December 2003

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

STOCK DEFINITION AND GEOGRAPHIC RANGE

Minke whales have a cosmopolitan distribution in polar, temperate and tropical waters. In the North Atlantic there are four recognized populations — Canadian east coast, west Greenland, central North Atlantic, and northeastern North Atlantic (Donovan 1991). These four population divisions were defined by examining segregation by sex and length, catch distributions, sightings, marking data and pre-existing ICES boundaries; however, there are very few data from the Canadian east coast population.

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 eastern half of the Davis Strait (45°W) to the Gulf of Mexico. The relationship between this and the other three stocks is uncertain. It is also uncertain if there are separate stocks within the Canadian east coast stock.

The minke whale is common and widely distributed within the USA Atlantic Exclusive Economic Zone (EEZ) (CETAP 1982). There appears to be a strong seasonal component to minke whale distribution. Spring and summer are times of relatively widespread and common occurrence, and during this time they are most abundant in New England waters. During fall in New England waters, there are fewer minke whales, while during winter, the species appears to be largely absent. Like most other baleen whales, the minke whale generally occupies the continental shelf proper, rather than the continental shelf edge region. Records summarized by Mitchell (1991) hint at a possible winter distribution in the West Indies and in mid-ocean south and east of Bermuda. As with several other cetacean species, the possibility of a deep-ocean component to distribution exists but remains unconfirmed.

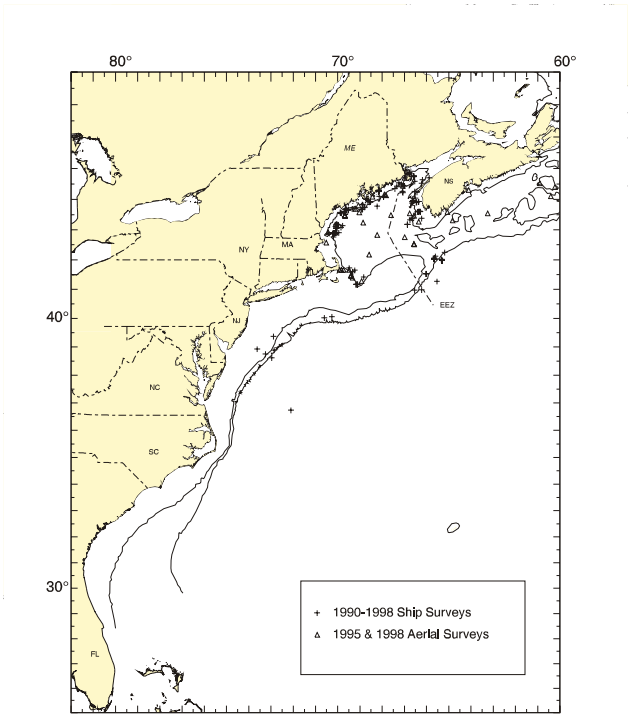

Figure 1. *Distribution of minke whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1990-1998. Isobaths are at 100 m and 1,000 m.*

POPULATION SIZE

The total number of minke whales in the Canadian East Coast population is unknown. However, seven estimates are available for portions of the habitat — a 1978-1982 estimate, a shipboard survey estimate from the summers of 1991 and 1992, a shipboard estimate from June-July 1993, an estimate made from a combination of shipboard and aerial surveys conducted during July to September 1995, an aerial survey estimate of the entire Gulf of St. Lawrence conducted in August to September 1995, an aerial survey estimate from the northern Gulf of St. Lawrence conducted during July and August 1996, and an aerial/shipboard survey conducted from Georges Bank to the mouth of the Gulf of St. Lawrence during July and August 1999 (Table 1; Figure 1).

An abundance of 320 minke whales (CV=0.23) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982).

An abundance of 2,650 (CV=0.31) minke whales was estimated from two shipboard line-transect surveys conducted during July to September 1991 and 1992 in the northern Gulf of Maine-lower Bay of Fundy region. This abundance estimate is a weighted-average of the 1991 and 1992 estimates, where each annual estimate was weighted by the inverse of its variance, using methods as described in Palka (1995).

An abundance of 330 minke whales (CV=0.66) was estimated from a June and July 1993 shipboard line-transect sighting survey conducted principally between the 200 and 2,000 m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (Anon. 1993).

