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Serious Injury Determinations for Small Cetaceans and Pinnipeds Caught in Commercial Fisheries off the Northeast US Coast, 2013

US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
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Northeast Fisheries Science Center
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Serious Injury Determinations for Small Cetaceans and Pinnipeds Caught in Commercial Fisheries off the Northeast US Coast, 2013

Frederick Wenzel[1], Gordon T. Waring[1], Elizabeth Josephson[1], Marjorie C. Lyssikatos[1], Barbie L. Byrd[2], Stacey C. Horstman[3], and Jessica R. Powell[3]

[1]National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543
[2]JHT, Inc. Contractor for NOAA National Marine Fisheries Service, Southeast Fisheries Science Center, 101 Pivers Island Road, Beaufort, NC 28516
[3]NOAA National Marine Fisheries Service, Southeast Regional Office, 263 13th Avenue South, St. Petersburg, FL, 33701

US DEPARTMENT OF COMMERCE
Penny Pritzker, Secretary
National Oceanic and Atmospheric Administration
Dr. Kathryn Sullivan, Administrator
National Marine Fisheries Service
Eileen Sobeck, Assistant Administrator for Fisheries
Northeast Fisheries Science Center
Woods Hole, Massachusetts

October 2015

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Species Names: The NEFSC Editorial Office's policy on the use of species names in all technical communications is generally to follow the American Fisheries Society's lists of scientific and common names for fishes, mollusks, and decapod crustaceans and to follow the Society for Marine Mammalogy's guidance on scientific and common names for marine mammals. Exceptions to this policy occur when there are subsequent compelling revisions in the classifications of species, resulting in changes in the names of species.

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TABLE OF CONTENTS

Introduction 1

Methods 1

Results and Discussion 2

Small cetaceans 2

Pinnipeds 2

Acknowledgements 3

References Cited 4

Table 1. List of marine mammal codes, common names, and scientific names 5

Table 2. Northeast region commercial fishery gear descriptions and codes used to query data on observed fishery interactions 5

Table 3. Comparison of fishery observer or at-sea monitor animal condition codes and Protected Species Branch injury determinations for the year 2013 6

Table 4. Summary of 2013 animal conditions and species 7

Table 5. Animal determination frequencies and relative proportions by gear type and species in 2013 8

Figure 1. US Northwest Atlantic Fishery statistical areas 9

Appendix 1. Tables 2 and 3 from NMFS Process for Distinguishing Serious from Nonserious Injury of Marine Mammals 10

Table 2. Summary of Small Cetacean Injury Categories and Criteria 10

Table 3. Summary of Pinniped Injury Categories and Criteria 14

Appendix 2. Serious injury and mortality determination of a bottlenose dolphin released alive February 5, 2013 from observed gillnet gear off North Carolina 18

Purpose 18

Background 18

1. Entanglement situation 19
2. Size of the dolphin 20

Applicable Marine Mammal Serious Injury Guideline (MMSIG) Determination Categories 21

Estimating Observed Dolphin Length and Age Class 21

Consideration of Serious Injury Criteria 23

Final determination of post-release dolphin condition 25

References Cited 26

Table 1. Injury categories and associated determinations 27

Table 2. Age classes based on total body lengths for bottlenose dolphins 27

Table 3. The stepwise approach estimating total body length of the 2013 bottlenose dolphin observed entangled in a gillnet off North Carolina 28

Figure 1. Coastal North Carolina near Cape Hatteras showing location of the Northeast Fisheries Observer Program observed entanglement and live release of a bottlenose dolphin from commercial gillnet gear on February 5, 2013 29

Figure 2. Photographs of the observed bottlenose dolphin that was released alive from a gillnet entanglement in February 2013 30

Figure 3. Images of the incidental take data log and trip debriefing worksheet completed by the Northeast Fisheries Observer Program and fisheries observer for the gillnet trip in February 2013 on which the bottlenose dolphin entanglement and live release was documented 31

Figure 4. Photographs depicting three different objects that were used to estimate total body size and age class of the observed bottlenose dolphin released alive from a gillnet entanglement in February 2013 32

Figure 5. Photograph taken by the fisheries observer during the February 2013 bottlenose dolphin gillnet entanglement used to measure the dolphin's length from the tip of the dorsal fin (A1) to the insertion of the flukes 33

Figure 6. A diagram of standard morphometric data collected during an Odontocete necropsy 34

Figure 7. Scatter plot of post-dorsal body length regressed on total body length from bottlenose dolphins that stranded in North Carolina 35

Figure 8. Scatter plot of measurements of the rostrum to fluke insertion regressed on fluke length from bottlenose dolphins that stranded in North Carolina and Virginia..... 36

INTRODUCTION

The Marine Mammal Protection Act (MMPA) requires the National Marine Fisheries Service (NMFS) to estimate annual levels of human-caused mortality and serious injury to marine mammal stocks (section 117) and to categorize commercial fisheries based on their level of incidental mortality and serious injury of marine mammals (section 118). Serious injury (SI) determination guidelines were developed at NMFS-convened workshops in 1997 and 2007 (Angliss and DeMaster 1998; Andersen et al. 2008) and in January 2012 the agency published new national guidelines for distinguishing serious from nonserious injuries of marine mammals (NMFS 2012). A serious injury is defined as an injury that is more likely than not to result in mortality. A major goal of the new guidelines was to establish national consistency and transparency in SI determinations. To implement the new guidelines, science center SI determination (SID) staff from each region review all documented marine mammal injury events on an annual basis. For this document, fisheries observer (OBS) and at-sea monitor (ASM) records are reviewed for incidentally-caught animals that were released/observed alive. Observer comments on the condition of released animals and any associated photographs are compared to specific injury categories described in the new guidelines' procedure manual and each event is assigned an injury determination. Once completed, the Northeast Fisheries Science Center (NEFSC) SI small cetacean and pinniped determination table is independently reviewed by the Southwest Fisheries Science Center's (SWFSC) SID staff, the Greater Atlantic Regional Fisheries Office (GARFO), and the Atlantic Scientific Review Group (SRG) before the SI determinations were finalized. This manuscript documents the SI determinations from the 2013 records.

METHODS

Electronic records of all small cetacean and pinniped bycatch that were coded as alive or condition unknown for 2013 were extracted from the Northeast Fisheries Observer Program (NEFOP) database. These records included OBS/ASM notes that provided information on entanglement characteristics (e.g., animal in cod-end), crew handling (e.g., rope tied to keel and crane, animals lifted overboard), animal condition (e.g., cut on dorsal flank, some blood), and state of released animal (e.g., swam away quickly, swimming sluggishly at surface, immediately sank). Two marine mammal researchers in the NEFSC Protected Species Branch independently compared the records to the small cetacean (S) and pinniped (P) criteria contained in the aforementioned SI guidance document (Appendix 1). Then the 2 evaluators compared their determinations and all differences were discussed to obtain agreement, including cases where a determination could not be made with the available data. All observed interactions in 2013 were tabulated and final injury determinations and mortality events were used to estimate the proportion of observed SI animals relative to the other observed determinations (e.g., uninjured [UI], non-serious injury [NSI], and dead) by gear type and species. All otter trawls, bottom trawls (OTB), and mid-water trawls (OTM) with observed takes of decomposed marine mammals were excluded from the proportion

analysis. In trawl fisheries tow times are generally too short for decomposition to take place, so when a decomposed animal comes up in the net, death is presumed to have preceded the interaction. All decomposed marine mammals observed in sink gillnets (SGN) were included in the proportion analysis because soak durations for gillnet gear can be long enough to produce/allow significant decomposition.

Species codes and gear codes used in this report are contained in Tables 1 and 2, respectively. The statistical area designations are presented in Figure 1.

RESULTS AND DISCUSSION

For 2013, NEFOP observer records of small cetaceans and pinnipeds were examined for takes with alive or unknown status. A further review of the data, including interviews with OBS or ASMs and photographs, lead to the conclusion that most animals were actually fresh dead and/or decomposed carcasses, or the seriousness/verification of the injury could not be determined (CBD). In total, 1 bottlenose dolphin, 1 harbor seal, and 1 gray seal were considered not seriously injured, and 2 unidentified dolphins and 1 unidentified seal were CBD. These compiled results were then merged with the total mortality tables for each species in the NOAA Stock Assessment Reports (http://www.nmfs.noaa.gov/pr/sars/).

Small cetaceans

For 2013, observer records were examined for takes of live small cetaceans. Only 1 coastal common bottlenose dolphin (*Tursiops truncatus*) was determined to be alive in the 2013 NEFOP database records (Tables 3-5; Appendix 2). During February 2013, a bottlenose dolphin was observed wrapped from just anterior of the dorsal fin to the leading part of the tailstock with a single layer of 12-in mesh net. On its fluke was a 'tangled mess' of approximately 100 meshes wrapped in a clump. The report states that the captain and crew were able to free the animal from the net within 5 minutes. No indents from net or gear, wounds, marks, or bleeding were observed on the dolphin. Once all gear was removed, the dolphin swam out of sight quickly. The animal was designated as NSI (Appendix 2). A November 2013 reported take of an unidentified dolphin was not witnessed by the ASM so the injury status could not be determined.

Pinnipeds

In 2013, observers recorded 1 harbor seal (*Phoca vitulina concolor*) and 1 gray seal (*Halichoerus grypus grypus*) bycaught during summer in Gulf of Maine Atlantic herring (*Clupea harengus*) purse seine sets. The harbor seal was trapped under part of the purse seine, but was freed by the crew and actively swam away. The gray seal was swimming in the seine but swam off when the crew lowered the top of the net. Both seals were designated as NSI (Tables 4-5).

ACKNOWLEDGEMENTS

We thank the NEFOP on-board observers and at-sea monitors for collecting the data, and staff in the NEFSC Fisheries Sampling Branch for their assistance in obtaining electronic copies of data logs and pictures required for our SI determinations. An earlier version of this document was reviewed by the Atlantic Scientific Group in February 2015. A special thanks to William Greer and Mike Tork (NEFSC), Kendall Falana and Wayne Hoggard (SEFSC), and David Hilton (SERO) for their review and comments on Appendix 2, "Serious injury and mortality determination of a bottlenose dolphin released alive February 5, 2013 from a gillnet off North Carolina."

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Table 1. List of marine mammal codes, common names, and scientific names.

Code	Common Name	Scientific Name
BODO	Coastal common bottlenose dolphin (northern North Carolina estuarine or northern migratory stock)	*Tursiops truncatus*
CODO	Short-beaked common dolphin	*Delphinus delphis delphis*
UNPW	Long-finned or short-finned pilot whale	*Globicephala spp.*
UNDO	Unidentified dolphin	
HAPO	Harbor porpoise	*Phocoena phocoena*
RISO	Risso's dolphin	*Grampus griseus*
WSDO	Atlantic white-sided dolphin	*Lagenorhynchus acutus*
GRSE	Gray seal	*Halichoerus grypus grypus*
HASE	Harbor seal	*Phoca vitulina concolor*
HPSE	Harp seal	*Pagophilus groenlandicus*
MIWH	Minke whale	*Balaenoptera acutorostrata*
UNSE	Unidentified seal	

Table 2. Northeast region commercial fishery gear descriptions and codes used to query data on observed fishery interactions.

Gear Abbreviation	Gear description and Northeast region gear codes
OTB	Otter trawl bottom (bottom trawl, fish = 050, twin trawl = 053, Rhule trawl = 054, and haddock separator = 057)
OTM	Mid-water trawls (single = 370 and paired = 170)
PSH	Purse seine = 121
SGN	Sink gillnet (anchored floating = 105, drift floating = 116, drift-sink = 117, and anchored sink, fixed = 100)

Table 3. Comparison of fishery observer or at-sea monitor animal condition codes and Protected Species Branch injury determinations (SI =serious injury, NSI = non serious injury, CBD = cannot be determined) for the year 2013. Determinations are based on observer notes and small cetacean and pinniped criteria in the National Marine Fisheries Service Determination Directive (NMFS 2012). Gear codes: 117 = sink gillnet (drift sink); 050 = otter trawl bottom (fish); 100 = sink gillnet (anchored, fixed); 121 = purse seine. Species codes: BODO = coastal common bottlenose dolphin (*Tursiops truncates*); UNPW = long-finned or short-finned pilot whale (*Globicephala* spp); UNSE = unidentified seal; HASE = harbor seal (*Phoca vitulina concolor*); GRSE = gray seal (*Halichoerus grypus grypus*); UNDO = unidentified dolphin. Statistical areas are shown in Figure 1.

