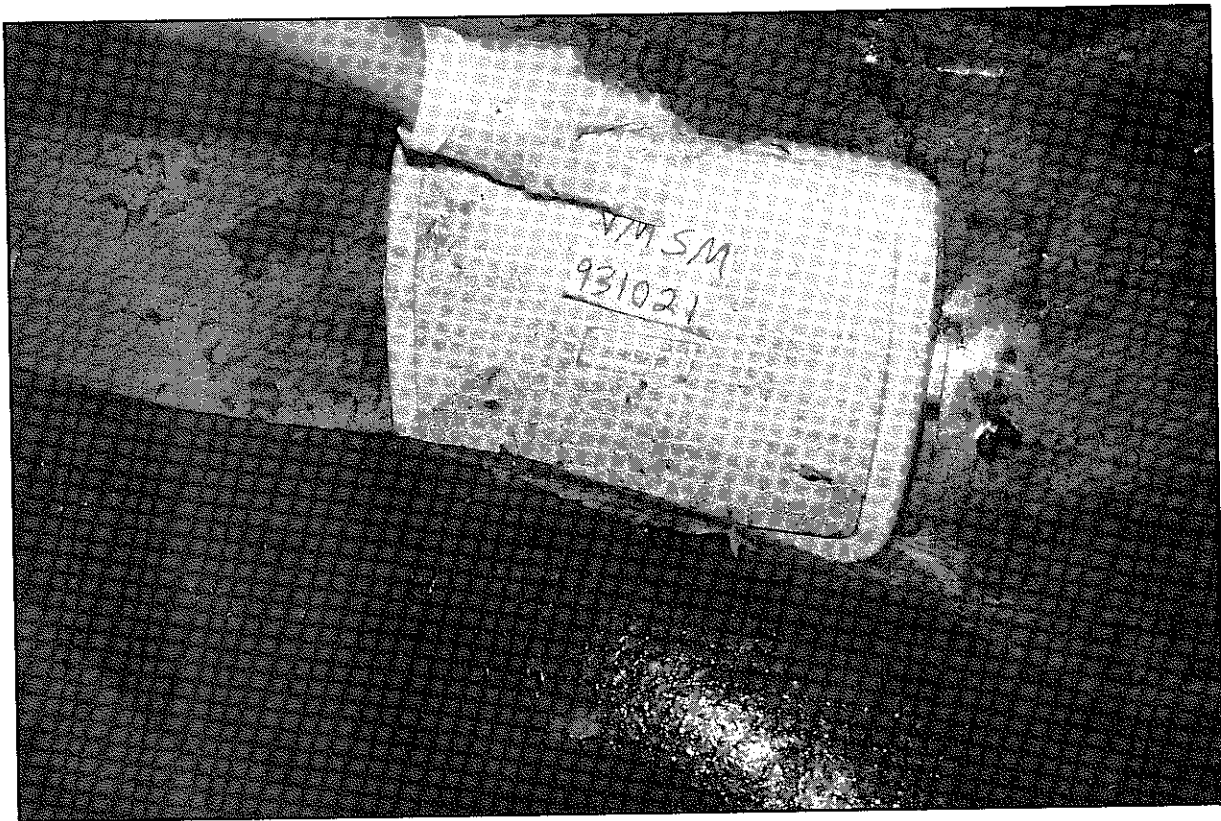


Figure 10. Missing dorsal fin on harbor porpoise specimen VMSM931021.

