Northeast Fisheries Science Center Reference Document 14-10

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ABSTRACT

The Northeast Fisheries Science Center (NEFSC) developed criteria to evaluate reports of human-caused mortality to baleen whales. The criteria minimize the likelihood of incorrectly assigning whale mortalities to human causes and provide a minimum count of human-caused events. This report describes determinations made for reports received from 2008 - 2012 involving North Atlantic right (*Eubalaena glacialis*), humpback (*Megaptera novaeangliae*), fin (*Balaenoptera physalus*), sei (*B. borealis*), blue (*B. musculus*), minke (*B. acutorostrata*), and Bryde's (*B. edeni*) whales observed in United States waters in the Gulf of Mexico, along the US eastern seaboard and in the Atlantic Canadian provinces. We confirmed a total of 300 mortalities: 60 (20%) caused by human interaction, 14 (5%) because of natural causes, and 236 (75%) which lacked sufficient evidence to determine cause of death. Of the human-caused mortalities, 32 were due to entanglement and 28 were vessel strike. These mortality numbers are minimum counts because of a low probability of detecting events and inadequate documentation to determine cause of death for the majority of events that are detected. Despite the minimum values, the mean annual confirmed human-caused mortality rate exceeds the Potential Biological Removal (PBR) value for 4 of the 7 stocks examined, including North Atlantic right, humpback, sei, and Bryde's whales. The true level of anthropogenic mortality to these stocks is greater than these minimum values, but the amount greater is unknown.

INTRODUCTION

The NOAA National Marine Fisheries Service (NMFS) is required to estimate annual rates of human-caused mortality and serious injury to marine mammal stocks occurring regularly in US waters. The agency is also charged with developing plans to reduce the rate of human-caused mortality and serious injury to strategic stocks to levels below their Potential Biological Removal (PBR). The PBR is the maximum number of animals, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population size (Wade and Angliss 1997). A 5-year average rate of human-caused mortality and serious injury is reported for each species in annual marine mammal stock assessment reports (SAR; e.g., Waring et al. 2014). This rate, when compared to a population's PBR, is used to identify stocks for which management actions may be required under the Marine Mammal Protection Act (MMPA Sec. 118).

This report presents the method and results of cause-of-death determination criteria that establish the minimum annual rates of confirmed human-caused mortality for North Atlantic right (*Eubalaena glacialis*), humpback (*Megaptera novaeangliae*), fin (*Balaenoptera physalus*), sei (*B. borealis*), blue (*B. musculus*), minke (*B. acutorostrata*), and Bryde's (*B. edeni*) whale stocks along the Gulf of Mexico, the eastern seaboard of the United States, and the Atlantic Canadian provinces for the period 2008 - 2012. Serious injuries and their causes are reported elsewhere (Cole and Henry, in prep).

METHODS

Members of the US and Canadian regional stranding networks, large whale disentanglement teams, the US and Canadian Coast Guards, and the general public provided

opportunistic marine mammal stranding and human interaction reports to the NMFS Greater Atlantic Regional Fisheries Office (GARFO), Southeast Regional Office (SERO), or the NEFSC. With the exception of minke whales, the incidental takes of large whales recorded by fisheries observer programs were treated as opportunistic reports because of the low number of observed takes. The Regional Offices obtained all available information for each report (photos, necropsy reports, etc.), which was then reviewed by NEFSC and GARFO staff members. Confirmed reports were designated "events," and for each event the species involved was verified, duplicate records identified, and relevant information from each source consolidated into a single record. Subsequent demographic, health, and sighting history information were obtained, where available, from local population monitoring studies. NEFSC staff reviewed each mortality event and assigned a cause of death following the confirmation criteria listed below. One staff member reviewed all determinations each year to ensure consistency in the application of determination criteria within and across years.