GEAR Code	Statistical Area	Take Date	Species Code	Recorded Animal Condition	Revised Animal Condition	Deter-mination	NMFS 2012 SI Deter-mination Directive	Comments regarding deter-mination
117	635	Feb. 2013	BODO	alive		NSI	S7b, S14, and S15.	All gear removed while in the water, actively swam away
050	522	Nov. 2013	UNPW	unknown	advanced decom-position	Dead		Decomposed carcass
100	514	May 2013	UNSE	unknown		CBD		No additional info available
121	513	July. 2013	HASE	alive		NSI	P7b	Released alive from purse seine.
121	513	Oct. 2013	GRSE	alive		NSI	P7b	Released alive from purse seine.
050	622	March 2013	UNDO	unknown		CBD		No additional info available
050	514	Nov. 2013	UNDO	08		CBD		08 = Alive, seen by captain and/ or crew only

Table 4. Summary of 2013 animal conditions (D=dead; DC=decomposed carcass; SI=serious injury; NSI=non serious injury; UI=uninjured; CBD=could not be determined) by gear type), species (short-beaked common dolphin [*Delphinus delphis*]; gray seal [*Halichoerus grypus*]; harbor porpoise [*Phocoena phocoena*]; harbor seal [*Phoca vitulina*]; long-finned or short-finned pilot whale [*Globicephala* spp]; Risso's dolphin [*Grampus griseus*]; white-sided dolphin [*Lagenorhynchus acutus*]; unidentified dolphin; bottlenose dolphin [*Tursiops truncates*]; harp seal [*Pagophilus groenlandicus*]; unidentified seal; minke whale [*Balaenoptera acutorostrata*]).

Gear Type	Common Name	Dead		Alive			
		D (1)	DC (2)	SI	NSI	UI	CBD
Otter Trawl Bottom	Short-beaked common dolphin	28					
	Gray seal	7	1				
	Harbor porpoise	1					
	Harbor seal	2					
	Long-finned or short-finned pilot whale	4	6				
	Risso's dolphin	4	1				
	White-sided dolphin	8	1				
	Unidentified dolphin						2
Sink gillnet	Bottlenose dolphin	1			1		
	Short-beaked common dolphin	6	1				
	Gray seal	62	6				
	Harbor porpoise	13	8				
	Harbor seal	20	2				
	Harp seal	2					
	Risso's dolphin	1					
	White-sided dolphin	1					
	Unidentified seal						1
Midwater Trawl	Gray seal	1					
	Minke whale		1				
	Pilot whale	3					
Purse Seine	Gray seal				1		
	Harbor seal				1		

[1] Animals included under the dead category include the following animal conditions reported by NEFOP: 10 – dead, condition unknown; 11 – dead, fresh; 14 – dead, seen by captain/crew only.
[2] Animals included under the decomposed carcass category include the following animal conditions reported by NEFOP: 12 – dead, moderately decomposed.

Table 5. Animal determination frequencies and relative proportions by gear type and species in 2013: Gear types: OTB=bottom trawls; SGN=gillnets; OTM=mid-water trawls; PSH=purse seines. Species: bottlenose dolphin [*Tursiops truncates*]; common dolphin [*Delphinus delphis*]; gray seal [*Halichoerus grypus*]; harbor porpoise [*Phocoena phocoena*]; harbor seal [*Phoca vitulina*]; pilot whale [*Globicephala* spp]; Risso's dolphin [*Grampus griseus*]; white-sided dolphin [*Lagenorhynchus acutus*]. Assignment codes: D=dead; D*= Excludes decomposed animals; D= Includes decomposed animals; SI=serious injury; NSI=non-serious injury; UI=uninjured.**

Gear	Determination	Bottlenose Dolphin		Common Dolphin		Gray Seal		Harbor Porpoise		Harbor Seal		Harp Seal		Pilot Whale		Risso's Dolphin		White-sided Dolphin	
OTB		Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop
	D*	0	0.00	28	1.00	7	1.00	1	1.00	2	1.00	0	0.00	4	1.00	4	1.00	8	1.00
	SI	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	NSI	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UI	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	Total	0	0.00	28	1.00	7	1.00	1	1.00	2	1.00	0	0.00	4	1.00	4	1.00	8	1.00
SGN		Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop
	D**	0	0.00	7	1.00	68	1.00	21	1.00	22	1.00	2	1.00	0	0.00	1	1.00	1	1.00
	SI	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	NSI	1	1.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UI	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	Total	0	1.00	7	1.00	68	1.00	21	1.00	22	1.00	0	1.00	0	0.00	1	1.00	1	1.00
OTM		Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop
	D*	0	0.00	0	0	1	1.00	0	0.00	0	0.00	0	0.00	3	1.00	0	0.00	0	0.00
	SI	0	0.00	0	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	NSI	0	0.00	0	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UI	0	0.00	0	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	Total	0	0.00	0	0	1	1.00	0	0.00	0	0.00	0	0.00	3	1.00	0	0.00	0	0.00
PSH		Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop	Freq	Prop
	D*	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	SI	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	NSI	0	0.00	0	0.00	1	1.00	0	0.00	1	1.00	0	0.00	0	0.00	0	0.00	0	0.00
	UI	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

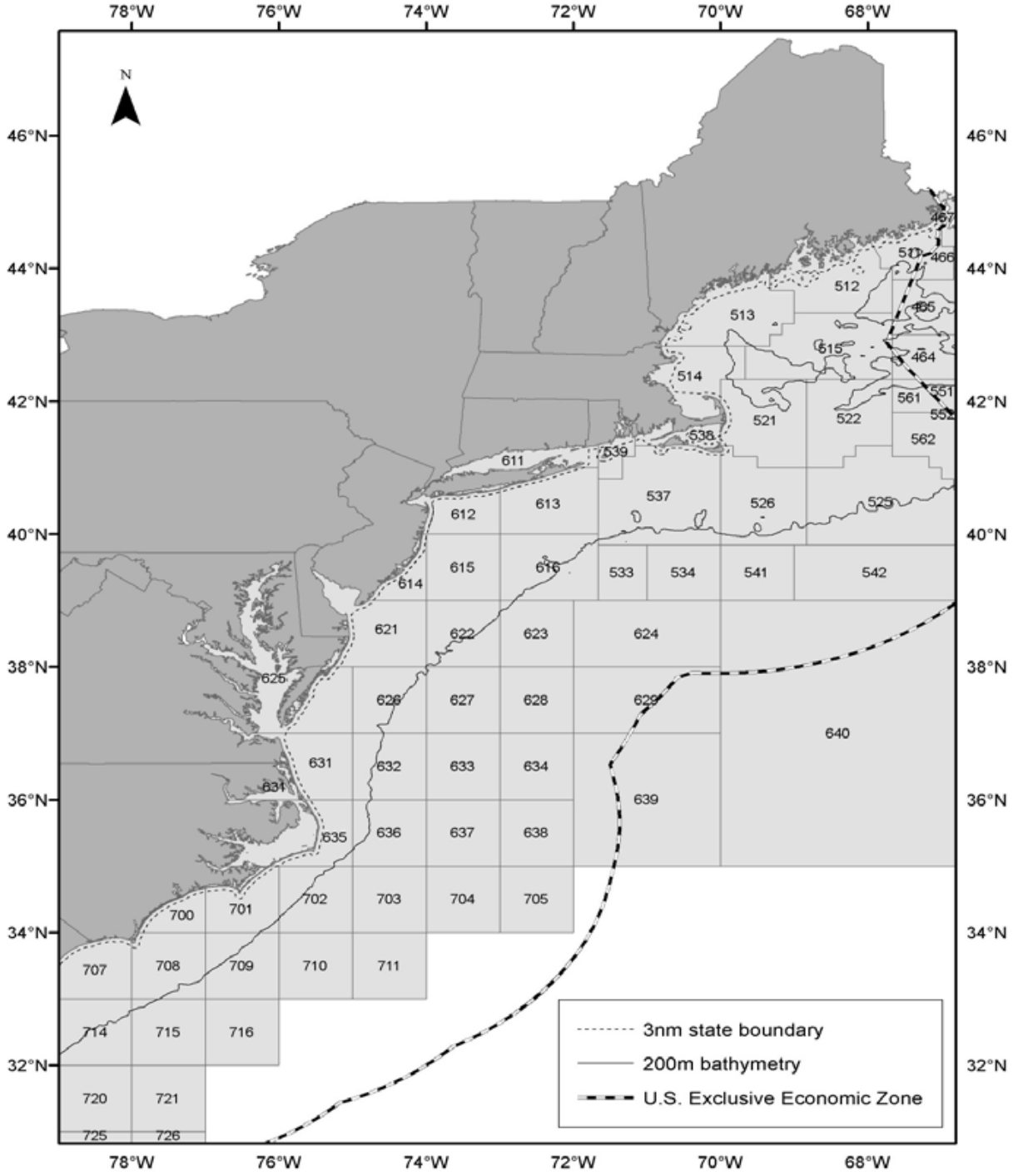

Figure 1. US Northwest Atlantic Fishery statistical areas.

Appendix 1. Tables 2 and 3 from NMFS Process for Distinguishing Serious from Nonserious Injury of Marine Mammals

Online at: http://www.nmfs.noaa.gov/pr/pdfs/serious_injury_procedure.pdf

Table 2. Summary of Small Cetacean[1] Injury Categories and Criteria

Instructions: Each small cetacean injury event is recorded to the appropriate injury/information category using all available information and scientific judgment, as described in the Procedural Directive. For a single injury event to which several categories apply, the injury determination with the highest level of severity is assigned. More detailed information or extended observation on an individual case/animal may justify a determination differing from the guidance of this table.

Category	Injury/Information	Injury Determination[2]	Additional factors for evaluating whether "case specific" injuries are serious or nonserious (additional factors at end of table) *
S1	A free-swimming animal observed at a date later than its human interaction, exhibiting signs of declining health believed to be resulting from initial injury (e.g., a marked skin discoloration, fat loss)	SI[3]	
S2	Ingested gear[4] or hook(s)	SI	
S3	Visible blood loss	Case specific[5]	Amount of blood, location of the bleeding injury, duration of bleeding
S4	Animal brought on vessel deck following entanglement/entrapment (excluding scientific research targeting marine mammals and authorized as such under a NMFS scientific research permit, where the animal is brought on and placed on the vessel deck in a controlled manner)	SI	
S5a	Hook(s) in head (excluding criterion S5b), regardless of the presence of gear	SI	
S5b	Hook(s) confirmed in lip only, external tissue outside of teeth, no trailing gear	Case specific	Prolonged restraint or struggle that could lead to capture myopathy, size of hook, depth of hooking, impairing ability to feed, presence of other injuries
S5c	Hook(s) in any body part, but hook(s) is removed or pulls out	Case specific	Prolonged restraint or struggle that could lead to capture myopathy, depth of hook, hook pulls out cleanly vs. causes further injury during dehooking, method used to remove hook, length of time hooked

Appendix 1 Table 2 continued.

