COMMON MINKE WHALE (*Balaenoptera acutorostrata acutorostrata*): Canadian East Coast Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Minke whales have a cosmopolitan distribution in temperate, tropical and high-latitude waters. They are common and widely distributed within the U.S. Atlantic Exclusive Economic Zone (EEZ; CETAP 1982). There appears to be a strong seasonal component to minke whale distribution on both the continental shelf and in deeper, off-shelf waters. Spring to fall are times of relatively widespread and common acoustic occurrence on the shelf (e.g., Risch *et al.* 2013), while September through April is the period of highest acoustic occurrence in deep-ocean waters throughout most of the western North Atlantic (Clark and Gagnon 2002, Risch *et al.* 2014). In New England waters the whales are most abundant during the spring-to-fall period. Records based on visual sightings and summarized by Mitchell (1991) hinted at a possible winter distribution in the West Indies, and in the mid-ocean south and east of Bermuda, a suggestion that has been validated by acoustic detections throughout broad ocean areas off the Caribbean from late September through early June (Clark and Gagnon 2002, Risch *et al.* 2014).

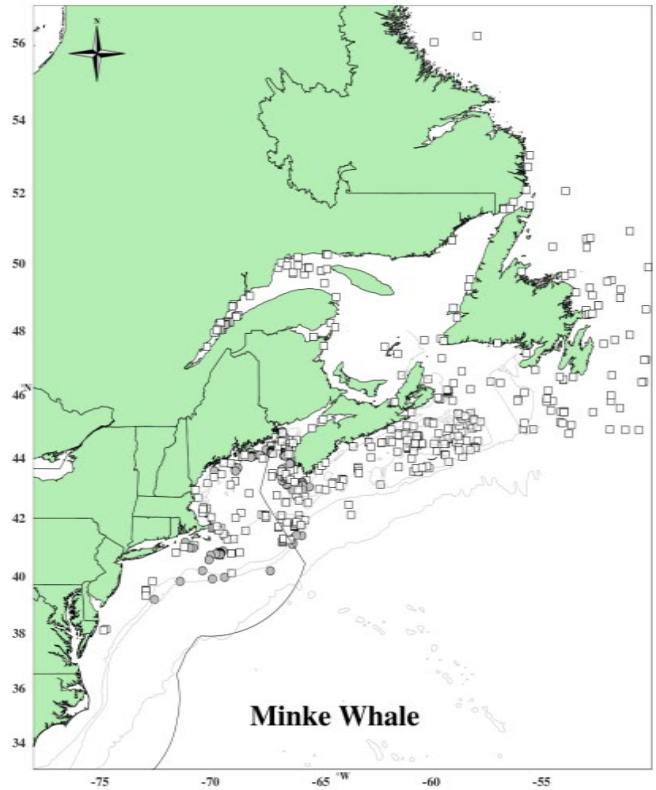

Figure 1. Distribution of minke whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010, 2011 and 2016 and DFO's 2007 TNASS and 2016 NAISS surveys. Isobaths are the 100-m, 200-mm 1000-m and 4000-m depth contours. Circle symbols represent shipboard sightings and squares are aerial sightings.

In the North Atlantic, there are four recognized populations—Canadian East Coast, west Greenland, central North Atlantic, and northeastern North Atlantic (Donovan 1991). These divisions were defined by examining segregation by sex and length, catch distributions, sightings, marking data, and pre-existing ICES boundaries. However, there were very few data from the Canadian East Coast population. Anderwald *et al.* (2011) found no evidence for geographic structure comparing these putative populations but did, using individual genotypes and likelihood assignment methods, identify two cryptic stocks distributed across the North Atlantic. Until better information is available, common minke whales off the eastern coast of the United States are considered to be part of the Canadian East Coast stock, which inhabits the area from the western half of the Davis Strait (45ºW) to the Gulf of Mexico.