Events from Newfoundland and Labrador involving confirmed transboundary stocks (i.e., stocks that enter US waters during part of the year) were also included. However, humpback events from these regions were not included in tallies because the Newfoundland and Labrador humpback feeding stocks are distinct from the Gulf of Maine stock found in US waters (Palsbøll et al. 2001).

Confirmation Criteria for Identification of Cause of Mortality (listed in order of certainty)

The cause of mortality was considered confirmed if the report included 1 of the following criteria:

1. Photographs or video allowed identification;
2. A marine mammal expert reported the mortality cause as certain; or
3. A report made by a trained observer or volunteer member of a stranding network which was verified by NMFS or stranding network staff.

The cause of mortality was considered confirmed in the following less certain cases:

1. Photographs or video allowed probable identification;
2. A marine mammal expert reported the mortality cause as probable;
3. An inexperienced observer's report allowed probable identification; or
4. An inexperienced observer's report was verified by NMFS or stranding network staff.

The cause of mortality was considered unconfirmed if:

1. Photographs or video were of insufficient quality to verify;
2. An inexperienced observer's report lacked photographs, video, or descriptive detail to confirm;
3. An incomplete examination did not allow for identification; or
4. A carcass was too decomposed to identify.

Human-induced Mortality Determinations

Events were categorized as entanglement mortalities if 1 of the following indications were confirmed to be present on a whale carcass:

1. Fishing line constricted any body part and subdermal hemorrhaging or extensive necrosis was present at point of attachment;
2. An extensive entanglement was evident;
3. An entanglement likely prevented feeding; or
4. A code 2 (fresh dead) whale was pulled up during fishing operations.

Events were categorized as vessel strike mortalities if 1 of the following indications was confirmed to be present on a whale carcass:

1. Large linear laceration(s) was present anywhere on body, as opposed to just dorsally as in Kraus (1990);
2. Large area(s) of subdermal hemorrhaging, hematoma, or edema was evident;
3. Major skeletal fracturing was evident; or
4. A code 2 (fresh dead) carcass was found on the bow of a ship.

Assignment to Country

We assigned entanglement mortalities to either the United States or Canada based on the entangling gear's country of origin. Identification of gear type and country of origin was conducted by GARFO, the Marine Animal Response Society based in Nova Scotia, or the Whale Release and Strandings Group based in Newfoundland. GARFO's results are included in annual Atlantic Large Whale Take Reduction Program (ALWTRP) reports[1]. Identified fisheries are categorized in the List of Fisheries (LOF) according to their frequency of incidental mortality or serious injury to marine mammal stocks (50 CFR Parts 216 and 229[2]).

If gear identification was lacking, a country assignment was made if circumstances clearly indicated in whose waters the event occurred, e.g., apparent duration of the entanglement and distance from the US/Canadian border (Hague Line). If there was a reasonable chance that the event may have occurred in either country's waters, the country assignment was listed as unknown. Events placed in this category were typically mortalities either first detected near the US/Canadian border, mortalities involving severely decomposed carcasses that potentially drifted across jurisdictions, or mortalities stemming from chronic entanglement injuries.

Vessel collision mortalities were assigned to a country according to the location of the carcass. This differs from the country assignment of entanglements because vessel collision mortalities are more likely to be instantaneous (Kraus 1990; Moore et al. 2004). The country assignment was listed as unknown if there was an equal chance that the event occurred in either country's waters.

[1] See http://www.greateratlantic.fisheries.noaa.gov/protected/whaletrp/reports/index.html
[2] See http://www.nmfs.noaa.gov/pr/pdfs/fr/fr60-45086.pdf

RESULTS

From 2008 through 2012, a total of 300 mortalities was documented, of which 60 (20%) were confirmed to be the result of human interactions, 15 (5%) were due to natural causes, and 225 (75%) had insufficient evidence to determine cause of death. Of the human-caused mortalities, 32 were due to entanglement and 28 were due to vessel strike. Table 1 gives the tallies of mortalities and the cause of death by stock for the period. Table 2 provides details, by stock, of each confirmed human interaction event that resulted in mortality. The LOF column indicates entanglement events that would be used in categorizing any US fishery responsible in the LOF if the gear or fishery could be identified. There were 22 entanglement events that warranted inclusion in the LOF during the period. In 4 of these cases the gear type was identified, but the specific fishery was not.