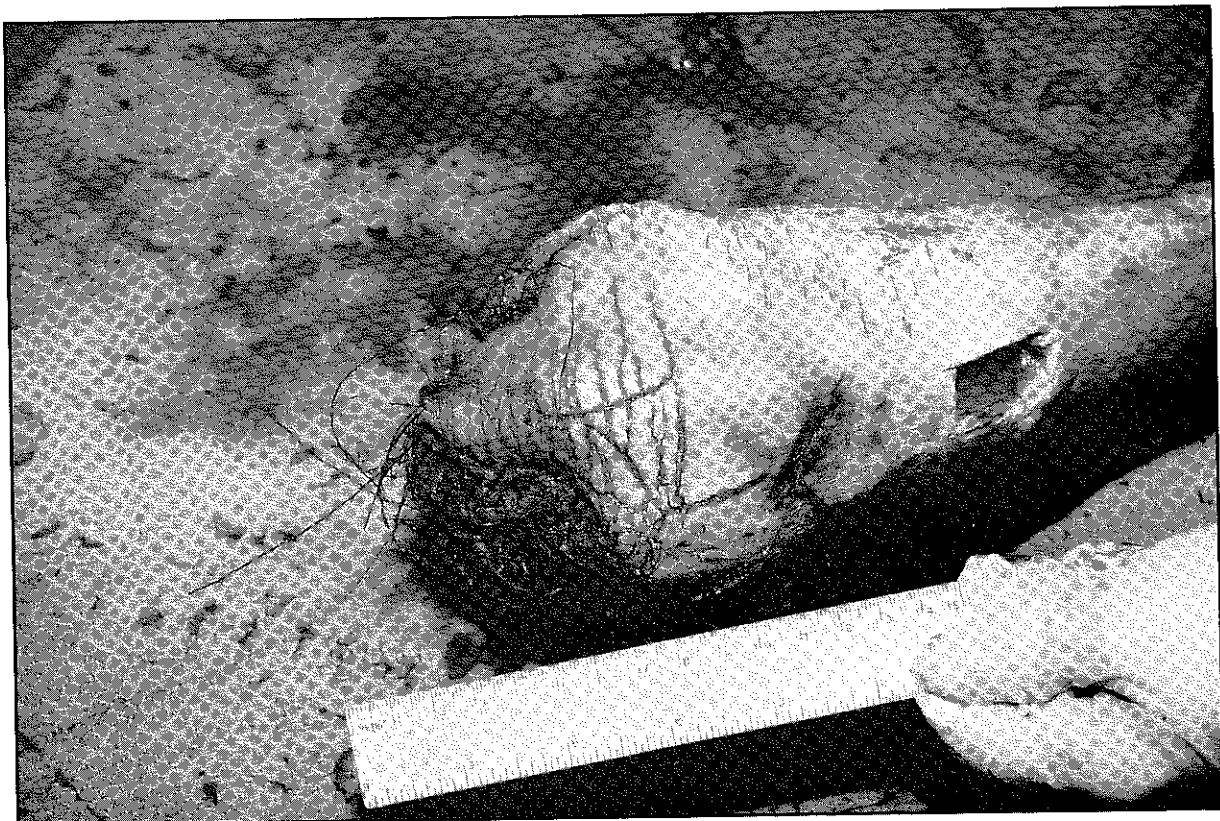


Figure 11. Severed posterior of harbor porpoise specimen VMSM931021.