In summary, key uncertainties about stock structure are due to the limited understanding of the distribution, movements, and genetic structure of this stock. It is unknown whether the stock may contain multiple demographically independent populations that should be separate stocks. To date, no analyses of stock structure within this stock have been performed.

POPULATION SIZE

The best available current abundance estimate for common minke whales in the Canadian East Coast stock is the sum of the 2016 NEFSC and Department of Fisheries and Oceans Canada (DFO) surveys: 24,202 (CV=0.30). Because the survey areas did not overlap, the estimates from the two surveys were added together and the CVs pooled using a delta method to produce a species abundance estimate for the stock area. This is assumed to be the majority of the Canadian East Coast stock. The 2016 estimate is larger than those from 2011 because the 2016 estimate is derived from a survey area extending from Newfoundland to Florida, which is about 1,300,000 km^2 larger than the 2011 survey area. In addition, some of the 2016 survey estimates in U.S. waters were corrected for availability bias (due to diving behavior), whereas the 2011 estimates were not corrected.

A key uncertainty in the population size estimate is the precision and accuracy of the availability bias correction factor that was applied. More information on the spatio-temporal variability of the species' dive profile is needed.

Earlier Estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions. As recommended in the 2016 guidelines for preparing stock assessment reports (NMFS 2016), estimates older than eight years are deemed unreliable for the determination of the current PBR.

Recent Surveys and Abundance Estimates

An abundance estimate of 2,802 (CV=0.81) minke whales was generated from a shipboard and aerial survey conducted during 27 June–28 September 2016 (Palka 2020) in a region covering 425,192 km^2. The aerial portion included 11,782 km of tracklines that were over waters north of New Jersey from the coastline to the 100-m depth contour, throughout the U.S. waters. The shipboard portion consisted of 4,351 km of tracklines that were in waters offshore of central Virginia to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the U.S. EEZ). Both sighting platforms used a two-team data collection procedure, which allows estimation of abundance to correct for perception bias of the detected species (Laake and Borchers 2004). The estimates were also corrected for availability bias.

Abundance estimates of 6,158 (CV=0.40) minke whales from the Canadian Gulf of St. Lawrence/Bay of Fundy/Scotian Shelf region and 13,008 (CV=0.46) minke whales from the Newfoundland/Labrador region were generated from an aerial survey conducted by the Department of Fisheries and Oceans, Canada (DFO). This survey covered Atlantic Canadian shelf and shelf-break waters extending from the northern tip of Labrador to the U.S. border off southern Nova Scotia in August and September of 2016 (Lawson and Gosselin 2018). A total of 29,123 km was flown over the Gulf of St. Lawrence/Bay of Fundy/Scotian Shelf stratum using two Cessna Skymaster 337s and 21,037 km were flown over the Newfoundland/Labrador stratum using a DeHavilland Twin Otter. The Newfoundland estimate was derived from the Twin Otter data using two-team mark-recapture multi-covariate distance sampling methods. The Gulf of St. Lawrence estimate was derived from the Skymaster data using single-team multi-covariate distance sampling with left truncation (to accommodate the obscured area under the plane) where size-bias was also investigated, and the Otter-based perception bias correction was applied. An availability bias correction factor, which was based on the cetaceans' surface intervals, was applied to both abundance estimates.

Table 1. Summary of recent abundance estimates for the Canadian East Coast stock of common minke whales (Balaenoptera acutorostrata acutorostrata) by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{est}) and and coefficient of variation (CV). The best estimate is in bold font.

Month/Year	Area	N_{est}	CV
Jun–Sep 2016	Central Virginia to lower Bay of Fundy	2,802	0.81
Aug–Sep 2016	Gulf of St. Lawrence/Bay of Fundy/Scotian Shelf	6,158	0.40
Aug–Sep 2016	Newfoundland/Labrador	13,008	0.46
Jun–Sep 2016	**Central Virginia to Labrador – COMBINED**	**21,968**	**0.31**

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the Canadian East Coast stock of common minke whales is 21,968 animals (CV=0.30). The minimum population estimate is 17,022 animals.