Over the 5 year period, there were 18 verified mortalities of North Atlantic right whales. Of these, 6 were due to entanglements, 2 due to vessel strikes, 4 due to natural causes, and 6 for which the cause was undetermined.

Humpbacks had the highest number of mortalities, with 93 carcasses detected. Of these mortalities, 8 were due to entanglement, 7 due to vessel strike, 3 due to natural causes, and cause of death was undetermined for the remaining 75 events. We assumed all humpback events occurring in or near US and southeast Canadian waters involved the Gulf of Maine stock unless a whale was confirmed to be from another stock. Humpback events from Labrador and Newfoundland were assumed to not involve the Gulf of Maine stock and are therefore not included in the tallies.

There were 32 verified fin whale mortalities: 3 were due to entanglement, 9 due to vessel strikes, 4 due to natural causes, and 16 were from undetermined causes.

Of the 7 events involving sei whale mortalities, 1 was attributed to entanglement, 2 to vessel strikes, and cause of death was undetermined for the remaining 4 events.

Minke whales were involved in 91 mortality events, of which 14 were due to entanglements, 6 due to vessel strikes, 4 due to natural causes, and cause of death was undetermined for the remaining 67 events.

Bryde's whales had 2 documented mortalities. One was the result of a vessel strike. The cause of the other death could not be determined.

Blue whales had 2 documented mortalities. The cause of death could not be determined for either case.

In 55 of the 300 confirmed unique large whale mortality events during 2008 - 2012, species identification was not possible. In 2 of the 55 events, the similarity in body shape and size between fin and sei whales prevented us from distinguishing which of these 2 species were involved. In another 12 events, the whales could only be identified as balaenopteridae based on the presence of ventral pleats. The taxonomic identity of the whales involved in the remaining 41 events could not be assigned to genus. Of these mortalities involving unidentified species, 1 was attributed to vessel strike. The cause of death was not determined for the remaining 54 mortalities.

Mortality tallies by country are presented in Table 3 and include a total of 10 Canadian entanglements (6 identified by gear and 4 assigned by location of first detection) and 10 US entanglements (4 identified by gear and 6 assigned by location of first detection). The remaining 12 entanglement events that resulted in mortality could not be assigned to either country's waters with certainty. Twenty-six of 28 confirmed collision events leading to death were first detected in

US waters. One event was found close to the US and Canadian boundary, so the location of the interaction could not be established. The remaining event involved an international commercial vessel carrying a fresh, unidentified whale carcass on its bow. It could not be determined if the strike occurred in US or international waters.

DISCUSSION

Our criteria attempt to encompass all event scenarios and minimize the likelihood of incorrectly assigning whale mortalities to human causes. The resulting values provide a minimum count of confirmed human-caused mortality for baleen whale stocks along the Gulf of Mexico, US east coast, and the Atlantic Canadian provinces. These values do not include observed serious injuries presumed to result in mortality (Cole and Henry, in prep*)*. Despite the minimum values, the annual confirmed human-caused mortality rates exceed PBR for 4 of the 7 stocks examined, including North Atlantic right, humpback, sei, and Bryde's whales, with PBRs of 0.9, 2.7, 0.5 and 0.1, respectively (Waring et al, in prep).

Differentiating injuries that cause mortalities from preexisting injuries or postmortem damage is problematic but can be accomplished through necropsy or, in many cases, parsimonious evaluation of available evidence. For example, fishing line constrictions on a whale carcass can be considered circumstantial evidence of premortem entanglement, as these constrictions are likely the result of force applied by an active animal. Large linear (nonwrapping) lacerations can be considered an indication of a premortem vessel collision since only whales at depth would be exposed to the propellers of a ship; floating carcasses would likely be pushed aside by the ship's bow wave (Knowlton et al. 1995).