An abundance of 2,790 (CV=0.32) minke whales was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Table 1; Palka *et al.* in review). Total track line length was 32,600 km. The ships covered waters

between the 50 and 1000 fathom depth contour isobaths, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom depth contour line. Data collection and analysis methods were described in Palka (1996).

Kingsley and Reeves (1998) estimated there were 1,020 (CV=0.27) minke whales in the entire Gulf of St. Lawrence in 1995 and 620 (CV=0.52) in the northern Gulf of St. Lawrence in 1996. During the 1995 survey, 8,427 km of track lines were flown in an area of 221,949 km^2 during August and September. During the 1996 survey, 3,993 km of track lines were flown in an area of 94,665 km^2 during July and August. Data were analyzed using Quenouille's jackknife bias reduction procedure on line-transect methods that model the left truncated sighting curve. These estimates were uncorrected for visibility biases such as *g(0)*, the probability of detecting a group on the track line.

An abundance of 2,998 (CV=0.19) minke whales was estimated from a July to August 1999 sighting survey conducted by a ship and airplane covering waters from Georges Bank to the mouth of the Gulf of St. Lawrence (Table 1; D. Palka, pers. comm.). Total track line length was 8,212 km. Using methods similar to that used in the above 1995 Virginia to Gulf of St. Lawrence survey, shipboard data were analyzed using the modified direct duplicate method that accounts for school size bias and *g(0)*. Aerial data were not corrected for *g(0)* (Palka 2000).

The best available current abundance estimate for minke whales is the sum of the 1999 Georges Bank to Gulf of St. Lawrence survey (2,998 (CV=0.19)) and the 1995 Gulf of St. Lawrence survey (1,020 (CV=0.27)), 4,018 (CV=0.16), because these surveys are recent and provided the most complete coverage of the known habitat.

Table 1. Summary of abundance estimates for Canadian East Coast minke whales. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Row Number	Month/Year	Area	N_{best}	CV
1	Jul-Sep 1995	Virginia to mouth of Gulf of St. Lawrence	2,790	0.32
2	Aug-Sep 1995	Gulf of St. Lawrence	1,020	0.27
3	Jul-Sep 1995	Virginia to Gulf of St. Lawrence (SUM OF ROWS 2 and 3)	3,810	0.25
4	Jul-Aug 1996	northern Gulf of St. Lawrence	620	0.52
5	July-Aug 1999	Georges Bank to mouth of Gulf of St. Lawrence	2,998	0.19
6	Aug-Sep 1995 + July-Aug 1999	Georges Bank to Gulf of St. Lawrence (SUM OF ROWS 2 and 5)	4,018	0.16

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 minke whales is 4,018 (CV=0.16). The minimum population estimate for the Canadian East Coast minke whale is 3,515 (CV=0.16).

Current Population Trend

There are insufficient data to determine population trends for this species.

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 include: females mature when 6-8 years old; pregnancy rates are approximately 0.86 to 0.93; thus, the calving interval is between 1 and 2 years; calves are probably born during October to March, after 10 to 11 months gestation; nursing lasts for less than 6 months; maximum ages are not known, but for Southern Hemisphere minke whales the maximum age appears to be about 50 years (Katona *et al.* 1993; 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).

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 3,515 (CV=0.16). The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened, or stocks of unknown status relative to

optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. PBR for the Canadian east coast minke whale is 35.

ANNUAL HUMAN-CAUSED MORTALITY AND INJURY

Recent minke whale takes have been observed or attributed to the Atlantic tuna purse seine, Gulf of Maine and mid-Atlantic lobster trap/pot, mid-Atlantic coastal gillnet, and unknown fisheries; though all takes have not resulted in mortalities (Tables 2-5).

Data to estimate the mortality and serious injury of minke whales come from the USA Fisheries Observer Program and from records of strandings and entanglements in USA waters. Estimates using the Fisheries Observer Program data are discussed by fishery under the Fishery Information section below (Table 2). Strandings and entanglement records are discussed under the lobster trap fishery, mid-Atlantic coastal gillnet fishery, and "Unknown Fisheries" within the Fishery Information section and under the Other Mortality section (Tables 3 and 4). Ship strike mortalities and serious injuries are discussed under the Other Mortality section. For the purposes of this report, only those strandings and entanglement records considered confirmed human-caused mortalities or serious injuries are discussed.