Current Population Trend

A trend analysis has not been conducted for this stock. The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and variable survey design (see Appendix IV for a survey history of this stock). For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV>0.30) remains below 80% (alpha=0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007). There is current work to standardize the strata-specific previous abundance estimates to consistently represent the same regions and include appropriate corrections for perception and availability bias. These standardized abundance estimates will be used in state-space trend models that incorporate environmental factors that could potentially influence the process and observational errors for each stratum.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Life history parameters that could be used to estimate net productivity are that females mature between 6 and 8 years of age, and pregnancy rates are approximately 0.86 to 0.93. Based on these parameters, the mean calving interval is between 1 and 2 years. Calves are probably born during October to March after 10 to 11 months gestation and nursing lasts for less than 6 months. Maximum ages are not known, but for Southern Hemisphere minke whales maximum age appears to be about 50 years (IWC 1991).

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995). Key uncertainties about the maximum net productivity rate are due to the limited understanding of the stock-specific life history parameters; thus the default value was used.

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 17,022. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5, the default value for stocks of unknown status relative to OSP and with the CV of the average mortality estimate less than 0.3 (Wade and Angliss 1997). PBR for the Canadian East Coast common minke whale is 170 (Table 2).

Table 2. Best and minimum abundance estimates for the Canadian East Coast stock of common minke whales with Maximum Productivity Rate (R_{max}), Recovery Factor (F_r) and PBR.

N_{est}	CV	N_{min}	F_r	R_{max}	PBR
21,968	0.31	17,022	0.5	0.04	170

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Data to estimate the mortality and serious injury of common minke whales come from the Northeast Fisheries Science Center Observer Program, the At-Sea Monitor Program, and from records of strandings and entanglements in U.S. and Canadian waters. For the purposes of this report, mortalities and serious injuries from reports of strandings and entanglements considered to be confirmed human-caused mortalities or serious injuries are shown in Table 4 while those recorded by the Observer or At-Sea Monitor Programs are shown in Table 5. Summary statistics are shown in Table 3.

Table 3. The total annual estimated average human-caused mortality and serious injury for the Canadian East Coast stock of common minke whales.

Years	Source	Annual Avg.
2014−2018	Incidental fishery interactions non-observed	8.95
2014−2018	U.S. fisheries using observer data	0.2
2014−2018	Vessel collisions	1.20
2014−2018	Other human interaction	0.2
Total		**10.55**

Fishery-Related Serious Injury and Mortality

United States

U.S. fishery interaction records for large whales come through two main sources: dedicated fishery observer data and opportunistic reports collected in the Greater Atlantic Regional Fisheries Office/NMFS entanglement/stranding database. One confirmed fishery-related mortality or serious injury of minke whales has been reported in the NMFS Sea Sampling bycatch database (fishery observers) during this reporting period (Table 4). A review of the records of stranded, floating, or injured minke whales for the reporting period 2014 through 2018 on file at NMFS found records in the audited Greater Atlantic Regional Fisheries Office/NMFS entanglement/stranding database with substantial evidence of fishery interactions causing injury or mortality (presented in Table 5; Henry *et al.* 2021). These records are not statistically quantifiable in the same way as the observer fishery records, and they almost surely undercount entanglements for the stock.

Mid-Atlantic Gillnet

In December 2016, one minke whale mortality was observed in mid-Atlantic gillnet gear. A mortality estimate was not expanded to the entire fishery because the observed mortality was such a rare event. See Table 4 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Table 4. From observer program data, summary of the incidental mortality of Canadian East Coast stock of common minke whales (Balaenoptera acutorostrata acutorostrata) by commercial fishery including the years sampled, the type of data used, the annual observer coverage, the mortalities and serious injuries recorded by on-board observers, the estimated annual serious injury and mortality, the estimated CV of the annual mortality, and the mean annual combined mortality.