However, carcasses detected at sea often cannot be examined sufficiently for either internal or even external indications of anthropogenic injury. Most notably, vessel collision mortalities frequently lack external evidence and may not be detected unless a necropsy is conducted. Necropsies frequently identify subdermal hemorrhaging or hematomas, the result of blunt trauma and the circulation of blood at the time of injury.

Given the likelihood that not all entanglement and vessel strike mortalities are detected, that the criteria applied here are designed to minimize the likelihood of incorrectly assigning whale mortalities to human causes, and that observed serious injuries are not considered here, the numbers in this report represent minimum values for confirmed human-caused mortality to baleen whale stocks in US waters of the Gulf of Mexico, the US eastern seaboard, and in the Atlantic Canadian provinces. The true level of anthropogenic impact to these stocks is greater than these minimum values, but the amount greater is unknown.

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Table 1. Summary of all unique large whale mortalities observed along the Gulf of Mexico Coast, US East Coast, and Atlantic Canadian Provinces, 2008-2012. Determinations of human-caused mortality follow the criteria established by the NEFSC.

Species	**Western North Atlantic right whale (***Eubalaena glacialis)*	**Gulf of Maine humpback whale** *(Megaptera novaeangliae)*	**Western North Atlantic fin whale** *(Balaenoptera physalus)*	**Nova Scotian sei whale (***B.borealis)*	**Western North Atlantic blue whale** *(B. musculus)*	**Canadian East Coast minke whale** *(B. acutorostrata)*	**Northern Gulf of Mexico Bryde's whale** *(B. edeni)*	**Unidentified fin/sei whale**	**Unidentified balaenopterid[a]**	**Unidentified whale spp.**	**Totals**
Total confirmed mortalities	**18** (3, 4, 4, 4, 3)	**93** (28, 20, 19, 12, 14)	**32** (5, 5, 6, 8, 8)	**7** (3, 2, 0, 1, 1)	**2** (0, 0, 1, 1, 0)	**91** (16, 9, 15, 25, 26)	**2** (0, 1, 0, 0, 1)	**2** (0, 0, 2, 0, 0)	**12** (0, 1, 5, 4, 2)	**41** (6, 6, 10, 14, 5)	**300**
Confirmed entanglement mortalities	**6** (0, 0, 3, 1, 2)	**8** (2, 2, 4, 0, 0)	**3** (0, 0, 0, 3, 0)	**1** (1, 0, 0, 0, 0)	**0**	**14** (4, 0, 0, 4, 6)	**0**	**0**	**0**	**0**	**32**
Confirmed vessel strike mortalities	**2** (0, 0, 1, 1, 0)	**7** (1, 0, 3, 3, 0)	**9** (1, 1, 2, 1, 4)	**2** (0, 1, 0, 1, 0)	**0**	**6** (0, 1, 1, 3, 1)	**1** (0, 1, 0, 0, 0)	**0**	**0**	**1** (0, 0, 1, 0, 0)	**28**
Confirmed mortalities, NOT vessel strike or entanglement	**4** (3, 1, 0, 0, 0)	**3** (0, 0, 1, 0, 2)	**4** (1, 1, 1, 0, 1)	**0**	**0**	**4** (0, 1, 1, 1, 1)	**0**	**0**	**0**	**0**	**15**
Confirmed mortalities, IITD[b]	**6** (0, 3, 0, 2, 1)	**75** (25, 18, 11, 9, 12)	**16** (3, 3, 3, 4, 3)	**4** (2, 1, 0, 0, 1)	**2** (0, 0, 1, 1, 0)	**67** (12, 7, 13, 17, 18)	**1** (0, 0, 0, 0, 1)	**2** (0, 0, 2, 0, 0)	**12** (0, 1, 5, 4, 2)	**40** (6, 6, 9, 14, 5)	**225**
Annual Human-Caused Mortality Rate (EN, VS)	**1.6** (1.2, 0.4)	**3** (1.6, 1.4)	**2.4** (0.6, 1.8)	**0.6** (0.2, 0.4)	**0**	**4** (2.8, 1.2)	**0.2** (0, 0.2)	**0**	**0**	**0.2** (0, 0.2)	**12** (6.4, 5.6)