**APPENDIX A
WORKSHOP ATTENDEES**

Susan Barco
Virginia Marine Science Museum
Virginia Beach, VA

Dave Bokaska
Smithsonian Institution
Washington, DC

Caren Carminati
Okeanos Ocean Research Foundation
Hampton Bays, NY

Vicki Credle
National Marine Fisheries Service
Silver Spring, MD

Frances Cresswell
Maryland Department of Natural Resources
Oxford, MD

Hillary DePuy
National Marine Fisheries Service
Silver Spring, MD

Greg Early
New England Aquarium
Boston, MA

Jeff Fasicky
National Aquarium
Baltimore, MD

Lisa Greene
Bermuda Natural History Museum
Bermuda

Nancy Haley
National Marine Fisheries Service
Gloucester, MA

Bob Hofman
Marine Mammal Commission
Washington, DC

Aleta Hohn
National Marine Fisheries Service
Silver Spring, MD

Jenni Jenkins
National Aquarium
Baltimore, MD

Laura Kennedy
Smithsonian Institution
Washington, DC

Jim Mead
Smithsonian Institution
Washington, DC

Rob Nawojchik
Mystic Marinelife Aquarium
Mystic, CT

John Nicolas
National Marine Fisheries Service
Woods Hole, MA

Charley Potter
Smithsonian Institution
Washington, DC

Andy Read
Woods Hole Oceanographic Institution
Woods Hole, MA

Bob Schoelkopf
New Jersey Marine Mammal Stranding Center
Brigantine, NJ

David Schofield
National Aquarium
Baltimore, MD

Vicki Thayer
National Marine Fisheries Service
Beaufort, NC

Dean Wilkinson
National Marine Fisheries Service
Silver Spring, MD

**APPENDIX B
WORKSHOP AGENDA**

WORKSHOP ON HARBOR PORPOISE MORTALITIES AND HUMAN INTERACTIONS

May 19-20, 1993
Smithsonian Institution

convened by the
National Marine Fisheries Service,
Northeast Region

AGENDA

Wednesday, May 19

- | | | |
|---------------|---|--|
| 10:00 - 10:05 | Intro remarks | Charley Potter |
| 10:05 - 10:30 | Purpose of workshop and Overview of recent strandings in the mid-Atlantic region | Nancy Haley |
| 10:30 - 10:45 | Relevance of strandings to the NMFS "Fish Fix" (how strandings are used to determine total takes against the PBR level) . . . | Vicki Credle |
| 10:45 - 11:00 | Relevance of harbor porpoise stranding data to proposed threatened listing | Mike Payne |
| 11:00 - 11:40 | Group discussion of means of determining mortality due to fishery interaction or other human intervention - Development of ranking system | |
| 11:40 - 12:30 | Lunch | |
| 12:30 - 5:00 | External examination of carcasses | Charley Potter/Andy Read/John Nicholas |

Thursday, May 20

- | | | |
|-------------|---|-------------------------------------|
| 9:00 - 2:30 | Necropsy session and commentary about harbor porpoise biology | Charley Potter/Andy Read/Aleta Hohn |
|-------------|---|-------------------------------------|

**APPENDIX C
NECROPSY PROTOCOLS**

CETACEAN SPECIMEN RECORD

SPECIES _____ SEX _____ LENGTH _____

LOCATION _____

CONDITION _____

CAUSE OF DEATH _____

COMMENTS _____

FIELD NO. _____

CATALOG NO. _____

PHOTO NOS. _____

OBSERVERS _____

CAPTURE DATE _____

NECROPSY DATE _____

Tooth Wear _____

Tooth Counts UL _____ UR _____ LL _____ LR _____

BLUBBER THICKNESS cm

I-DOR	.
I-LAT	.
I-VEN	.

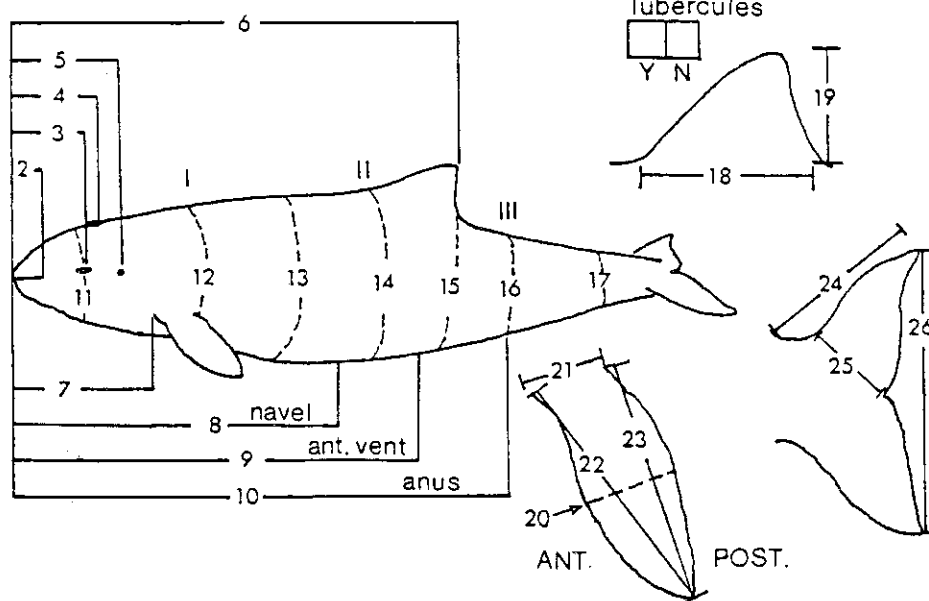
II-DOR	.
II-LAT	.
II-VEN	.