Fishery	Years	Data Type[a]	Observer Coverage[b]	Observed Serious Injury[c]	Observed Mortality	Estimated Serious Injury[c]	Est. Mort.	Est. Combined Mortality	Est. CVs	Mean Combined Annual Mortality	CV of Mean
	2014		0.05	0	0	0	0	0	0		
	2015	Obs.	0.06	0	0	0	0	0	0		
Mid-Atl.	2016	Data,	0.08	0	1	0	1	1	0	0.2	na
Gillnet	2017	Weighout	0.09	0	0	0	0	0	0		
	2018		0.09	0	0	0	0	0	0		
Total										**0.2**	

a. Observer data (Obs. Data) are used to measure bycatch rates and the data are collected within the Northeast Fisheries Observer Program. NEFSC collects weighout (Weighout) landings data that are used as a measure of total effort for the U.S. gillnet fisheries. Mandatory vessel trip report (VTR; Trip Logbook) data are used to determine the spatial distribution of fishing effort in the Northeast sink gillnet fishery.
b. Observer coverage for the U.S. Northeast gillnet fisheries is based on tons of fish landed.
c. Serious injuries were evaluated for the current period and include both at-sea monitor and traditional observer data (Josephson *et al.* 2021).

Other Fisheries

Confirmed mortalities and serious injuries of common minke whales in the last five years as recorded in the audited Greater Atlantic Regional Office/NMFS entanglement/stranding database are reported in Table 5. One of the serious injury entanglement cases reported in Table 5 was a non-fishery interaction (strapping) and so 0.2 was subtracted from the total entanglement 5-year average. Most cases in which gear was recovered and identified involved gillnet or pot/trap gear.

Canada

Read (1994) reported interactions between common minke whales and gillnets in Newfoundland and Labrador, in cod traps in Newfoundland, and in herring weirs in the Bay of Fundy. Hooker *et al.* (1997) summarized bycatch data from a Canadian fisheries observer program that placed observers on all foreign fishing vessels operating in Canadian waters, on between 25% and 40% of large Canadian fishing vessels (greater than 100 feet long), and on approximately 5% of smaller Canadian fishing vessels. During 1991 through 1996, no common minke whales were observed taken. More current observer data are not available.

Other Fisheries

Mortalities and serious injuries that were likely a result of an interaction with Canadian fisheries are detailed in Table 5.

Table 5. Confirmed human-caused mortality and serious injury records of common minke whales (Balaenoptera acutorostrata acutorostrata): 2014–2018[a]