[a] Described as having throat grooves (rorqual pleats).

[b] IITD = insufficient information to determine cause of death or if the injury was serious and likely lethal.

Table 2. Confirmed human-caused mortality records of baleen whale stocks along the Gulf of Mexico, US East Coast, and Atlantic Canadian Provinces, 2008-2012.

Date	Individual	Catalog #	General Location	Cause of Fate	Country of Origin[a]	Country Conf Code[b]	Gear Type[c]	Comments	LOF[d]
Western North Atlantic right whale (*Eubalaena glacialis*)									
27-Jun-10	Tips	1124	off Cape May, NJ	EN	XU	CE	NR	Evidence of constricting rostrum, mouth & pectoral wraps w/ associated hemorrhage & bone damage	1
02-Jul-10	U	-	off Great Wass Island, ME	VS	XU	CE	-	2 large lacerations from dorsal to ventral surface	-
12-Aug-10	Trident	1113	Digby Neck, NS	EN	XC	CE	NP	Evidence of entanglement w/ associated hemorrhaging around right pectoral	1
25-Dec-10[e]	Bayla	3911	off Jacksonville, FL	EN	XU	CE	GU	Embedded line in mouth and pectoral; severe health decline; proximate COD - entanglement, ultimate COD - shark predation	1
16-Mar-11	U	-	Cape Romain, SC	EN	XU	CE	GU	Multiple wraps embedded in right pectoral bones	1
27-Mar-11	-	1308	Nags Head, NC	VS	US	AE	-	Fractured right skull	-
19-Jul-12	U	-	Clam Bay, NS	EN	XC	CE	NR	Multiple constricting wraps on peduncle; COD - peracute underwater entrapment	1
18-Dec-12	-	4193	off Palm Coast, FL	EN	US	GI	PT	Constricting and embedded wraps with associated hemorrhaging at peduncle, mouthline, tongue, oral rete, rostrum and pectoral; malnourished	1

Table 2, continued. Confirmed human-caused mortality records of baleen whale stocks along the Gulf of Mexico, US East Coast, and Atlantic Canadian Provinces, 2008-2012.

Individual	Catalog #	General Location	Cause of Fate	Country of Origin[a]	Country Conf Code[b]	Gear Type[c]	Comments	LOF[d]
Gulf of Maine humpback whale (*Megaptera novaeangliae*)								
30-May-08	U	Georges Bank	EN	XU	CE	NR	Constricting body wraps, one wrap under lower jaw; open wound on right pectoral	1
09-Jun-08	U	Georges Bank	EN	US	GI	PT	Constricting body wrap	1
04-Nov-08	U	Assateague Island, MD	VS	US	AE	-	Cranial fractures w/ associated hemorrhaging	-
08-Feb-09	U	Cape Fear, NC	EN	XU	CE	NP	Evidence of entanglement at mouthline, peduncle, & pectoral w/ associated hemorrhaging; emaciated	1
16-Feb-09	U	Nags Head, NC	EN	XU	CE	NP	Evidence of entanglement involving anchoring or heavily weighted gear w/ associated hemorrhaging	1
13-Mar-10	U	Ocean City, MD	VS	US	AE	-	Skull fractures w/ associated hemorrhaging	-
08-May-10	U	Narragansett, RI	EN	CN	GI	GN	Evidence of constricting gear w/ associated hemorrhaging; fluid filled lungs	-
15-May-10[e]	U	Cape Hatteras Inlet, NC	EN	XU	CE	NP	Necrotic infected wounds at fluke insertion; chronic abrasions on head; proximate COD - entanglement, ultimate COD - euthanasia	1
28-May-10	U	Edgartown, MA	EN	XU	CE	GU	Evidence of entanglement w/ associated bruising & edema	1
10-Jun-10	U	Jones Beach State Park, NY	VS	US	AE	-	Extensive hemorrhage & edema on right dorsal lateral surface	-