Category	Injury/Information	Injury Determination[2]	Additional factors for evaluating whether "case specific" injuries are serious or nonserious (additional factors at end of table) *
S5d	Hook(s) in appendage or body (excluding criterion S5a), without trailing gear or with trailing gear that does not have the potential[6] to: 1) become a constricting wrap on animal; 2) be ingested; 3) accumulate drag; or 4) become snagged on something in the environment, anchoring the animal	Case specific	Prolonged restraint or struggle that could lead to capture myopathy, depth and location of hook, type and amount of gear attached
S6	Gear attached to free-swimming animal with potential[7] to: 1) become a constricting wrap on animal; 2) be ingested; 3) accumulate drag; or 4) become snagged on something in the environment, anchoring the animal	SI	
S7a	Anchored, immobilized, or entrapped and not freed	SI	
S7b	Anchored, immobilized, entangled, or entrapped before being freed without gear attached	Case specific	Duration of entanglement/ entrapment, prolonged restraint or struggle that could lead to capture myopathy, gear type, where/how gear is attached to animal, associated injury (i.e., where directly or indirectly caused by initial entanglement), response of individual animal, method used by human to remove gear from animal
S8a	Gear wrapped and constricting on any body part or is likely to become constricting as the animal moves or grows	SI	
S8b	Gear wrapped and loose on any body part	Case specific	Gear type, amount of gear, potential for snag, potential to lead to criterion S8a, animal body size relative to gear (e.g., because of species or age), effect on animal movement, species sensitivity (e.g., frightens easily)
S9	Body trauma[8] not covered by any other criteria	Case specific	Location of wound, depth (e.g., superficial or to the bone, penetrating muscle or organs), length, number of lacerations, cleanliness (i.e., compression vs. tearing)
S10	Visible fracture(s), excluding pectoral fins (see criterion S13d for pectoral fin fractures)	SI	
S11	Vertebral transection, including fully severed flukes	SI	
S12	Body cavity penetration[9] by foreign object or body cavity exposure	SI	

Appendix 1 Table 2 continued.

Category	Injury/Information	Injury Determination[2]	Additional factors for evaluating whether "case specific" injuries are serious or nonserious (additional factors at end of table) *
S13a	Loss or disfigurement of dorsal fin	Case specific	Cleanliness (i.e., compression vs. tearing), nature of injury causing the loss, extent of fin loss (i.e., full or partial), amount and duration of blood loss
S13b	Partially severed flukes, transecting midline	SI	
S13c	Partially severed flukes, not transecting midline	Case specific	Cleanliness (i.e., compression vs. tearing), nature of injury causing the loss, amount and duration of blood loss
S13d	Partially or completely severed or fractured pectoral fin(s)	Case specific	Cleanliness (i.e., compression vs. tearing), nature of injury causing the loss, extent of fin loss (i.e., full or partial), amount and duration of blood loss, opened or closed fracture
S14	Social animal separated from group and/or released alone post-interaction (excluding criterion S15)	Case specific	Species (e.g., sensitivity, offshore vs. inshore), location of release (e.g., likelihood of animal locating its conspecifics).
S15	Dependent animal (i.e., calf, juvenile) released alone post-interaction or dependent animal left with a seriously injured or dead mother	SI	
S16	Observed or reported collision with vessel	Case specific	Speed of vessel, size of vessel, hull shape, part of vessel to strike the animal, size of animal compared to size of vessel, behavior of animal after collision, extent and location of wound(s) on animal

1 For the purposes of this table, small cetaceans include all Odontocetes except sperm whales.

2 This table includes only those criteria determined to be serious injuries or case specific based on expert opinion at the 2007 Workshop (Andersen *et al.*, 2008) and by small cetacean experts on the NMFS Determination Staff working group. For the purposes of streamlining the information for the reader, criteria determined to be non-serious injuries are not included in this table.

3 SI = serious injury.

4 For the purposes of this table, gear is defined as any portion of fishing gear excluding the hook, which is considered separately. Lures are considered gear. Gear also generally refers to any type of debris entangling or attached to the animal.

5 Case specific = Could be a serious or non-serious injury, but either 1) there is insufficient information about the impact of a particular injury, or 2) additional factors must be considered on a case-by-case basis to determine the severity

6 For the purposes of this table, "potential" as it relates to criterion S5d indicates that the trailing gear IS

NOT capable of leading to any of the situations listed.

7 For the purposes of this table, potential as it relates to criterion S6 indicates that the trailing gear IS capable of leading to any of the situations listed.

8 For the purposes of this table, "trauma" is defined as a wound or bodily harm caused by an extrinsic agent. Blunt trauma is an injury (abrasion, laceration, contusion or skeletal fracture) produced by a blunt object striking the body or impact of the body against a blunt object or surface. Sharp force trauma is an injury caused by a sharp or pointed object creating a penetrating (stab, chop or incision) wound. Laceration is defined as a ragged incision or a tearing of the skin. Lacerations are caused by blunt trauma that results in stretching, tearing, crushing, shearing, or avulsion of the tissue.

9 For the purposes of this table, "penetration" is defined as a wound occurring when a foreign object punctures the body. Penetrating wounds can be characterized as one of three types: stab (small external wound that is greater in length into the body than is apparent on the skin surface), incised (clean cuts into the skin which are longer on the skin surface than they are deep), or chop wounds (incised wounds that penetrate deep to the bone, leaving a groove or cut in the bone).

* Factors listed in the far right column of Table 2 are unique to the associated injury type. In addition to those listed in this column, the factors that should be considered, if available, when reviewing all case specific injury events in Table 2 include, but are not limited to:

- Species
- Age or age class (e.g., calf, juvenile, adult)
- Sex
- Size of animal
- Overall health (e.g., nutritional status, body condition, pre-existing disease state, pre-existing injuries)
- Behavior during and/or after injury- causing interaction (e.g., dorsal arching, listlessness)
- Reproductive status (e.g., pregnant, lactating, has dependant calf)
- Natural history (e.g., indigenous, migratory)
- Location of injury (e.g., mouth, head, body, fin, tail, internal)
- Size of injury
- Duration of injury (e.g., single event, repeated, chronic)
- Depth of injury (e.g., superficial or to the bone, penetrating muscle or organs)
- Cleanliness of injury (e.g., compression, tearing)
- Environmental condition (e.g., individuals out of their normal habitat, climate stressors)
- Social stressors (e.g., social structure of species, separation of social individuals from the group, cow/calf separation)
- Cumulative effects of repeated exposures
- Compounding effects of multiple injuries obtained during a single event
- Availability of data on multiple sequential events involving the same individual over time
- Susceptibility of the species to capture myopathy (spinner dolphins and porpoises notoriously sensitive; bottlenose dolphins robust; many others fall in between, with some unknown)
- Ability of rehabilitated animal to be released
- Relative effect of blood loss on different species

In addition to those factors listed above, the factors that apply to all fishery-interaction related case specific injuries include, but are not limited to:

- Entanglement type (e.g., hooked, anchored, entrapment)
- Amount and size of gear (e.g., size, length and number of branches of line; number of buoys, traps or anchors; volume of netting)
- Entanglement constriction (e.g., tight, loose, multiple wraps)
- Habitat where animal is located (e.g., an animal with trailing gear areas of dense gear or an area with vegetation is more likely to risk snagging the gear and becoming anchored)
- Entanglement duration
- Existence, type and amount of any trailing gear
- Method of handling the animal during disentanglement

Table 3. Summary of Pinniped[1] Injury Categories and Criteria

Instructions: Each pinniped injury event is recorded to the appropriate injury/information category using all available information and scientific judgment, as described in the Procedural Directive. For a single injury event to which several categories apply, the injury determination with the highest level of severity is assigned. More detailed information or extended observation on an individual case/animal may justify a determination differing from the guidance of this table. Any injury leading to apparent significant health decline (e.g., skin discoloration, fat loss) is a serious injury.			
Category	**Injury/Information**	**Injury Determination[2]**	**Additional factors for evaluating whether "case specific" injuries are serious or non-serious (additional factors at end of table)***
P1	A free-swimming animal observed at a date later than its human interaction, exhibiting signs of declining health believed to be resulting from initial injury (e.g., a marked change in body condition, tissue necrosis, emaciation, gangrene).	SI[3]	
P2	Ingested gear[4] or hook(s)	SI	
P3	Visible blood loss	Case specific[5]	Amount of blood, location of the bleeding injury, duration of bleeding
P4	Animal brought on vessel deck following entanglement/entrapment(excluding scientific research targeting marine mammals and authorized as such under a NMFS scientific research permit, where the animal is brought on and placed on the vessel deck in a controlled manner)	Case specific	Manner in which animal is brought on deck, length of time animal is on deck, environmental conditions (e.g., temperature)
P5a	Hook(s) in mouth (excluding criterion P5b), regardless of the presence of gear	SI	
P5b	Hook(s) confirmed in head (excluding criterion P5a), or in lip only (external tissue outside of teeth), no trailing gear	Case specific	Location on head (e.g., eye), depth of penetration, type of hook, prolonged restraint or struggle that could lead to capture myopathy, size of hook, impairing ability to feed
P5c	Hook(s) in any body part, but hook(s) is removed or pulls out	Case specific	Prolonged restraint or struggle that could lead to capture myopathy, location of hooking on the body, depth of hook, hook pulls out cleanly vs. causes further injury during dehooking, method used to remove hook, length of time hooked

Appendix 1 Table 3 continued.

Category	Injury/Information	Injury Determination[2]	Additional factors for evaluating whether "case specific" injuries are serious or non-serious (additional factors at end of table)*
P5d	Hook(s) in appendage or body (excluding criteria P5a-c and P12), without trailing gear or with trailing gear that does not have the potential[6] to: 1) become a constricting wrap on animal; 2) be ingested, 3) accumulate drag; or 4) become snagged on something in the environment, anchoring the animal	NSI[7]	
P6	Gear attached in any manner to free- swimming animal with potential[8] to: 1) become a constricting wrap on animal; 2) be ingested; 3) accumulate drag; or 4) become snagged on something in the environment, anchoring the animal	SI	
P7a	Anchored/immobilized and not freed	SI	
P7b	Anchored, immobilized, or entangled before being freed without gear attached	Case specific	Duration of entanglement, prolonged restraint or struggle that could lead to capture myopathy, type of fishing gear, where/how gear immobilized animal, associated injury (where directly or indirectly caused by initial entanglement), response of individual
P8a	Gear wrapped and constricting any body part or likely to become constricting as the animal moves or grows	SI	
P8b	Gear wrapped loosely on any body part	Case specific	Type and amount of fishing gear, animal body size relative to gear (species, age), effect on movement, species sensitivity
P9	Body trauma[9] not covered by any other criteria	Case specific	Location of trauma on body, depth (superficial or to the bone, penetrating muscle or organs) length of laceration(s), number of lacerations, cleanliness (compression vs. tearing), amount and duration of blood loss, risk of infection or disease transmission (e.g., dog bites)
P10	Visible fracture(s), excluding broken appendages (see criterion P13 for broken appendages)	SI	
P11	Vertebral transection or fully severed flipper(s)	SI	
P12	Body cavity penetration[10] by foreign object or body cavity exposure	SI	

Appendix 1 Table 3 continued.

Category	Injury/Information	Injury Determination[2]	Additional factors for evaluating whether "case specific" injuries are serious or non-serious (additional factors at end of table)
P13	Partially severed or fractured flipper(s)	Case specific	Cleanliness (clean cut vs. tear), nature of injury causing the loss, extent of fin or flipper loss, opened or closed fracture, dislocation, amount/duration of blood loss
P14	Dependent animal (i.e., pup, juvenile) released alone post-interaction or dependent animal left with a seriously injured or dead mother	SI	
P15	Observed or reported collision with vessel	Case specific	Speed of vessel, size of vessel, hull shape, part of vessel to strike the animal (e.g., propeller, hull), size of animal compared to size of vessel, location of strike on animal's body, extent and location of wound(s) to animal

1 For the purposes of this table, pinnipeds include all pinniped species except walrus.

2 This table includes on only those criteria determined to be serious injuries or case specific based on expert opinion at the 2007 Workshop (Andersen *et al.*, 2008) and by pinniped experts on the NMFS Determination Staff working group. For the purposes of streamlining the information for the reader, criteria determined to be non-serious injuries are not included in this table.