Date[b]	Fate	ID	Location[b]	Assigned Cause[f]	Value against PBR[c]	Country[d]	Gear Type[e]	Description
06/09/2014	Mortality	-	off Truro, MA	EN	1	US	PT	Fresh carcass anchored, hog-tied in gear. COD: peracute underwater entrapment.
07/02/2014	Mortality	-	Northumberland Strait, NB	EN	1	CN	NR	Carcass with constricting gear around lower jaw. Large open injury at attachment point on the left side.
07/10/2014	Prorated Injury	-	10 nm SE of Southport, ME	EN	0.75	XU	NR	Free-swimming, trailing 2 buoys. Attachment point(s) unknown.
07/12/2014	Serious Injury	-	10 nm S of Southampton, NY	EN	1	XU	NR	Free-swimming with yellow plastic strapping cutting into top and sides of rostrum. No trailing gear.
07/17/2014	Mortality	-	South Addison, ME	EN	1	XU	NP	Fresh carcass with line impression across ventral surface & evidence of constricting gear around peduncle and fluke insertion. Bruising evident at fluke injuries. No gear present.
07/29/2014	Mortality	-	5 nm E of Herring Cove, NS	VS	1	CN	-	Live animal w/ tongue completely ballooned out, forcing its jaws 90 degrees apart. Found dead at same location the next day. Carcass recovered with two traps & constricting line around the peduncle. Necropsy found indication of blunt trauma to right jaw. Animal anchored in gear was subsequently struck by a vessel (primary cause of death).
12/24/2014	Mortality	-	Dam Neck, VA	VS	1	US	-	Fresh carcass with broken ribs & fractured vertebrae w/ extensive hemorrhage & edema.
03/26/2015	Serious Injury	-	off Cape Canaveral, FL	EN	1	XU	NR	Evidence of constricting rostrum wrap, but unable to determine if gear still present. Emaciated.
04/16/2015	Mortality	-	Lockes Island, Shelburne, NS	EN	1	CN	NP	Fresh carcass with evidence of constricting wraps. No gear present. Robust, pregnant, fish in stomach and intestines. No other abnormalities noted.
05/09/2015	Mortality	-	Duck, NC	EN	1	XU	GU	Live stranded and euthanized. Embedded gear cutting into bone of mandible. Emaciated.
06/06/2015	Mortality	-	Coney Island, NY	VS	1	US	-	Fresh carcass with deep lacerations to throat area and head missing. Large area of bruising on dorsal surface.
06/14/2015	Prorated Injury	-	off Chatham, MA	EN	.75	XU	NR	Free-swimming with acorn buoy trailing 20-30 ft. Attachment point(s) and configuration unknown.
06/23/2015	Prorated Injury	-	off Ingonish, NS	EN	.75	CN	PT	Entangled in traps and buoys. Partially disentangled by fisherman. Original and final configuration unknown.
07/07/2015	Mortality	-	off Funk Island, NL	EN	1	CN	PT	Found at 340m depth in between two pots. Gear through mouth and wrapped around peduncle.
08/18/2015	Mortality	-	Roseville, PEI	EN	1	CN	NP	Evidence of constricting body, peduncle, and fluke wraps. No gear present. No necropsy but robust body condition supports entanglement as COD.
09/01/2015	Mortality	-	Gloucester, MA	EN	1	US	NP	Evidence of extensive, constricting gear with associated hemorrhaging. No gear present.