Table 2, continued. Confirmed human-caused mortality records of baleen whale stocks along the Gulf of Mexico, US East Coast, and Atlantic Canadian Provinces, 2008-2012.

Individual	Catalog #	General Location	Cause of Fate	Country of Origin[a]	Country Conf Code[b]	Gear Type[c]	Comments	LOF[d]
Gulf of Maine humpback whale (*Megaptera novaeangliae*)								
04-Jul-10	U	off Assateague, MD	VS	US	AE	-	Extensive hemorrhage & edema to left lateral area	-
27-Nov-10	U	Bay of Fundy	EN	XC	CE	NR	Evidence of constricting wraps on fluke, peduncle, & pectoral	1
07-Mar-11[e]	U	Thorofare Bay, Core Sound, NC	VS	US	AE	-	8 deep lacerations across back; robust with anemia & pale musculature indicates exsanguination; proximate COD - vessel strike, ultimate COD - euthanasia	-
05-May-11	U	Little Compton, RI	VS	US	AE	-	Hemorrhaging at left jaw associated w/ blunt trauma; evidence of healing entanglement injuries	-
27-May-11	U	Barnegat Inlet, NJ	VS	US	AE	-	5 broken vertebral processes along left side w/ associated hemorrhaging	-
Western North Atlantic fin whale (*Balaenoptera physalus*)								
02-Jul-08	U	Barnegat Inlet, NJ	VS	US	AE	-	Vertebral fractures w/ associated hemorrhaging; hemorrhaging around ball joint of right pectoral	-
01-Oct-09	U	Port Elizabeth, NJ	VS	US	AE	-	Fresh carcass w/ broken pectoral, hematomas, & abrasions	-
18-Mar-10	U	off Bethany Beach, DE	VS	US	AE	-	Fractured skull w/ associated hemorrhaging; abrasion mid-dorsal consistent w/ being folded over the bow of a ship	-

Table 2, continued. Confirmed human-caused mortality records of baleen whale stocks along the Gulf of Mexico, US East Coast, and Atlantic Canadian Provinces, 2008-2012.

Individual	Catalog #	General Location	Cause of Fate	Country of Origin[a]	Country Conf Code[b]	Gear Type[c]	Comments	LOF[d]
Western North Atlantic fin whale (*Balaenoptera physalus*)								
03-Sep-10	U	Cape Henlopen State Park, DE	VS	US	AE	-	Large laceration & vertebral fractures w/ associated hemorrhaging	-
01-Jan-11	U	off Portland, ME	EN	XU	CE	NP	Fresh carcass w/ evidence of constricting gear	1
05-Jun-11	U	off Long Beach, NJ	VS	US	AE	-	Extensive hemorrhage & soft tissue damage to the dorsal & right lateral thoracic region	-
24-Jul-11	U	Cheticamp, NS	EN	CN	AE	NP	Fresh carcass w/ evidence of extensive entanglement	-
21-Sep-11	U	off Atlantic City, NJ	EN	US	AE	NP	Fresh carcass w/ evidence of extensive entanglement	1
23-Jan-12	U	Ocean City, NJ	VS	US	AE	-	Hemorrhaging along right, midlateral surface; fish in stomach indicated feeding	-
19-Feb-12	U	Norfolk, VA	VS	US	AE	-	Deep laceration on head; skeletal fractures of rostrum and vertebrae; extensive hemorrhaging	-
10-Aug-12	U	Hampton Bays, NY	VS	US	AE	-	Extensive bruising along right lateral and ventral aspects	-
07-Oct-12	U	Boston Harbor, MA	VS	US	AE	-	Deep mid-line impression with associated hemorrhaging consistent with being folded across bow of ship	-