During 1997 to 2001, the USA total annual estimated average human-caused mortality was 3.6 minke whales per year. This is derived from three components: 0 minke whales per year (CV=0.0) from USA fisheries using observer data, 3.4 minke whales per year from USA fisheries using strandings and entanglement data, and 0.2 minke whales per year from ship strikes. During 1997 to 2001, there were no confirmed mortalities or serious injuries in Canadian waters as reported by the various, small scale stranding and observer data collection programs in Atlantic Canada.

Fishery Information

Earlier Interactions

Little information is available about fishery interactions that took place before the 1990's. Read (1994) reported that a minke whale was found dead in a Rhode Island fish trap in 1976.

Distant-water Fleet

Prior to 1977, there was no documentation of marine mammal bycatch in the distant-water fleet (DWF) activities off the northeast coast of the USA. With implementation of the Magnuson Fisheries Conservation and Management Act in that year, an observer program was established which recorded fishery data and information on incidental bycatch of marine mammals. A minke whale was caught and released alive in the Japanese tuna longline fishery in 3,000 m of water, south of Lydonia Canyon on Georges Bank, in September 1986 (Waring *et al.* 1990). In 1982, there were 112 different foreign vessels; 16%, or 18, were Japanese tuna longline vessels operating along the USA east coast. This was the first year that the Northeast Regional Observer Program assumed responsibility for observer coverage of the longline vessels. Between 1983 and 1988, the numbers of Japanese longline vessels operating within the US Atlantic EEZ each year were 3, 5, 7, 6, 8, and 8, respectively. Observer coverage was 100%.

Northeast Sink Gillnet

Two minke whales were observed taken in the Northeast sink gillnet fishery between 1989 and the present. The take in July 1991, south of Penobscot Bay, Maine resulted in a mortality, and the take in October 1992, off the coast of New Hampshire near Jeffreys Ledge was released alive. There were approximately 349 vessels (full and part time) in the Northeast sink gillnet fishery in 1993 (Walden 1996) and 301 full and part time vessels in 1998. Observer coverage as a percentage of trips has been 1%, 6%, 7%, 5%, 7%, 5%, 4%, 6%, 5%, 6%, 6% and 4% for years 1990 to 2001, respectively. Because no mortalities have been observed since 1991, the annual estimated average Northeast sink gillnet fishery-related mortality for minke whales is zero.

Herring Weir

A minke whale got trapped and was released alive from a herring weir off northern Maine in 1990. In USA and Canadian waters the herring weir fishery occurred from May to September each year along the southwestern shore of the Bay of Fundy, and was scattered along the coasts of western Nova Scotia and northern Maine. In 1990 there were 56 active weirs in Maine (Read 1994). According to state officials, in 1998, the number of weirs in Maine waters dropped to nearly nothing due to the limited herring market (Jean Chenoweth, pers. comm.) and in 2000 only 11 weirs were built (Molyneaux 2000). The number of active weirs in the USA is unknown. It is also unknown if the active weirs incidentally take any marine mammals.

Pelagic Drift Gillnet

In 1996 and 1997, NMFS issued management regulations which prohibited the operation of this fishery in 1997. The fishery was active during 1998. Then, in January 1999, NMFS issued a Final Rule to prohibit the use of drift net gear in the North Atlantic swordfish fishery (50 CFR Part 630). Four minke whale mortalities were observed in the Atlantic pelagic drift gillnet fishery during 1995. The estimated total number of hauls in the Atlantic pelagic drift gillnet fishery increased from 714 in 1989 to 1,144 in 1990; thereafter, with the introduction of quotas, effort was severely reduced. The estimated number of hauls in 1991 to 1996 were 233, 243, 232, 197, 164 and 149, respectively. Fifty-nine different vessels participated in this fishery at one time or another between 1989 and 1993. In 1994 to 1998, there were 12, 11, 10, 0 and 11 vessels, respectively, in the fishery. Observer coverage, expressed as percent of sets, was 8% in 1989, 6% in 1990, 20% in 1991, 40% in 1992, 42% in 1993, 87% in 1994, 99% in 1995, 64% in 1996, no fishery in 1997 and 99% coverage during 1998. Observer coverage dropped during 1996