Date[b]	Fate	ID	Location[b]	Assigned Cause[f]	Value against PBR[c]	Country[d]	Gear Type[e]	Description
09/21/2015	Mortality	-	Cape Wolfe, Burton, PEI	EN	1	CN	NP	Evidence of constricting body wraps. No gear present. No necropsy but experts state peractute underwater entrapment most parsimonious.
12/06/2015	Mortality	-	off Port Joli, NS	EN	1	CN	PT	Live animal anchored in gear. Carcass recovered 4 days later.
05/03/2016	Mortality	-	Biddeford, ME	EN	1	US	PT	Line through mouth with evidence of constriction across ventral pleats and at peduncle. Hemorrhaging associated with these lesions.
07/21/2016	Serious Injury	-	Digby, NS	EN	1	XC	GU	Free-swimming with netting deeply embedded in rostrum. Disentangled, but significant health decline.
08/15/2016	Mortality	-	off Seguin Island, ME	EN	1	US	NR	Line exiting mouth leading to weighted/anchored gear.
08/30/2016	Mortality	-	3.1 nm SW of Matinicus Island, ME	EN	1	US	PT	Fresh carcass anchored in gear with evidence of constricting wraps at peduncle and fluke insertions
11/02/2016	Prorated Injury	-	Bonne Bay, Gros Morne National Park, NL	EN	0.75	XC	NR	Free-swimming and towing gear. Attachment point(s) and configuration unknown. No resights post 06Nov2016.
04/27/2017	Mortality	-	Staten Island, NY	VS	1	US	-	Evidence of bruising on dorsal and right scapular region. Histopathology results support blunt trauma from vessel strike most parsimonious as COD.
07/06/2017	Mortality	-	Manomet Point, MA	EN	1	US	PT	Live animal anchored in gear. Witnessed becoming entangled in second set. Gear hauled and animal found deceased with line through mouth and constricting wraps on peduncle.
07/22/2017	Mortality	-	Piscataqua River, NH	EN	1	US	NP	Evidence of multiple constricting wraps on lower jaw and ventral pleats with associated hemorrhaging. No gear present.
08/09/2017	Mortality	-	off Plymouth, MA	EN	1	US	NP	Evidence of constricting entanglement at fluke insertion, across fluke blades and ventral pleats. No necropsy but fresh carcass with extensive injuries supports COD of entanglement as most parsimonious.
08/11/2017	Prorated Injury	-	off York, ME	EN	0.75	US	NR	Partially disentangled from anchoring gear. Final configuration unknown.
08/12/2017	Mortality	-	off Tremont, ME	EN	1	US	GU	Fresh carcass of a pregnant female in gear. Constricting wrap injuries with associated hemorrhaging on dorsal and ventral surfaces and flukes.
08/14/2017	Mortality	-	Pt. Judith, RI	EN	1	US	NP	Evidence of constricting entanglement along left side with associated hemorrhaging. Found floating in stationary offshore fishing trap, but not entangled in trap gear. No gear present on animal.
08/17/2017	Mortality	-	Rye, NH	EN	1	US	NR	Evidence of constricting wraps on fluke blades and peduncle. Documented with line in baleen, but not present at time of necropsy. Limited necropsy, but extent of injuries and robust animal with evidence of recent feeding supports COD of entanglement as most parsimonious.
08/28/2017	Mortality	-	off Portland, ME	EN	1	US	PT	Fresh carcass anchored in gear. Endline wrapped around mouth and laceration from constricting gear on peduncle. Mud on flippers and mouth.

Date[b]	Fate	ID	Location[b]	Assigned Cause[f]	Value against PBR[c]	Country[d]	Gear Type[e]	Description
08/30/2017	Mortality	-	off North Cape, PEI	EN	1	CN	NR	Fresh carcass in gear. Full configuration unclear, but complex enough to not have drifted into post-mortem.
09/04/2017	Mortality	-	St. Carroll's, NL	EN	1	CN	NE	Alive in herring net. Found dead the next day. Fisher pulled carcass ashore and removed the net.
09/06/2017	Mortality	-	Newport, RI	VS	1	US	-	Hemorrhaging at left pectoral, left body, and aft of blowholes. Histopathology results support blunt trauma from vessel strike as COD.
09/17/2017	Mortality	-	Henry Island, NS	EN	1	CN	NR	Fresh carcass with gear in mouth and around flukes. Evidence of constricting wrap on dorsum. No necropsy, but configuration complex enough that unlikely to have drifted into gear post-mortem.
09/26/2017	Prorated Injury	-	off Richbuctou, NB	EN	0.75	CN	NR	Animal initially anchored in gear then not resighted. Unable to confirm if gear free, partially entangled, or drowned.
09/27/2017	Mortality	-	5.7nm NE of Richbuctou, NB	EN	1	CN	NP	No gear present. Fresh carcass with evidence of constricting wraps.
10/10/2017	Mortality	-	off Rockland, ME	EN	1	US	PT	Entangled in 2 different sets of gear. Constricting wrap around lower jaw. Found at depth when fisher hauled gear.
02/09/2018	Mortality	-	Tiverton, Long Island, NS	EN	1	XC	NP	No gear present. Evidence of constricting body, flipper, and peduncle wraps. No necropsy conducted, but COD from entanglement most parsimonious.
05/25/2018	Mortality	-	Digby, NS	VS	1	CN	-	Fresh carcass in harbor with large area of hemorrhage aft of blowholes. Necropsy did not state COD, but blunt trauma from vessel strike most parsimonious.
06/11/2018	Mortality	-	Cape Dauphin, NS	EN	1	CN	PT	Fresh, pregnant carcass anchored in gear.
06/19/2018	Mortality	-	East Point, PEI	EN	1	CN	NP	No gear present. Fresh, pregnant carcass with evidence of extensive constricting body and peduncle wraps with associated hemorrhaging.
06/22/2018	Prorated Injury	-	4.5 nm N of Grand Manan, NB	EN	0.75	XC	NR	Full configuration unclear — line across back, one buoy under left pectoral and another trailing 30–40ft aft. Reported as anchored but unable to confirm. Response team was not able to relocate.
06/24/2018	Mortality	-	Wellfleet, MA	EN	1	XU	GN	Evidence of extensive constricting body and mouth wraps with associated hemorrhaging. Deep lacerations at fluke insertion from constricting gear. COD - peracute underwater entrapment.
07/07/2018	Mortality	-	1.6 nm E of Newcastle, NH	EN	1	US	PT	Anchored in gear with line through mouth and wrapping around body. Associated bruising at right corner of mouth. COD - peracute underwater entrapment.
07/22/2018	Mortality	-	Cape Neddick, ME	EN	1	XU	NP	No necropsy, but evidence of constricting wrap at fluke insertion with associated hemorrhaging. Histopathology confirms pre-mortem human-induced trauma.
07/28/2018	Mortality	-	Biddeford, ME	EN	1	XU	NP	No gear present, but evidence of constricting gear with associated bruising at mouth, around body and peduncle.
08/06/2018	Prorated Injury	-	Fish Cove Point, NL	EN	0.75	CN	NE	Free-swimming towing net with float attached. Member of public cut off float. Original and final configuration unknown.