Table 2, continued. Confirmed human-caused mortality records of baleen whale stocks along the Gulf of Mexico, US East Coast, and Atlantic Canadian Provinces, 2008-2012.

Individual	Catalog #	General Location	Cause of Fate	Country of Origin[a]	Country Conf Code[b]	Gear Type[c]	Comments	LOF[d]
Nova Scotian sei whale (*Balaenoptera borealis*)								
29-Jun-08	U	Slack's Cove, NB	EN	CN	AE	NP	Extensive entanglement evident	-
19-May-09	U	off Rehobeth Beach, DE	VS	US	AE	-	Posterior portion of skull & right mandible fractured; hemorrhaging dorsal to left pectoral	-
26-Mar-11	U	Virginia Beach, VA	VS	US	AE	-	Jaw, scapula, rib & vertebral fractures along right side w/ associated hemorrhaging	-
Canadian East Coast minke whale (*Balaenoptera acutorostrata*)								
14-Jun-08	U	Orleans, MA	EN	US	AE	NP	Braided line impressions wrapped body in 3 places & left a deep, hemorrhaged laceration across the rostrum & blowholes; hemorrhaged abrasions present on roof of mouth; wet, blood-filled lungs indicate drowning	1
23-Jul-08	U	Kelligrews, NL	EN	CN	AE	GU	Constricting wraps of gear on caudal peduncle	-
26-Jul-08	U	Conception Bay, NL	EN	CN	GI	GN	Constricting wraps of gear through mouth & around tail	-
21-Aug-08[t]	U	off Richibucto Cape, NB	EN	CN	AE	NR	Evidence of constricting body wraps	-
20-May-09	U	off Point Pleasant, NJ	VS	US	AE	-	Large hemorrhage at right pectoral	-

Table 2, continued. Confirmed human-caused mortality records of baleen whale stocks along the Gulf of Mexico, US East Coast, and Atlantic Canadian Provinces, 2008-2012.

Individual	Catalog #	General Location	Cause of Fate	Country of Origin[a]	Country Conf Code[b]	Gear Type[c]	Comments	LOF[d]
Canadian East Coast minke whale (*Balaenoptera acutorostrata*)								
09-Jul-10	U	Fire Island, NY	VS	US	AE	-	3-4 large dorsal lacerations associated w/ fractured ribs	-
06-May-11	U	off Martha's Vineyard, MA	EN	US	GI	PT	Anchored in gear; embedded line at fluke; evidence of entanglement w/ associated hemorrhaging at mouth corners & insertion of pectorals	1
04-Aug-11	U	off Sandy Hook, NJ	VS	US	AE	-	4 propeller lacerations across dorsal surface; fractured ribs w/ associated hemorrhaging	-
26-Aug-11	U	off Sandy Hook, NJ	EN	US	AE	NP	Fresh carcass w/ evidence of extensive entanglement	1
29-Aug-11	U	Moriches, NY	VS	US	AE	-	Extensive hemorrhage & edema along dorsal & both lateral surfaces	-
06-Oct-11	U	off Matinicus Island, ME	EN	US	GI	PT	Fresh carcass anchored in gear	1
07-Dec-11	U	Carolina Beach, NC	VS	US	AE	-	Healed deep & superficial propeller lacerations; internal lesions associated w/ deep lacerations indicative of peritonitis & infection	-
19-Dec-11	U	Bay of Fundy	EN	CN	GI	PT	Live entanglement; recovered dead in gear the following day; constricting peduncle wraps	-
16-Mar-12	U	Ipswich, MA	EN	US	AE	NP	Evidence of extensive, constricting gear with associated hemorrhaging	1

Table 2, continued. Confirmed human-caused mortality records of baleen whale stocks along the Gulf of Mexico, US East Coast, and Atlantic Canadian Provinces, 2008-2012.