3 SI = serious injury.

4 For the purposes of this table, gear is defined as any portion of fishing gear excluding the hook, which is considered separately. Lures are considered gear. Gear also generally refers to any type of debris entangling or attached to the animal.

5 Case specific = Could be a serious or non-serious injury, but either 1) there insufficient information about the impact of a particular injury, or 2) additional factors must be considered on a case-by-case basis to determine the severity.

6 For the purposes of this table, potential as it relates to criterion P5d indicates that the trailing gear IS NOT capable of leading to any of the situations listed.

7 NSI = non-serious injury.

8 For the purposes of this table, potential as it relates to criterion P6 indicates that the trailing gear IS capable of leading to any of the situations listed.

9 For the purposes of this table, "trauma" is defined as a wound or bodily harm caused by an extrinsic agent. Blunt trauma is an injury (abrasion, laceration, contusion or skeletal fracture) produced by a blunt object striking the body or impact of the body against a blunt object or surface. Sharp force trauma is an injury caused by a sharp or pointed object or a bullet from a gunshot creating a penetrating (stab, chop or incision) wound. Laceration is defined as a ragged incision or a tearing of the skin.

Lacerations are caused by blunt trauma that results in stretching, tearing, crushing, shearing, or avulsion of the tissue.

10 For the purposes of this table, "penetration" is defined as a wound occurring when a foreign object punctures the body, such as a bullet from a gunshot. Penetrating wounds can be characterized as one

of three types: stab (small external wound that is greater in length into the body than is apparent on the skin surface), incised (clean cuts into the skin which are longer on the skin surface than they are deep), or chop wounds (incised wounds that penetrate deep to the bone, leaving a groove or cut in the bone).

* Factors listed in the far right column of Table 3 are unique to the associated injury type. In addition to those listed in this column, the factors that should be considered, if available, when reviewing all case specific injury events in Table 3 include, but are not limited to:

- Species
- Age or age class (e.g., calf, juvenile, adult)
- Sex
- Size of animal
- Overall health (e.g., nutritional status, body condition, pre-existing disease state, pre-existing injuries)
- Behavior during and/or after injury- causing interaction (e.g., listlessness)
- Reproductive status (e.g., pregnant, lactating, has dependant pup)
- Natural history (e.g., small home range, large home range)
- Location of injury (e.g., mouth, head, body, flipper/fin, internal)
- Size of injury
- Duration of injury (e.g., single event, repeated, chronic)
- Depth of injury (e.g., superficial or to the bone, penetrating muscle or organs)
- Cleanliness of injury (e.g., compression, tearing)
- Environmental condition (e.g., individuals out of their normal habitat, environmental stressors)
- Social stressors (e.g., social structure of species, separation of social individuals from the group, mother/pup separation)
- Cumulative effects of repeated exposures
- Compounding effects of multiple injuries obtained during a single event
- Availability of data on multiple sequential events involving the same individual over time
- Susceptibility of the species to capture myopathy (some sensitive, others robust, some unknown)
- Ability of rehabilitated animal to be released
- Relative effect of blood loss on different species

In addition to those factors listed above, the factors that apply to all fishery or marine-debris interaction related case specific injuries include, but are not limited to:

- Entanglement type (e.g., hooked, anchored, entrapment)
- Amount and size of gear(e.g., size, length and number of lines; number of buoys, traps or anchors; volume of netting; material of gear)
- Method of handling the animal during disentanglement
- Entanglement constriction (e.g., tight, loose, multiple wraps)
- Habitat where animal is located (e.g., an animal with trailing gear in areas of dense gear or an area with vegetation or on shore is more likely to risk snagging the gear and becoming anchored)
- Entanglement duration
- Existence, type and amount of any trailing gear

Appendix 2. Serious injury and mortality determination of a bottlenose dolphin released alive February 5, 2013 from observed gillnet gear off North Carolina

Purpose

To determine whether a common bottlenose dolphin released alive from entanglement in gillnet gear was a serious or non-serious injury based on the information provided on the entanglement event.

Background

On February 5, 2013, a fisheries observer from the Northeast Fisheries Observer Program (NEFOP) observed a fisheries interaction with a bottlenose dolphin off North Carolina's coast. The observer was on board a North Carolina commercial gillnet vessel targeting spiny dogfish. The event occurred in shallow near-shore waters (5.5 m depth, 1.8 km from shore; Figure 1). The fishing gear was a 5.5 in mesh unanchored sink gillnet with a total net length of 1200 ft (four 300 ft net panels). The total soak duration from the end of setting the gear to the beginning of hauling the gear was 38 minutes. The dolphin was observed within the first minute of hauling the gear. Two photographs were taken of the dolphin in the gear (Figure 2). The dolphin was released alive and did not require any cutting of gear to be freed. The observer estimated the length of the dolphin as 5 ft (150 cm).

Pursuant to section 117 of the Marine Mammal Protection Act (MMPA) the National Marine Fisheries Service (NMFS) is required to estimate annual levels of human-caused mortality and serious injury to marine mammal stocks. The NMFS' national guidelines for distinguishing marine mammal serious from non-serious injuries were used to make a final determination on the expected outcome of the dolphin's condition post-release (NMFS 2012).

Many of the details from the observed entanglement came from NEFOP data log sheets for the observed trip and a follow-up telephone interview with the NEFOP fisheries observer. The observer recorded detailed comments regarding the interaction on the incidental take log (Figure 3). Additional questions were answered on a trip file worksheet during the normal observer debriefing shortly after conclusion of the trip (Figure 3). The follow-up telephone interview with the observer was conducted for further clarification on some details of the event to assist with making a final determination on the dolphin's condition post-release.

A summary of relevant comments from (1) the incidental take log; (2) observer debriefing; and (3) follow-up telephone interview with the fisheries observer are described below.

1. Entanglement situation

a. **Incidental take log comments** (Figure 3)

"When first spotted. The dolphin was seen in water and appeared to be swimming in water like normal."

"Once I got to the back of the boat I saw the dolphin's head and upper half were completely free."

"The entanglement (i.e. when the meshes were actually around his body) didn't start until his caudal fin. However due to this entanglement, the gillnet managed to wrap lightly around the body from right behind pectoral fins & in front of dorsal all the way to about ½ way between dorsal and caudal fin where the 1st mesh appeared around the body. (This is reason I gave condition code as 01 b/c really only caudal fin caught in net). I didn't see any entanglement from the gillnet being around the dolphin until the first mesh being about ½ way between the dorsal & caudal. From that point to the caudal base there was probably 12 meshes around that area. Starting at the dolphin caudal, the gillnet became a tangled mess. There was about 100-200 meshes tangled in the caudal fin. Most of the entanglement was around the fork of the fin -> being basically a big ball. But there were also meshes, ~6 on either side wrapped around the 2 legs of the caudal fin. Then I saw the net put no real pressure on the animal's flesh. I didn't see any indentations on the tail from the net. Just more wad of net caused by the dolphins struggle. The captain & crew were able to get the dolphin free w/in 5 minutes of seeing the problem, including time hauling to the boat. The net didn't have to be cut in order to get it out either. Once they got the tail free, the dolphin got away w/o struggle. The part of the net draped around the mid-section fell away w/ease. No cuts or scrapes see on the body. The dolphin was never under water for a length of time. When freed swam away quickly and in a normal fashion. Little to no harm was shown in behavior."

b. Observer debriefing (Trip File Worksheet; Figure 3)

- Was all gear removed before it swam off?
  "Yes, no gear on its release."
- Was there any involvement of lead or float lines in the entanglement?
  "Pretty sure just mesh, only mesh around tail stock."
- Can you describe the dolphin's behavior you saw while it was entangled?
  "Very active, almost pulled captain over from thrashing up and down so much."
- Was the entanglement around the tail stock/flukes and net covering other parts of body but not caught or through meshes?

"Yeah, entanglement near tail stock but body wrapped like a blanket by mesh."

- How long did you see the dolphin after its release?
  "Matter of seconds, very quickly. As soon as it was out of the gear it was gone."
- Are you sure 100-200 meshes (big ball) around tail stock sounds right?
  "Lots of meshes."
- Were you able to see the entire body during entanglement or is there a portion you never saw?
  "Didn't get a good look at head area, only seen initially. Never saw underside, nothing seen of note for injuries, cuts or bleeding. No blood in water either."

c. Phone interview - The observer stated that the entire disentanglement event lasted no longer than 5 minutes (the disentanglement event is defined as the time period beginning the initial observation of the dolphin in the gear up to when the dolphin was released). The dolphin was not seen submerged below the water while it was entangled and being released (i.e., no threat of drowning). The caudal peduncle was the only part of the body entangled in the gear. The caudal peduncle of the dolphin was wrapped in the body of the webbing between the float and sink lines. The observer indicated that the dolphin was not entangled in any part of the float or sink lines. The rest of the body, including the dorsal fin and flukes was pressed against the gear but did not become entangled in the webbing itself. The observer was able to see the dolphin, but there were moments when her view was obstructed by the crew members working to release the animal. During the entanglement event, the dolphin did not vigorously struggle for any length of time. It was not struggling when the crew was attempting to release it from the gear.

2. Size of the dolphin

a. **Incidental take log –** Estimated length = 150 cm.

b. **Observer debriefing** (Trip File Worksheet) –
- Is about 5 ft for the estimated length correct?
  "Roughly sounds right."
- Any other dolphins seen in the area?
  "Nope."

c. **Phone Interview** - The observer does not believe the entangled dolphin was a calf based on seeing free-swimming (non-entangled) bottlenose dolphin calves during her NEFOP-related observations in NC waters for 2 years. The observer admitted that her size estimates tend to be underestimates and that this dolphin could have been as large as 6 ft. She was less confident about it being as large as 7 ft.

Applicable Marine Mammal Serious Injury Guideline (MMSIG) Determination Categories

Based on the information collected from the observed event, there are 3 categories (S7b, S14, and S15) of small cetacean injury from the MMSIG that are applicable to this event (Table 1).

At the beginning of the injury determination process, the piece of information with the most uncertainty was the observer's size estimation of the dolphin on the incidental take log (visually estimated at 150 cm [5 ft]). A 150-cm dolphin would be considered a calf based on age class information currently used by the Working Group on Marine Mammal Unusual Mortality Events (WGMMUME, http://www.nmfs.noaa.gov/pr/health/mmume/history.htm) for the Atlantic Unusual Mortality Event (Deborah Fauquier, NMFS, pers. comm.; Table 2). Injury category S15 would apply if the animal was a calf; thus, it would be considered a serious injury (Table 1).

However, there was uncertainty in the dolphin's estimated length for two reasons (1) the observer's admission of underestimating size; and (2) some of the features observed in the photographs taken by the observer (Figure 2) were not consistent with a dependent calf (e.g., notches in the dorsal fin and the apparent size of dorsal fin in relation to the gillnet float size). If the animal was not a calf, injury categories S7b and S14 would then apply and require consideration of additional factors to make an injury determination. Therefore, we used an alternative method to improve accuracy of the estimated length and corresponding age class (i.e., perinate, calf, sub-adult, adult) to determine whether or not the animal was seriously injured post-release.

Estimating Observed Dolphin Length and Age Class

A series of steps and additional sources of information were used to improve accuracy of the observer's estimated length of the dolphin. The only portion of the dolphin's body that was visible in the available photographs of the event was from the dorsal fin to the fluke insertion (Figure 2). As a result of this limitation, morphometric data available from stranded dolphins in North Carolina and Virginia, image measurement software, and linear regressions were used to help obtain an estimate of the dolphin's total body length (TBL) using the available photographs.