Date[b]	Fate	ID	Location[b]	Assigned Cause[f]	Value against PBR[c]	Country[d]	Gear Type[e]	Description
08/29/2018	Prorated Injury	-	7.5 nm SE of Chatham, MA	EN	0.75	XU	NR	Free-swimming with buoy near flukes, full configuration unknown.
09/03/2018	Mortality	-	Nancy Head, Campobello, NB	EN	1	CN	WE, SE	Live animal entrapped. Failed attempt by fisher to remove animal with seine. Animal became entangled in seine and drowned.
09/16/2018	Mortality	-	0.7 nm SSE of Rye, NH	EN	1	US	PT	Fresh carcass anchored in gear. Constricting body, jaw, peduncle, and fluke wraps with associated hemorrhaging.
11/07/2018	Mortality	-	Tangier Island, VA	EN	1	XU	NE	Constricting gear with associated hemorrhaging partly amputating tip of rostrum. Poor body condition. COD - chronic entanglement.
12/25/2018	Mortality	-	Yarmouth Bar, NS	EN	1	XC	NP	No gear present. Evidence of constricting entanglement on head, ventral pleats, peduncle and flukes. No necropsy, but COD from entanglement most parsimonious.

Assigned Cause	Five-Year Mean (US/CN/XU/XC)
Vessel strike	1.2 (0.8/0.4/0/0)
Entanglement	8.95 (3.15/2.85/2.05/0.9)

a. For more details on events, see Henry *et al.* 2021.
b. The date sighted and location provided in the table are not necessarily when or where the serious injury or mortality occurred; rather, this information indicates when and where the whale was first reported beached, entangled, or injured.
c. Mortality events are counted as 1 against PBR. Serious injury events have been evaluated using NMFS guidelines (NOAA 2012).
d. US=United States, XU=Unassigned 1st sight in U.S., CN=Canada, XC=Unassigned 1st sight in CN.
e. H=hook, GN=gillnet, GU=gear unidentifiable, MF=monofilament, NP=none present, NR=none recovered/received, PT=pot/trap, WE=weir.
f. Assigned cause: EN=entanglement, VS=vessel strike, ET=entrapment (summed with entanglement).