because some vessels were deemed too small or unsafe by the contractor that provided observer coverage to NMFS. Fishing effort was concentrated along the southern edge of Georges Bank and off Cape Hatteras. Examination of the species composition of the catch and locations of the fishery throughout the year, suggested that the drift gillnet fishery be stratified into two strata, a southern or winter stratum, and a northern or summer stratum. Estimates of the total bycatch, for each year from 1989 to 1993, were obtained using the aggregated (pooled 1989-1993) catch rates, by strata (Northridge 1996). Total annual bycatch after 1993 was estimated separately for each year by summing the observed caught with the product of the average bycatch per haul and number of unobserved hauls as recorded in SEFSC logbooks. Variances were estimated using bootstrap re-sampling techniques. Estimated annual fishery-related mortality and serious injury (CV in parentheses) was 0 for 1989 to 1994, 4.5 (0) for 1995, 0 for 1996 (Bisack 1997) and 0 for 1998. The fishery was closed during 1997. Estimated average annual mortality and serious injury related to this fishery during 1994 to 1996, and 1998 was 1.1 minke whales (CV=0.0). There is no current mortality related to this fishery because the fishery closed in 1999.

Atlantic Tuna Purse Seine

In an Atlantic tuna purse seine off Stellwagen Bank, one minke whale was reported caught and released uninjured in 1991(D. Beach, NMFS NE Regional Office, pers. comm.) and in 1996. The minke caught during 1991 escaped after a crew member cut the rope that was wrapped around the tail. The minke whale caught during 1996 escaped by diving beneath the net (Table 2). The tuna purse seine fishery occurring between Cape Hatteras and Cape Cod is directed at small and medium bluefin and skipjack for the canning industry, while the fishery north of Cape Cod is directed at large medium and giant bluefin tuna (NMFS 1995). These two fisheries are entirely separate from other Atlantic tuna purse seine fisheries. Spotter aircraft were used to locate fish schools. The official start date, set by regulation, was August 15. Individual vessel quotas (IVQs) and a limited access system prevent a derby fishery situation. Catch rates for large mediums and giant tuna are high and consequently, the season usually only lasts a few weeks. The 1996 regulations allocated 250 MT (5 IVQs) with a minimum of 90% giants and 10% large mediums.

Limited observer data are available for the Atlantic tuna purse seine fishery. Out of 45 total trips made in 1996, 43 trips (95.6%) were observed. Forty-four sets were made on the 43 observed trips and all sets were observed. A total of 136 days were covered. No trips were observed during 1997 through 1999. Two trips (seven hauls) were observed in October 2000 in the Great South Channel region. Four trips were observed in September 2001. No marine mammals were observed taken during these trips. If there are no minke whale takes during 2002, then this section will be put into the "Earlier Interactions" section, because there will be no takes observed within the previous five years.

Gulf of Maine and mid-Atlantic Lobster Trap/Pot Fishery

The strandings and entanglement database, maintained by the New England Aquarium and the Northeast Regional Office/NMFS, reported seven minke whale mortalities and serious injuries that were attributed to the lobster fishery during 1990 to 1994; 1 in 1990 (may be serious injury), 2 in 1991 (one mortality and one serious injury), 2 in 1992 (both mortalities), 1 in 1993 (serious injury) and 1 in 1994 (mortality) (1997 List of Fisheries 62FR33, January 2, 1997). The one confirmed minke whale mortality during 1995 was attributed to the lobster fishery (Tables 3 and 4). No confirmed mortalities or serious injuries of minke whales occurred in 1996. From the four confirmed 1997 records, one minke whale mortality was attributed to the lobster trap fishery. No minke whale mortalities were attributed to this fishery for other years.

There are three distinctly identified stock areas for the American lobster: 1) Gulf of Maine, 2) south of Cape Cod to Long Island Sound, and 3) Georges Bank and south to Cape Hatteras. In 1997, there were 3,431 vessels holding licenses to harvest lobsters in federal waters, 2,674 vessels licensed to use lobster pot gear in state waters, 675 vessels licensed to use bottom trawls and approximately 100 licenses to use dredge gear to harvest lobsters. In 2000, there were 7,539 vessels from Maine to North Carolina holding licenses. Lobsters are taken primarily by traps, with about 2-3% of the harvest being taken by mobile gear (trawlers and dredges). About 80% of lobsters were harvested from state waters. The offshore fishery in federal waters has developed in the past 10 to 15 years, largely due to technological improvements in equipment and lower competition in the offshore areas. In January 1997, NMFS changed the classification of the Gulf of Maine and USA mid-Atlantic lobster pot fisheries from Category III to Category I (1997 List of Fisheries 62FR33, January 2, 1997) based on examination of 1990 to 1994 stranding and entanglement records of large whales (including right, humpback and minke whales). This fishery is operating under regulations from the Large Whale Take Reduction Plan (July 22, 1997; 62 FR 39157) and the federal American Lobster fishery plan (December 6, 1999; 64 FR 68228). Annual mortalities due to this fishery, as determined from strandings and entanglement records that have been audited, were 1 in 1991, 2 in 1992, 1 in 1994, 1 in 1995, 0 in 1996, 1 in 1997 and 0 in 1998 to 2001. Estimated average annual mortality related to this fishery during 1997 to 2001 was 0.2 minke whales per year (Table 3).