Step 1

The software, CELLSENS (Olympus Corporation, PA), was used to measure the length of the portion of the dolphin visible in the best available photograph (Figure 2a). This was accomplished by calibrating the software's measuring tool with objects of known sizes in the photograph. Objects used for calibration (i.e., calibrated objects) were (1) float length on the float line (11.43 cm), (2) mesh bar length (6.99 cm), and (3) distance between floats on the float line (91.44 cm) (Figures 4 and 5). The mesh bar length and distance between floats were reported on the NEFOP data sheets. The float length was obtained by information provided from the

owner of the commercial vessel fishing vessel and consultation with fishing gear experts using the shape and color of the float in the photographs. A straight line measurement was calculated for the visible portion of the dolphin: the tip of the dorsal fin to the insertion of the flukes/peduncle, hereafter referred to as 'post-dorsal length' (PDL; Figures 2 and 6). The dolphin's tailstock was arched, so a straight line measurement was approximated (Figure 5). The PDL was measured 3 times, once for each of the calibrated objects (Table 2).

Step 2

Measuring objects in photographs using CELLSENS or similar software can have two sources of bias: 1) the distance an object (calibrated or measured) is from the camera, and 2) the angle of an object (calibrated or measured) relative to the camera lens. Efforts were made to correct for these biases by comparing the known size of the calibrated objects (float length, mesh bar, and distance between floats) to measurements of those objects obtained in CELLSENS. First, measurements were taken of floats, mesh bar, and the distance between floats using each calibrated object. For example, when float C2 (Figure 4) was the calibrated object, floats C1 and C3, 2 mesh bars, and the distance between floats were measured in addition to the dolphin. The bias was calculated for each measured object as the percent relative difference ((CELLSENS measurement-Actual length)/CELLSENS measurement)*100. The average bias across measurements made for each calibration object was then calculated. The PDL measurements for each calibration object were then corrected for this bias (Table 3).

Step 3

The bias-corrected PDLs from Step 2 did not include the flukes because only the dorsal fin to the fluke insertion was visible in the pictures. However, we had data to derive an estimate of fluke length (FL; distance between the insertion of flukes and the fluke notch; Figure 6, Step 4 below) using an estimate of TBL without the fluke, hereafter referred to as rostrum to fluke insertion (RTFI). The RTFI was predicted using a regression equation estimated from detailed morphometrics data collected from bottlenose dolphin strandings in North Carolina (n=430) (NMFS, Protected Resources Branch, Beaufort NC, Unpublished data; Figure 7). The PDLs were regressed on TBLs from these data. Since we had 3 estimates of PDL from Step 2 we used those values to predict TBL, but in this case TBL reflects only RTFI because the fluke portion of the body was absent. The mean RTFI across all the calibration objects was 219.25 cm (Table 3).

Step 4

The FL measurement is not standard for morphometrics data collected from stranded dolphins and hence was not available in the NMFS Beaufort data referenced in Step 3. However, a dataset including the RTFI and FL measurements was available from 33 strandings in North Carolina and Virginia (Erin Fougères, NMFS, St. Petersburg FL, unpublished data). These data

were fitted to a regression line comparing RTFI to FL (Figure 8). The RTFI estimates derived from Step 3 were used to predict FL (mean FL = 18.62 cm; Table 3).

Step 5

For a complete PDL that incorporates the length from the animal from its dorsal fin to the fluke notch (Figure 6), the bias corrected PDL from Step 2 was added to the FL derived from Step 4. The estimated mean PDL from dorsal fin to fluke notch was 108.92 cm (Table 3).

Step 6

The final step was to estimate the complete TBL from rostrum to fluke notch (Figure 6). The regression equation derived from the morphometrics data described in Step 3 was used to infer TBL for the observed dolphin take given the bias corrected PDL + FL from each calibration object from Step 5 above (Table 3; Figure 8). Although a comparable measurement to our estimated PDL + FL is not routinely recorded for strandings, we were able to calculate that length for each stranding by subtracting the measurement of the tip of the rostrum to the tip of the dorsal fin from the TBL (Figure 6). The mean TBL based on each of the three calibration objects was 259.36 cm [SD = 4.13], 95% CIs = 254.69-264.03 cm (Table 3).

Step 7

The mean TBL from Step 6 was compared to the age class categories used by the WGMMUME to estimate the age of the observed dolphin as an adult (Figure 8). This would place the observed dolphin take in the adult category using the WGMMUME's age class categories for the Atlantic Unusual Mortality Event (Table 2).

Consideration of Serious Injury Criteria

When considering injury category S15 and whether the bycaught dolphin was a dependent calf, it is important to note that our average TBL estimate of 259.36 cm [8.5 ft] is larger than the observer's visually estimated 150 cm [5 ft] length recorded on the logs and provided in the phone interview. However, this estimated larger size is more consistent with other details visible in the photo, such as a large distinctive dorsal fin and the lack of other dolphins seen in the vicinity by the observer. When considering the uncertainty and biases associated with our estimated length, we conservatively concluded that the bycaught dolphin was at least an older sub-adult or an adult and not likely a dependent calf as indicated by the original length estimated by the observer on the incidental take log. Therefore, the injury category S15 (Table 1) no longer applies when making a final injury determination for this dolphin. Injury categories S7b and S14 were subsequently considered, which are case specific and require consideration of additional factors to make an injury determination. Under injury category S7b, several factors were considered including the duration and location of entanglement, whether the dolphin was restrained or

struggled, how the gear was attached to the animal, and where and how the gear was removed. The observer stated the entire observed entanglement event lasted approximately 5 min from when the dolphin was first observed entangled until it was released from the gear. It is not possible to know the actual duration of the entanglement event. However, the gillnet was known to be soaking for 38 min and the animal was observed within the first minute of hauling the gear after the vessel came upon the gear to haul it in to the vessel. It is reasonable to conclude that the entanglement lasted no more than 5 min given the gear was actively being hauled and attended at the time. The observer also noted that the dolphin appeared to be swimming normally in the water when it was first spotted, suggesting perhaps it was not entangled at that time and became entangled when the crew started hauling in the gear. The dolphin was entangled in the body of the gillnet but not in the lead or float lines. The nature of entanglement location on the dolphin's body was described as the gillnet wrapping the body like "a blanket" starting about halfway between the dorsal fin and peduncle but not actually entangling the dorsal fin or pectoral flippers. The gear then became entangled around the flukes with about 100-200 meshes tangled in a ball, which the observer indicated was a result of the dolphin's struggle. While the dolphin was entangled, the observer noted its behavior to be "very active" to the point where the animal almost pulled the captain overboard. This active thrashing may also suggest that the entanglement was rather recent because the animal was not yet exhausted (i.e., docile) from trying to escape from the net. The observer noted the dolphin did not struggle for any length of time during the entanglement event and was not struggling when the crew released it. The observers did not see any visibly associated injuries, net indentations on the dolphin's skin, or blood in the water from the entanglement. Once the flukes were disentangled, the rest of the net was noted to fall away from the dolphin's body, and it swam away free of any gear. The observer only saw the dolphin briefly post-release and noted it "swam away quickly and in a normal fashion."

Although the entanglement event appeared to be of relatively short duration overall, dolphins are known to die within a couple of minutes from becoming entangled in gillnets and wrapping themselves in the gear. In this case, the dolphin did not wrap itself in the gear and it only became entangled around the flukes during short periods of struggle as noted by the observer. Also, the crew quickly disentangled and released the dolphin. When considering all the information above coupled with the observer's remarks that there were no visible injuries and that the dolphin swam away normally and quickly, we conclude that the potential outcome of criteria S7b is likely not a serious injury.

Under injury category S14, several factors were considered including the species, whether it was released offshore or nearshore, and the likelihood of it locating conspecifics. It is well known that bottlenose dolphins are highly social, but it is not unusual to see estuarine or coastal adult common bottlenose dolphins occasionally alone (Shane et al. 1986; Connor et al. 2000; Wells 1991). The observer noted that no other dolphins were seen in the vicinity during the event, and the dolphin was released alone. In this case, the likelihood of the dolphin finding conspecifics is high based on the location of the entanglement and release. The entanglement event and location of the dolphin's release occurred in shallow, nearshore waters and relatively close to an

inlet (Figure 1). Also, this entangled animal was in known bottlenose dolphin habitat within ranges of both the Northern North Carolina Estuarine System Stock and the Coastal Northern Migratory Stock, not released in an area out of habitat as a result of the entanglement. Therefore, we do not believe that this dolphin suffered serious injury as a result of being temporarily separated from a social group.

Final determination of post-release dolphin condition

After considering all the documented factors associated with this event, we conclude that the entanglement did not likely result in serious injury to the dolphin when considered under applicable injury categories S7b, S14, and S15.

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Wells R. 1991. The role of long-term study in understanding the social structure of a bottlenose dolphin community. In: Pryor K, Norris KS, editors, Dolphin Societies: Discoveries and Puzzles.Berkeley (CA): University of California Press; 397 p.

Table 1. Injury categories and associated determinations were extracted from Table 2 in the Marine Mammal Serious Injury Guideline (MMSIG) process for making injury determinations. Please refer to MMSIG Policy Procedure (NOAA 2012) for additional details on small cetacean injury categories and criteria.

Category	Injury/Information	Injury Determination	Additional factors for evaluating whether "case specific" injuries are serious or non-serious (additional factors at end of table)
S7b	Anchored, immobilized, entangled, or entrapped before being freed without gear attached	Case specific	Duration of entanglement/entrapment, prolonged restraint or struggle that could lead to capture myopathy, gear type, where/how gear is attached to animal, associated injury (i.e. where directly or indirectly caused by initial entanglement), response of individual animal, method used by human to remove gear from animal
S14	Social animal separated from group and/or released alone post- interaction (excluding criterion S15)	Case specific	Species (e.g. sensitivity, offshore vs. inshore, location of release (e.g. likelihood of animal locating its conspecifics)
S15	Dependent animal (i.e., calf, juvenile) released along post-interaction or dependent animal left with a seriously injured or dead mother	Serious Injury (SI)	

Table 2. Age classes based on total body lengths (cm) for bottlenose dolphins. Table provided by the Working Group on Marine Mammal Unusual Mortality Events (WGMMUME, http://www.nmfs.noaa.gov/pr/health/mmume/history.htm).

Age Class	Total Body Length (cm)
Perinate	<115
Calf	≥115 and <210
Sub-Adult	≥210 and <240
Adult	≥240

Table 3. The stepwise approach estimating total body length (TBL= rostrum to fluke notch) of the 2013 bottlenose dolphin observed entangled in a gillnet off North Carolina. The software CELLSENS was first calibrated using objects with known lengths (mesh bar length, float, and distance between floats) from the best photograph. It was then used to measure the visible dolphin's post dorsal length (PDL, tip of dorsal fin to insertion of flukes) and objects of known lengths in the photograph (Figures 2-6). Measurement bias (% relative difference between software estimated PDL length and actual PDL length) and subsequent predictions of various body lengths were estimated in Steps 2 through 6 to derive TBL and age class assignment.