Other Mortality

North Atlantic common minke whales have been and continue to be hunted. From the Canadian East Coast population, documented whaling occurred from 1948 to 1972 with a total kill of 1,103 animals (IWC 1992). Animals from other North Atlantic common minke populations (e.g., Iceland) are presently being hunted.

United States

Common minke whales inhabit coastal waters during much of the year and are thus susceptible to collision with vessels. Vessel strike interactions in U.S. and Canadian waters are reported in Table 5. In January 2017, a minke whale Unusual Mortality Event (UME) was declared for the U.S. Atlantic coast due to elevated numbers of mortalities. From January 2017 to December 2018, 57 minke whales stranded between Maine and South Carolina. Preliminary findings in several of the whales have shown evidence of human interactions or infectious disease. This most recent UME is ongoing (https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2020-minke-whale-unusual-mortality-event-along-atlantic-coast; Accessed 31July2020). Anthropogenic mortalities and serious injuries that occurred in 2017 and 2018 as part of this UME are included in Table 5.

Canada

The Nova Scotia Stranding Network documented whales and dolphins stranded on the coast of Nova Scotia between 1991 and 1996 (Hooker *et al.* 1997). Researchers with the Department of Fisheries and Oceans Canada documented strandings on the beaches of Sable Island (Lucas and Hooker 2000). Common minke whales stranded on the coast of Nova Scotia were recorded by the Marine Animal Response Society (MARS) and the Nova Scotia Stranding Network (Tonya Wimmer/Andrew Reid, pers. comm.).

The Whale Release and Strandings program report common minke whale stranding mortalities in Newfoundland and Labrador (Ledwell and Huntington 2013, 2014, 2015, 2017, 2018). Those that have been determined to be human-caused serious injury or mortality are included in Table 5.

HABITAT ISSUES

Climate-related changes in spatial distribution and abundance, including poleward and depth shifts, have been documented in and predicted for a range of plankton species and commercially important fish stocks (Nye *et al.* 2009, Head *et al.* 2010, Pinsky *et al.* 2013, Poloczanska *et al.* 2013, Hare *et al.* 2016, Grieve *et al.* 2017, Morley *et al*. 2018) and cetacean species (e.g., MacLeod 2009; Sousa *et al*. 2019). There is uncertainty in how, if at all, the distribution and population size of this species will respond to these changes and how the ecological shifts will affect human impacts to the species.

Human-made noises have been shown to impact common minke whales. A study in the Northwest Atlantic, investigated the potential of vessel noise to mask baleen whale vocalizations and found an 80% loss of communication space for minke whale pulse trains relative to historical "quiet" conditions (Cholewiak *et al*. 2018). Minke whales have been observed to respond to mid-frequency active sonar and other training activities by reducing or ceasing calling and by exhibiting avoidance behaviors (Harris *et al.* 2019, Martin *et al.* 2015). In addition, they have strongly avoided acoustic deterrent devices that were used as noise mitigation of construction activities (McGarry *et al*. 2017).

Although levels of persistent organic pollutants are decreasing in many cetacean species, elevated concentrations of persistent organic pollutants and emerging halogenated flame retardants have been reported in tissues of minke whales in the St. Lawrence Estuary in Canada that may affect the regulation of the thyroid and/or steroid axes (Simond *et al.* 2019).

STATUS OF STOCK

Common minke whales are not listed as threatened or endangered under the Endangered Species Act, and the Canadian East Coast stock is not considered strategic under the Marine Mammal Protection Act. The total U.S. fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. The status of common minke whales relative to OSP in the U.S. Atlantic EEZ is unknown.

It is expected that the uncertainties described above will have little effect on the designation of the status of the entire stock. Even though the estimate of human-caused mortality and serious injury in this assessment (8 animals) is negatively biased due to using strandings and entanglement data as the primary source, it is well below the PBR calculated from the abundance estimate for the U.S. and Canadian portion of the Canadian East Coast common minke whale stock's habitat.

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