III-DOR	.
III-LAT	.

BODY WT. _____

BLUBB. WT. _____

MEASUREMENTS STRAIGHT LINE & AXIAL



LEFT SIDE:

2	.
3	.
4	.
5	.
6	.
7	.
8	.
9	.
10	.
11	.
12	.
13	.
14	.
15	.
16	.
17	.
18	.
19	.
20	.
21	.
22	.
23	.
24	.
25	.
26	.

REPRODUCTIVE TISSUES

FIELD NO. _____

Gonad Dimensions L x W x D Left _____ Right _____
 Lactating _____ Mammary Gland Colour _____ LxWxD _____
 Pregnant _____ Foetus Length _____ Weight _____ Sex _____
 C. Lutea _____ C. Albicantia _____ Uterine Diam. L. _____ R. _____
 Sperm in Epididymus _____ Testis Wt. L. _____ R. _____
 Comments _____

STOMACH CONTENTS

	Full Wt.	Empty Wt.	Contents
FORE	_____	_____	_____
MAIN	_____	_____	_____
PYLORIC	_____	_____	_____

Comments _____

ORGAN WEIGHTS:(g)

Heart	_____	L. Kidney	_____	Stomachs	_____
L. Lung	_____	R. Kidney	_____	Skeleton	_____
R. Lung	_____	Pancreas	_____	Brain	_____
Liver	_____	L. Adrenal	_____	Intestines	_____
Spleen	_____	R. Adrenal	_____	Muscle	_____

PARASITES & PATHOLOGY

Stomach _____
 Intestine _____
 Kidney _____
 Pancreas _____
 Mammary _____
 Liver _____
 Lungs _____
 Heart _____
 Brain _____
 Sinuses _____
 Other _____

SPECIMEN CHECKLIST

Teeth	_____	Gonads	_____	Parasites	_____	Brain	_____
Skull	_____	Mammary	_____	Blubber	_____	Stom. Cont.	_____
Skeleton	_____	Foetus	_____	Muscle	_____	Liver	_____
				Kidney	_____	Other	_____

CETACEAN DATA RECORD

Species _____ catalog no. _____
 observer _____ field no. _____
 Sex _____ length _____ condition _____
 date, time of death _____ of data _____
 locality _____ latitude and longitude _____
 reported by _____
 photographs or drawings _____
 circumstances, causes of death, etc. _____

external description (pigmentation, scars) _____

tooth or baleen counts: erupted _____ total _____ upper l. _____ upper r. _____ lower l. _____ lower r. _____
 diameter largest tooth, length longest baleen plate _____ color of baleen _____
 number of throat or ventral grooves (count latter between flippers) _____

MEASUREMENTS (specify units of measure used _____)