		Step 1	Step 2		Step 3	Step 4	Step 5	Step 6
Calibration object	Measured object	CELLSENS measurement (cm)	% Relative Difference (Bias)	PDL corrected for average bias (cm)	RTFI (Rostrum to Fluke Insertion)	FL (Fluke insertion to Fluke Notch)	PDL + FL (Dorsal Fin to Fluke Notch)	Complete TBL (Rostrum to Fluke Notch)
D2 (mesh bar length) (6.99 cm)	C1 (float)	8.15	-40.28					
	C2 (float)	8.83	-29.43					
	C3 (float)	8.43	-35.62					
	D1 (mesh bar length)	6.71	-4.13					
	D2 (mesh bar length)							
	E (float to float)	79.74	14.67					
	B1 +B2 (dolphin PDL)	74.11						
	average bias		***-24.83***	92.51	223.99	18.94	111.45	264.80
C2 (float) (11.43 cm)	C1 (float)	8.79	-30.03					
	C2 (float)							
	C3 (float)	8.49	-34.63					
	D1 (mesh bar length)	6.60	-5.91					
	D2 (mesh bar length)	6.23	-12.20					
	E (float to float)	79.33	15.27					
	B1 +B2 (dolphin PDL)	74.42						
	average bias		***-19.61***	89.01	216.47	18.43	107.44	256.16
E (float to float) (91.44 cm)	C1 (float)	11.45	0.17					
	C2 (float)	10.52	-8.65					
	C3 (float)	10.03	-13.96					
	D1 (mesh bar length)	7.43	5.92					
	D2 (mesh bar length)	7.71	9.34					
	E (float to float)							
	B1+B2 (dolphin PDL)	88.13						
	average bias		***1.43***	89.39	217.28	18.48	107.87	257.09
Avg. among objects				90.30	219.25	18.62	108.92	259.35

Average (SD) = (4.13)

CIs = 254.69 - 264.03

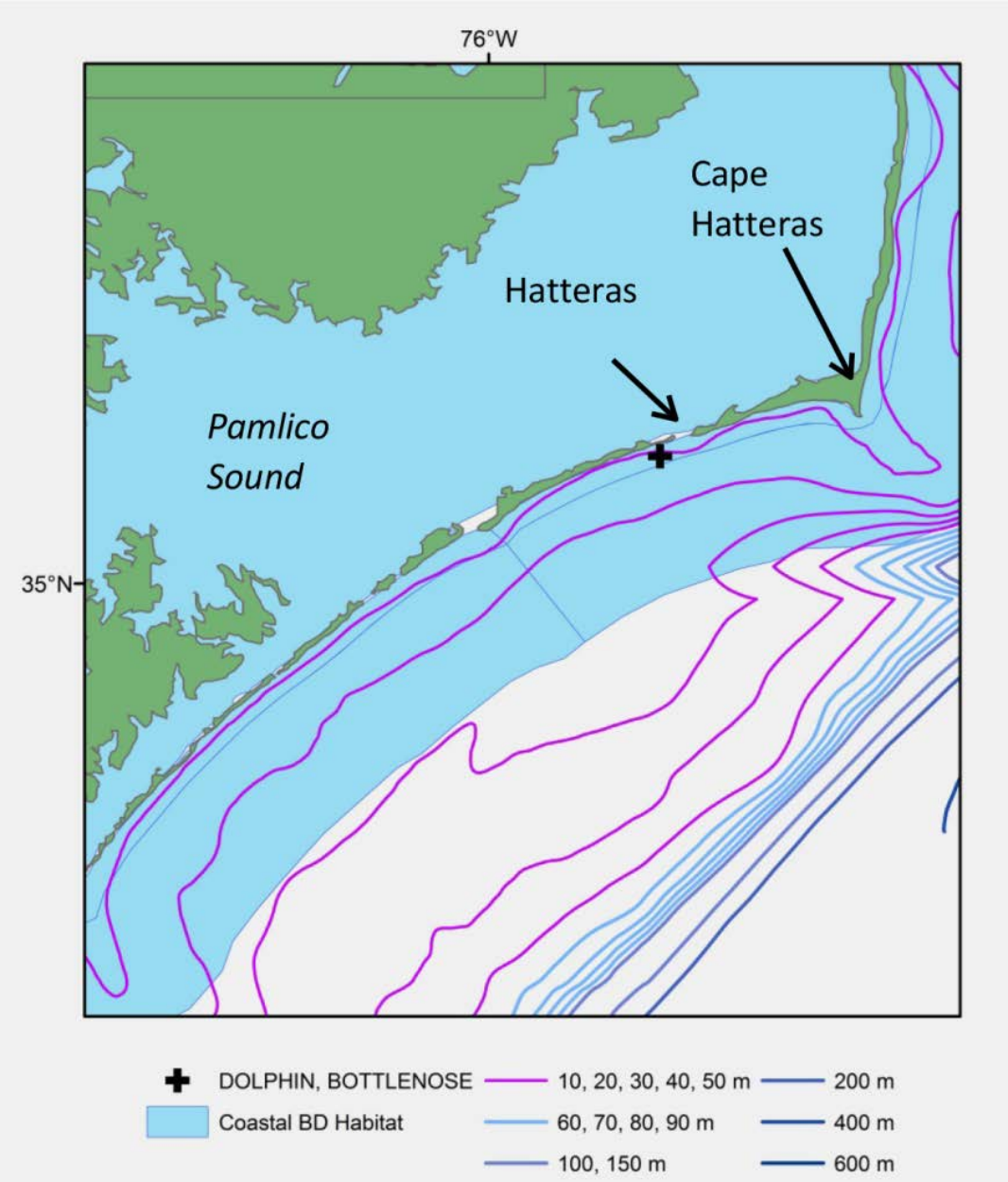


Figure 1. Coastal North Carolina near Cape Hatteras showing location of the Northeast Fisheries Observer Program observed entanglement and live release of a bottlenose dolphin from commercial gillnet gear on February 5, 2013.

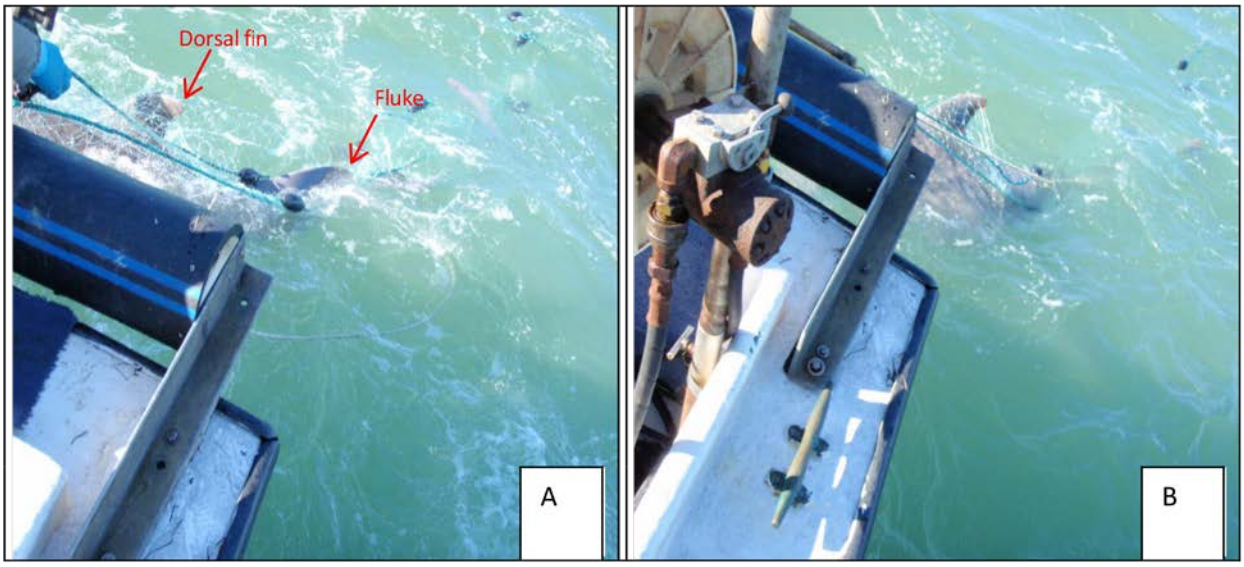
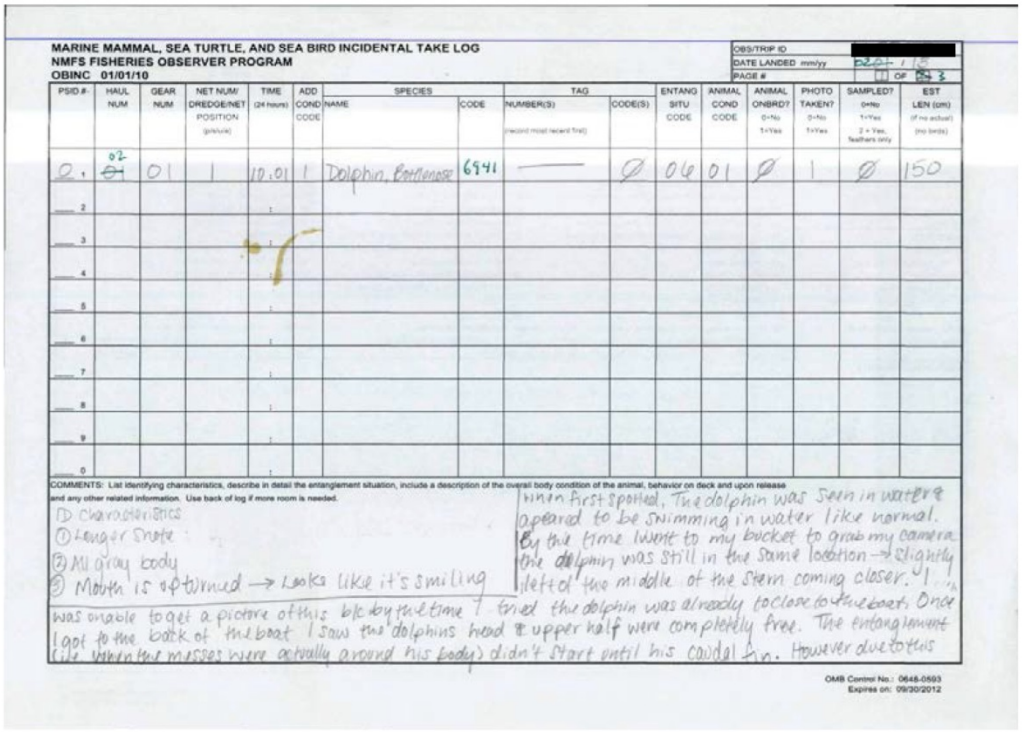


Figure 2. Photographs of the observed bottlenose dolphin that was released alive from a gillnet entanglement in February 2013. Photograph 'A' was used for the measurement analysis.



MARINE MAMMAL, SEA TURTLE, AND SEA BIRD INCIDENTAL TAKE LOG
NMFS FISHERIES OBSERVER PROGRAM
OBINC 01/01/10

OBS/TRIP ID [redacted]
DATE LANDED mm/yy
PAGE # OF

PSID #	HAUL NUM	GEAR NUM	NET NUM/ DREDGE/NET POSITION (pick/uck)	TIME (24 hours)	ADD COND CODE	SPECIES NAME	SPECIES CODE	TAG NUMBER(S) (record most recent first)	TAG CODE(S)	ENTANG SITU CODE	ANIMAL COND CODE	ANIMAL ONBRD? 0=No 1=Yes	PHOTO TAKEN? 0=No 1=Yes	SAMPLED? 0=No 1=Yes 2 = Yes, feathers only	EST LEN (cm) (if no actual) (no birds)
1	~~01~~ 02	01	1	10:01	1	Dolphin, Bottlenose	6941	—	Ø	06	01	Ø	1	Ø	150
2															
3															
4															
5															
6															
7															
8															
9															
0															

COMMENTS: List identifying characteristics, describe in detail the entanglement situation, include a description of the overall body condition of the animal, behavior on deck and upon release and any other related information. Use back of log if more room is needed.