Individual	Catalog #	General Location	Cause of Fate	Country of Origin[a]	Country Conf Code[b]	Gear Type[c]	Comments	LOF[d]
Canadian East Coast minke whale (*Balaenoptera acutorostrata*)								
23-Jun-12	U	Container Terminal Port, Newark, NJ	VS	US	AE		Fresh carcass on bow of ship; deep laceration across ventral surface; COD - disembowelment and hypovolemic shock	-
26-Jun-12	U	off Renews Rock, NL	EN	CN	GI	PT	Fresh carcass with constricting gear around peduncle	-
30-Jun-12	U	off Campbell Cove, Naufrage, PEI	EN	CN	GI	PT	Fresh carcass anchored in gear	-
01-Jul-12	U	East Point, Northern Lake Harbor, PEI	EN	CN	GI	PT	Constricting gear with associated hemorrhaging; COD - drowning	-
05-Aug-12	U	Chatham, MA	EN	US	AE	NR	Multiple constricting wraps through and around mouth and on fluke blades; COD - acute underwater entrapment	1
04-Oct-12	U	off Cliff Island, ME	EN	US	AE	NR	Evidence of constricting gear at mouthline, across ventral pleats, and at peduncle	1
Northern Gulf of Mexico Bryde's whale (*Balaenoptera edeni*)								
04-Oct-09	U	Tampa, FL	VS	US	AE		Vertebral separation; lung damage; subdermal contusions	-

Notes:

a. CN=Canada, US=United States, XC=Unk 1st sight in CN, XU=Unk 1st sight in US

b. GI=gear identified, AE=acute/very recent event or confirmed location, CE=chronic/prolonged event without indication of initial location

c. GN=gillnet, GU=gear unidentifiable, NP=none present, NR=none recovered/received, PT=pot/trap

d. Consider for List of Fisheries inclusion (1=yes)

e. Previously reported as a Serious Injury (Cole and Henry 2013)

f. Previously reported as two separate events: 1 live injury on 8/21/10 (Cole and Henry 2013) and 1 mortality on 8/25/08 (Henry et al 2013). Events were confirmed to be the same animal

Table 3. Summary of country of origin for all confirmed human-caused mortalities of baleen whale stocks along the Gulf of Mexico, US East Coast, and Atlantic Canadian Provinces, 2008-2012

Event Location	Event Type	Western North Atlantic right whale (*Eubalaena glacialis)*	Gulf of Maine humpback whale *(Megaptera novaeangliae)*	Western North Atlantic fin whale *(Balaenoptera physalus)*	Nova Scotian sei whale (*B.borealis)*	Western North Atlantic blue whale *(B. musculus)*	Canadian East Coast minke whale *(B. acutorostrata)*	Northern Gulf of Mexico Bryde's whale *(B. edeni)*	Unidentified fin/sei whale	Unidentified balaenopterid[a]	Unidentified whale spp.	Totals
US waters	**Entanglement**	1	1	1	0	0	7	0	0	0	0	**10**
	Vessel Strike	1	7	9	2	0	6	1	0	0	0	**26**
Canadian waters	**Entanglement**	0	1	1	1	0	7	0	0	0	0	**10**
	Vessel Strike	0	0	0	0	0	0	0	0	0	0	**0**
Unassigned waters	**Entanglement**	5	6	1	0	0	0	0	0	0	0	**12**
	Vessel Strike	1	0	0	0	0	0	0	0	0	1	**2**

[a] Described as having throat grooves (rorqualn pleats).

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