(3) snout to apex of melon.....	_____	(23) thickness, same place*.....	_____
(9) snout to center of blowhole(s)...	_____	(15) projection lower/upper jaw.....	_____
(2) snout to center of eye.....	_____	rostral width at apex of melon...	_____
(4) snout to angle of mouth.....	_____	(24) length of eye opening.....	_____
(5) snout to ear.....	_____	(6) center of eye to ear*.....	_____
(10) snout to flipper.....	_____	(7) center of eye to angle of mouth*.	_____
(12) snout to center of umbilicus.....	_____	eye to blowhole edge (right)*....	_____
(16) snout to end of ventral grooves..	_____	eye to blowhole edge (left)*....	_____
(13) snout to genital slit (center)...	_____	(27) blowhole length _____ width*....	_____
(14) snout to anus.....	_____	(28) diameter ear opening r _____ l....	_____
(1) total length, snout to notch....	_____	diameter of head between eyes*...	_____
snout to insertion of dorsal fin.	_____	(20) length of throat grooves.....	_____
(11) snout to tip of dorsal fin.....	_____	(29) flipper length, anterior*.....	_____
fluke notch to anus.....	_____	(30) flipper length, posterior*.....	_____
notch to center genital slit.....	_____	(31) flipper width, maximum*.....	_____
fluke notch to umbilicus.....	_____	(25) length mammary slits r _____ l....	_____
fluke notch to dorsal fin center.	_____	number of mammary slits.....	_____
fluke notch to dorsal fin tip....	_____	(26) length genital slit _____ anal slit.	_____
girth at eye.....	_____	perineal length (males).....	_____
(21) girth at axilla.....	_____	(34) fluke width*.....	_____
(22) maximum girth.....	_____	(35) fluke depth*.....	_____
(23) girth at anus.....	_____	(36) depth of fluke notch.....	_____
girth midway anus to fluke notch.	_____	(32) dorsal fin height*.....	_____
height, same place*.....	_____	(33) length dorsal fin base.....	_____

blubber thickness: mid-dorsal _____ mid-lateral _____ mid ventral _____

mammary gland: color _____ length _____ width _____ depth _____

lactating? _____ pregnant? _____ sperm in epididymus? _____

uterine condition: immature _____ mature _____ mature and dilated _____

fetus: length _____ weight _____ sex _____ flat diameter uterine horn r _____ l _____

diameter largest corpus luteum _____ number corpora lutea _____ corpora albicantia _____

gonads: weight r. _____ l. _____ dimensions (LXWXD) r. _____ l. _____

vertebral epiphyses: open _____ mm; closed, visible _____ closed, invisible _____

length of intestine _____ growth layer groups: dentine _____ cement _____

intact carcass..... WEIGHTS (specify units used _____)

viscera..... heart..... stomachs empty.....

muscle: epaxial..... lung right..... intestines.....

hypaxial..... lung left..... pancreas.....

misc..... liver..... adrenal right.....

total..... spleen..... adrenal left.....

bone..... kidney right..... brain.....

blubber..... kidney left.....

Remarks on weights _____ stomachs, full.....

skull length _____ skull width _____ length tooth or baleen row, upper _____ lower _____
vertebral count: cervical _____ thoracic _____ lumbar _____ caudal _____
double headed ribs _____ single headed ribs _____

Parasite and pathology checklist (check if present, no if absent, NE if not examined)

eye..... _____ forestomach.... _____ mammary glands..... _____ muscle..... _____
mouth..... _____ mainstomach.... _____ liver..... _____ Phyllobothrium _____
genital slit.. _____ pyloric stomach _____ bile duct..... _____ Monorhagma.... _____
anal slit..... _____ intestine..... _____ uterus..... _____ crassicaudid.. _____
appendages.... _____ rectum..... _____ lungs..... _____ Braunina..... _____
barnacles..... _____ kidney tissue.. _____ heart..... _____ other (see remarks) _____
cyamids..... _____ kidney duct.... _____ brain..... _____ _____
Penella..... _____ pancreas..... _____ air sinuses..... _____

Specimen collection checklist (indicate preservative in blank)

teeth or baleen.. _____ ear plugs..... _____ liver sample... _____ epiphyses.... _____
stomach contents. _____ ectoparasites. _____ kidney sample.. _____ other..... _____
gonads..... _____ endoparasites. _____ fetus..... _____ _____
mammary gland... _____ blubber sample _____ skull..... _____ _____
uterine mucosa... _____ muscle sample _____ skeleton..... _____

Stomach contents (distinguish fore-, main-, and pyloric; describe condition and quantity)

intact fish _____ fish bones _____ otoliths _____ squid beaks _____ other _____
Remarks _____

INSTRUCTIONS. The measurements are arranged for convenience, starting from the head, with those requiring two persons coming first. All measurements, except those marked with a *, are taken in a straight line parallel to the body axis. The marked ones are taken point to point. Indicate if done otherwise. Measure to the centers of the apertures. Fill out separate form for fetuses. Photographs are very important. Tissue samples to be frozen or in 10% formalin. Stomach contents in alcohol only.