① Characteristics
① Longer Snote
② All gray body
③ Mouth is upturned → Looks like it's smiling

When first spotted, The dolphin was seen in water & appeared to be swimming in water like normal. By the time I went to my bucket to grab my camera the dolphin was still in the same location → slightly left of the middle of the stern coming closer. I was unable to get a picture of this b/c by the time I tried the dolphin was already to close to the boat. Once I got to the back of the boat I saw the dolphins head & upper half were completely free. The entanglement (i.e. where the nets were actually around his body) didn't start until his caudal fin. However due to this

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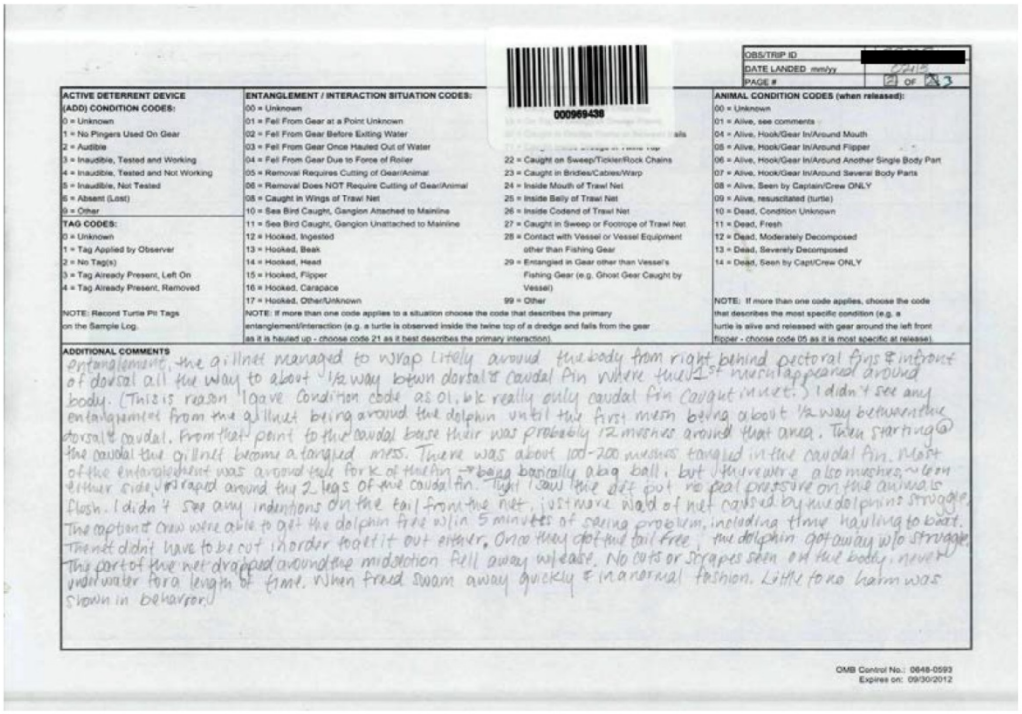
Expires on: 09/30/2012



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000969438

ACTIVE DETERRENT DEVICE (ADD) CONDITION CODES:
0 = Unknown
1 = No Pingers Used On Gear
2 = Audible
3 = Inaudible, Tested and Working
4 = Inaudible, Tested and Not Working
5 = Inaudible, Not Tested
6 = Absent (Lost)
9 = Other

TAG CODES:
0 = Unknown
1 = Tag Applied by Observer
2 = No Tag(s)
3 = Tag Already Present, Left On
4 = Tag Already Present, Removed

NOTE: Record Turtle Pit Tags on the Sample Log.

ENTANGLEMENT / INTERACTION SITUATION CODES:
00 = Unknown
01 = Fell From Gear at a Point Unknown
02 = Fell From Gear Before Exiting Water
03 = Fell From Gear Once Hauled Out of Water
04 = Fell From Gear Due to Force of Roller
05 = Removal Requires Cutting of Gear/Animal
06 = Removal Does NOT Require Cutting of Gear/Animal
08 = Caught in Wings of Trawl Net
10 = Sea Bird Caught, Gangion Attached to Mainline
11 = Sea Bird Caught, Gangion Unattached to Mainline
12 = Hooked, Ingested
13 = Hooked, Beak
14 = Hooked, Head
15 = Hooked, Flipper
16 = Hooked, Carapace
17 = Hooked, Other/Unknown
22 = Caught on Sweep/Tickler/Rock Chains
23 = Caught in Bridles/Cables/Warp
24 = Inside Mouth of Trawl Net
25 = Inside Belly of Trawl Net
26 = Inside Codend of Trawl Net
27 = Caught in Sweep or Footrope of Trawl Net
28 = Contact with Vessel or Vessel Equipment other than Fishing Gear
29 = Entangled in Gear other than Vessel's Fishing Gear (e.g. Ghost Gear Caught by Vessel)
99 = Other

NOTE: If more than one code applies to a situation choose the code that describes the primary entanglement/interaction (e.g. a turtle is observed inside the twine top of a dredge and falls from the gear as it is hauled up - choose code 21 as it best describes the primary interaction).

ANIMAL CONDITION CODES (when released):
00 = Unknown
01 = Alive, see comments
04 = Alive, Hook/Gear In/Around Mouth
05 = Alive, Hook/Gear In/Around Flipper
06 = Alive, Hook/Gear In/Around Another Single Body Part
07 = Alive, Hook/Gear In/Around Several Body Parts
08 = Alive, Seen by Captain/Crew ONLY
09 = Alive, resuscitated (turtle)
10 = Dead, Condition Unknown
11 = Dead, Fresh
12 = Dead, Moderately Decomposed
13 = Dead, Severely Decomposed
14 = Dead, Seen by Capt/Crew ONLY

NOTE: If more than one code applies, choose the code that describes the most specific condition (e.g. a turtle is alive and released with gear around the left front flipper - choose code 05 as it is most specific at release).

ADDITIONAL COMMENTS
Entanglement, the gillnet managed to wrap Litely around the body from right behind pectoral fins & infront of dorsal all the way to about 1/2 way btwn dorsal & caudal fin where the 1st mesh appeared around body. (This is reason I gave condition code as 01, b/c really only caudal fin caught in net.) I didn't see any entanglement from the gillnet being around the dolphin until the first mesh being about 1/2 way between the dorsal & caudal. From that point to the caudal base there was probably 12 meshes around that area. Then starting @ the caudal the gillnet became a tangled mess. There was about 100-200 meshes tangled in the caudal fin. Most of the entanglement was around tail fork of the fin → being basically a big ball, but there were also meshes ~ from either side wrapped around the 2 legs of the caudal fin. Tight I saw the dolphin pot no real pressure on the animal's flesh. I didn't see any indentions on the tail from the net, just more wad of net caused by the dolphins struggle. The crew were able to get the dolphin free within 5 minutes of seeing problem, including time hauling to boat. The net didn't have to be cut in order to get it out either. Once they got the tail free, the dolphin got away w/o struggle. The part of the net dragged around the midsection fell away w/ease. No cuts or scrapes seen on the body, never left water for a length of time. When freed swam away quickly & in a normal fashion. Little to no harm was shown in behavior.

OMB Control No.: 0648-0593
Expires on: 09/30/2012

Figure 3. Images of the incidental take data log and trip debriefing worksheet completed by the Northeast Fisheries Observer Program and fisheries observer for the gillnet trip in February 2013 on which the bottlenose dolphin entanglement and live release was documented.

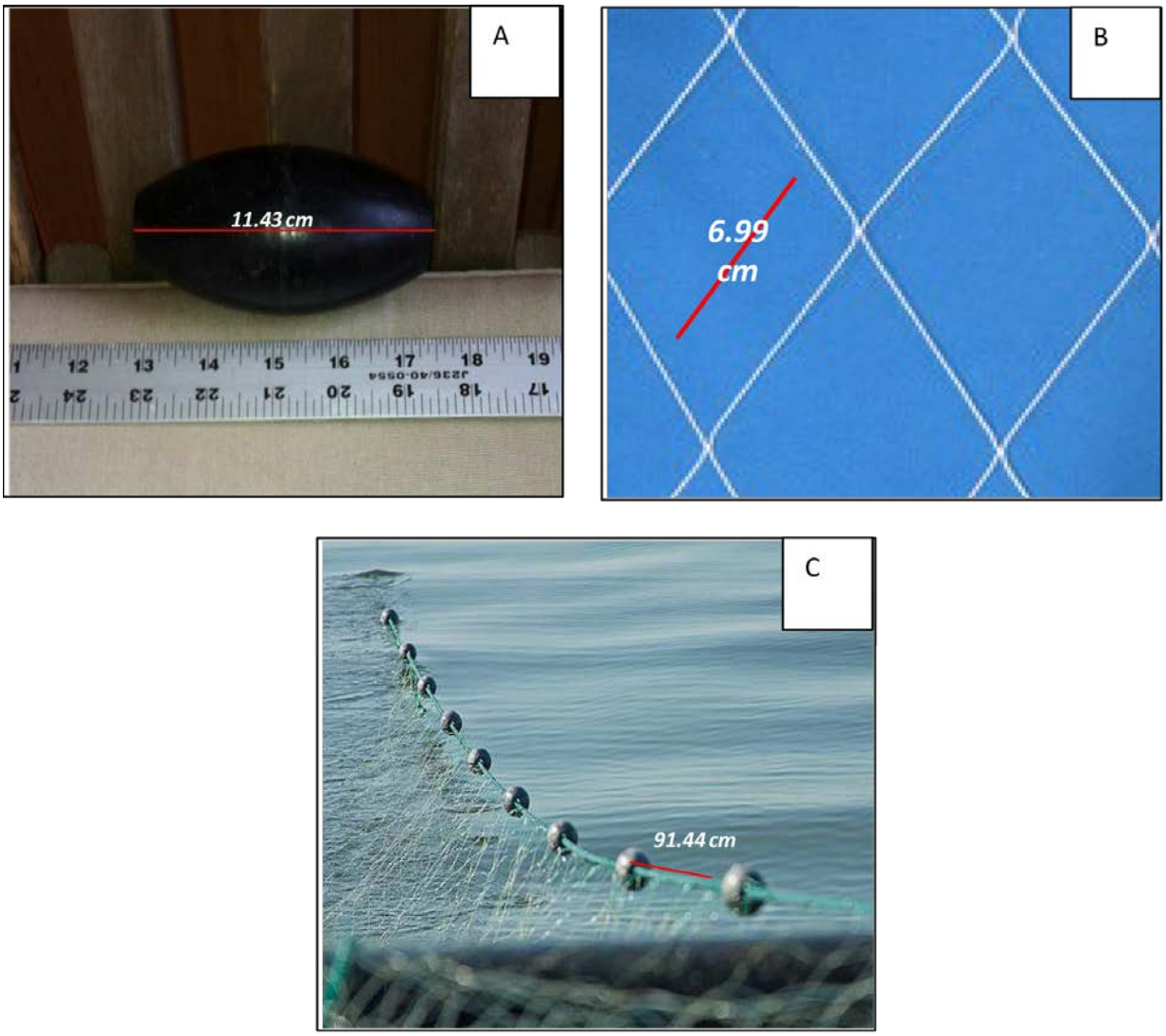

Figure 4. Photographs depicting three different objects that were used to estimate total body size and age class of the observed bottlenose dolphin released alive from a gillnet entanglement in February 2013: A) float length, B) mesh bar length, and C) distance between floats.

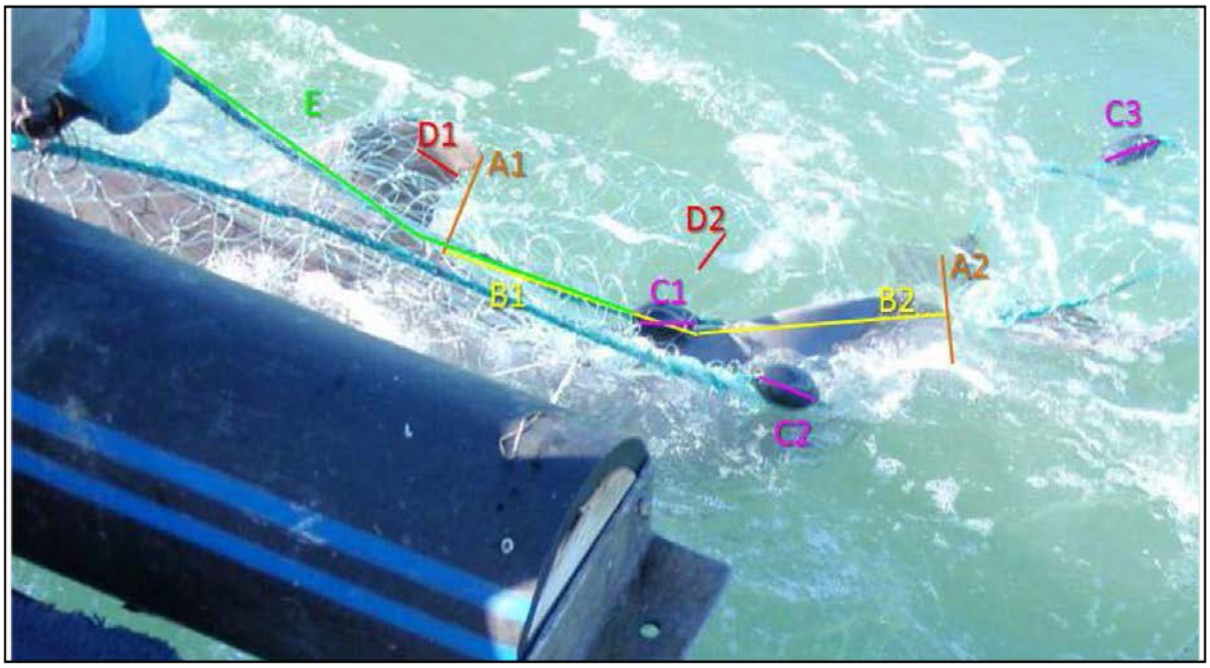

Figure 5. Photograph taken by the fisheries observer during the February 2013 bottlenose dolphin gillnet entanglement used to measure the dolphin's length from the tip of the dorsal fin (A1) to the insertion of the flukes (A2). Because the dolphin's body is arched, measurements B1 and B2 were used to approximate the straight- line post-dorsal length. The float C2, straight bar D2, and distance between floats (E) measurement were used to calibrate the measurement software. Measurements of other objects (C1, C3, D1) were calculated using software to determine measurement bias.

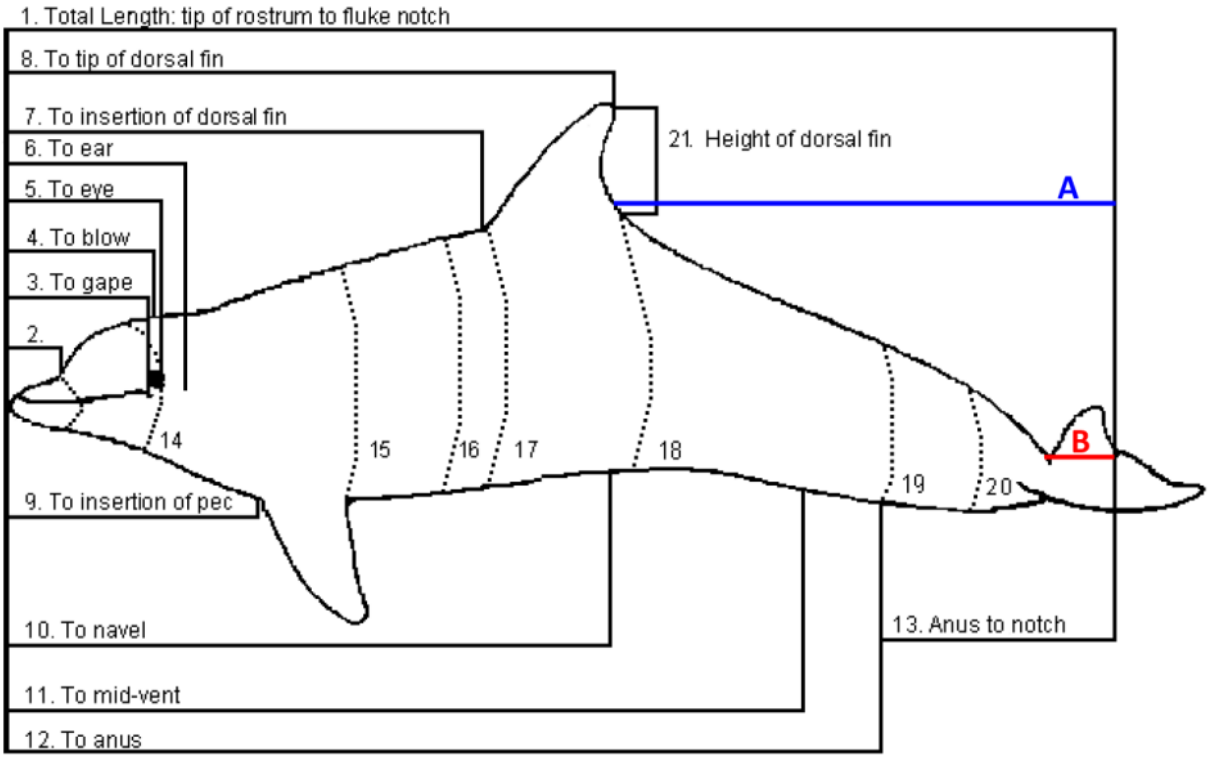

Figure 6. A diagram of standard morphometric data collected during an Odontocete necropsy (NMFS, Protected Species Branch, pers. comm.). Measurement from the tip of the dorsal fin to the fluke notch (A, blue line) was calculated as #1 minus #8. Measurement B (red line) = the insertion of the flukes to the fluke notch. Line 'A' minus line 'B' is equivalent to the PDL estimated in Step #1.

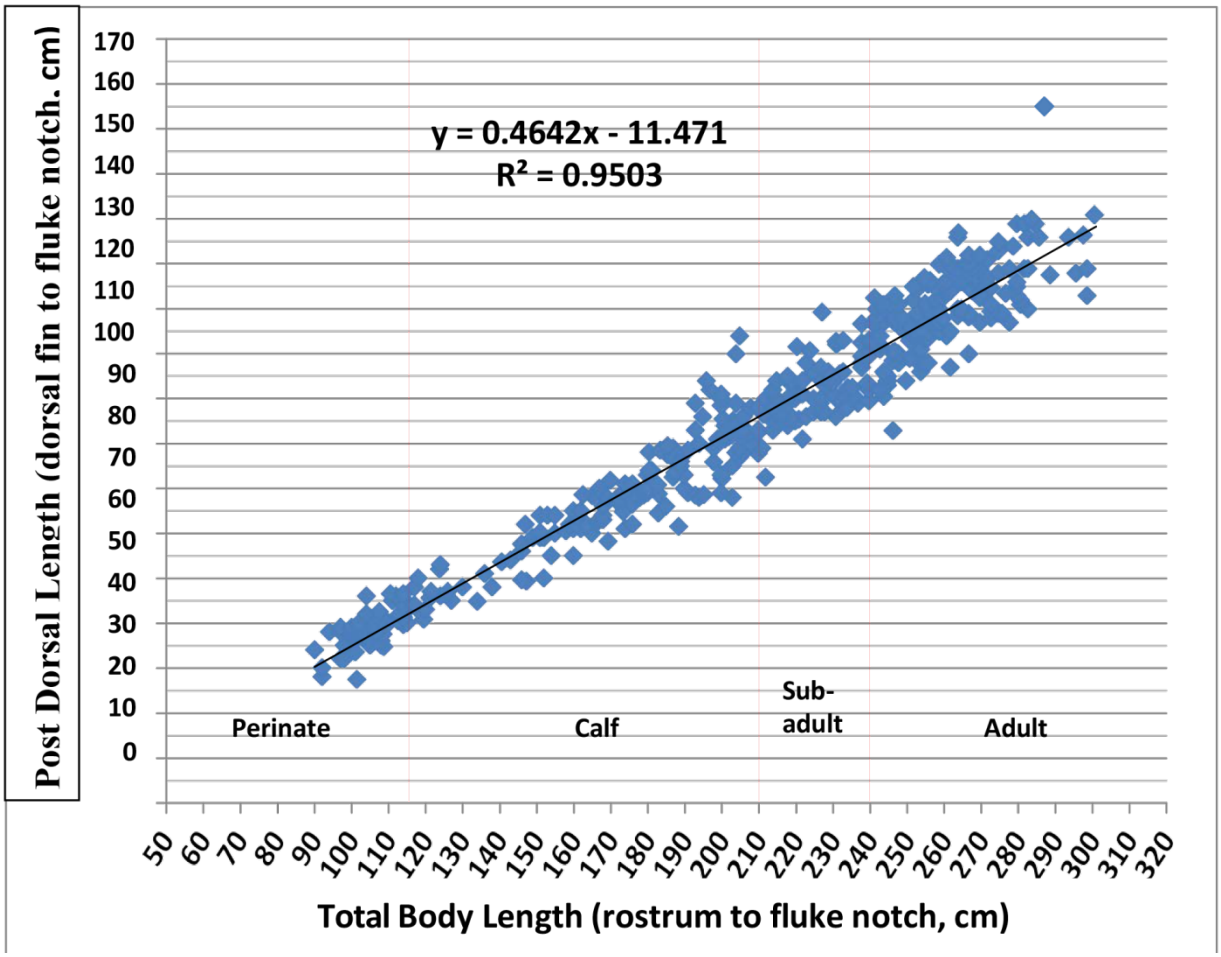

Figure 7. Scatter plot of post-dorsal body length regressed on total body length from bottlenose dolphins that stranded in North Carolina (n=430). The linear regression equation was used to predict total body length (x) of the 2013 observed bottlenose dolphin take based on the three separate (y) measurements from Table 3.

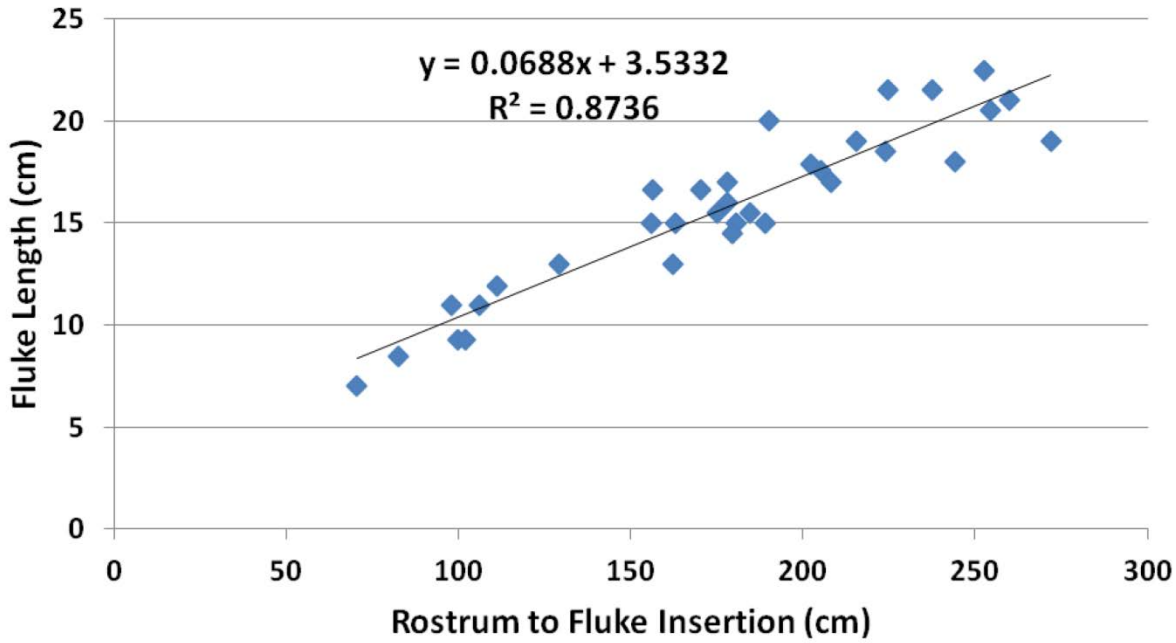

Figure 8. Scatter plot of measurements of the rostrum to fluke insertion regressed on fluke length from bottlenose dolphins that stranded in North Carolina and Virginia (n=33). The linear regression equation was used to predict the fluke length (y) from the 2013 observed bottlenose dolphin take based on its predicted measurement of rostrum to fluke insertion (Table 3).

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