APPENDIX D
FINAL PROTOCOL FOR EVALUATING HUMAN INTERACTIONS
WITH MARINE MAMMALS

PROTOCOL FOR EVALUATING HUMAN INTERACTIONS WITH
MARINE MAMMALS

FIELD NO. _____ CATALOG NO. _____
 SPECIES _____ OBSERVATION DATE ____ / ____ / ____
 EXAMINER _____ PHOTOS TAKEN: YES / NO
 CARCASS CONDITION ? Smithsonian Institution Scale (1-5) _____

A. EXTERNAL SIGNS

Body condition ? ROBUST ___ EMACIATED ___ CBD^[a] ___ N/E^[a] ___

External marks ? YES ___ NO ___ CBD ___ N/E ___

Describe (net/line or other obvious marks): _____

Penetrating wounds (marks, punctures, cuts) ? PRESENT ___ ABSENT ___

Characterize wounds: _____

Mutilation:

Bodies slit ? YES ___ NO ___ CBD ___ N/E ___

Describe: _____

Missing appendages ? YES ___ NO ___ CBD ___ N/E ___

Describe: _____

Scavenger damage ? YES ___ NO ___ CBD ___ N/E ___

Describe: _____

 [a] CBD = Cannot Be Determined, N/E = Not Examined

B. INTERNAL SIGNS

Hemorrhaging (sub-dermal)? YES ___ NO ___ CBD ___ N/E ___

Describe: _____

Side-dependency (lungs) ? YES ___ NO ___ CBD ___ N/E ___

Describe (Asymmetry in organ size, distribution of blood pooling (e.g., lungs)): _____

Stomach contents ? FULL ___ EMPTY ___ Contents saved ? Yes / No

Describe: _____

Lung contents ? FLUID ___ FROTH ___ AIR ___ CBD ___ N/E ___

Broken bones ? YES ___ NO ___ CBD ___ N/E ___

Describe: _____

C. SUMMARY

BODY COND. _____

FULL STOMACH: Yes / No

SCAVENGER DAMAGE: Yes / No

GEAR COLLECTED: Yes / No

HUMAN INTERACTION POTENTIAL: High / Low / Can't Determine

Comments: _____

National Marine Fisheries Service, NOAA
Northeast Regional Operations Office
One Blackburn Drive
Gloucester, MA 01930

THIRD CLASS MAIL

NOAA TECHNICAL MEMORANDUM NMFS-F/NER

NOAA's National Marine Fisheries Service (NMFS) seeks to "achieve a continued optimum utilization of living resources for the benefit of the Nation." The NMFS Northeast Regional Operations Office administers the conservation and management of the living marine resources of the northeastern United States, as mandated by the Magnuson Fishery Conservation and Management Act, the Marine Mammal Protection Act, the Endangered Species Act, the Clean Water Act, the Fish and Wildlife Coordination Act, and numerous other federal authorities. The office works closely with federal, state, and private agencies, including the New England and Mid-Atlantic Fishery Management Councils and the Atlantic States Marine Fisheries Commission, as well as with commercial and recreational fishing interests, consumers, and the general public, in providing for the conservation and management of the region's living marine resources.

To fulfill its role, the Northeast Regional Operations Office regularly undertakes special-purpose studies, particularly in implementing fishery management plans, evaluating fishery habitat alterations, and conserving protected species. The *NOAA Technical Memorandum NMFS-F/NER* series provides a relatively quick and highly visible publication outlet for results of these studies. Any use of trade names in this series does not imply endorsement. Free copies of this and other issues in this series are available in limited numbers from the National Marine Fisheries Service, Northeast Regional Operations Office, One Blackburn Drive, Gloucester, MA 01930. Photoduplicated and microfiche copies can also be purchased from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.