Mid-Atlantic Coastal Gillnet

One minke whale, reported in the strandings and entanglement database, maintained by the New England Aquarium and the Northeast Regional Office/NMFS, was taken in a 6-inch gill net on 06 July 1998 off Long Island, New York (Tables 3 and 4). This take was assigned to the mid-Atlantic coastal gillnet fishery. No minke whales have been taken from this fishery during observed trips in 1993 to 2001. In July 1993, an observer program was initiated in the USA Atlantic coastal gillnet fishery by the NEFSC Fisheries Observer program. Twenty trips were observed during 1993. During 1994 and 1995, 221 and 382 trips were observed, respectively. This fishery, which extends from North Carolina to New York, is actually a combination of small vessel fisheries that target a variety of

fish species. Some of these vessels operate right off the beach, some use drift nets and others use sink nets. During 1998, it was estimated that 302 full- and part-time sink gillnet vessels and an undetermined number of drift gillnet vessels participated in this fishery. This is the number of unique vessels in the commercial landings database (Weighout) that reported catch from fisheries during 1998 from the states of Connecticut to North Carolina. This does not include a small percentage of records where the vessel number was missing. Observer coverage, expressed as percent of tons of fish landed, was 5%, 4%, 3%, 5%, 2%, 2% and 2% for 1995 to 2001, respectively. Observed fishing effort was concentrated off New Jersey and scattered between Delaware and North Carolina from the beach to 50 miles off the beach.

Annual mortalities due to this fishery, as determined from strandings and entanglement records were 0 in 1991, 1992, 1994 to 1997, 1 in 1998 and 0 in 1999 to 2001. Estimated average annual mortality related to this fishery during 1997 to 2001 was 0.2 minke whales per year (Tables 3 and 4).

Unknown Fisheries

The strandings and entanglement database, maintained by the New England Aquarium and the Northeast Regional Office/NMFS, included 36 records of minke whales within USA waters for 1975-1992. The gear included unspecified fishing net, unspecified cable or line, fish trap, weirs, seines, gillnets, and lobster gear. A review of these records is not complete. One confirmed entanglement was an immature female minke whale, entangled with line around the tail stock, that came ashore on the Jacksonville, Florida jetty on 31 January 1990 (R. Bonde, USFWS, Gainesville, FL, pers. comm.).

The audited NE Regional Office/NMFS entanglement/stranding database for 1995 to 2001 contains 43 records of minke whales, of which the confirmed mortalities and serious injuries are reported in Table 4. Mortalities (and serious injuries) that were likely a result of a fishery interaction with an unknown fishery include 3 (0) in 1997, 3 (0) in 1999, 1 (1) in 2000, 3 (2) in 2001, and 0 in other years. The examination of the minke entanglement records from 1997 indicate that 4 out of 4 confirmed records of mortality are likely a result of fishery interactions, one attributed to the lobster pot fishery (see above), and three not attributed to any particular fishery because the reports do not contain the necessary details. Of the 5 mortalities in 1999, 2 were attributed to an unknown trawl fishery and 3 to some other fishery. One of the interactions with an unknown fishery in 2000 was a mortality and one was a serious injury (Tables 3 and 4). In 2001, of the 5 confirmed fishery interactions, 3 interactions were mortalities in an unknown fishery and 2 were serious injuries in an unknown fishery.

In general, an entangled or stranded cetacean could be an animal that is part of an expanded bycatch estimate from an observed fishery and thus it is not possible to know if an entangled or stranded animal is an additional mortality. During 1997 to 2001, there were no minke whales observed taken in any fishery that participated in the Fisheries Observer Program, therefore, the strandings where mortality was due to a fishery interaction can be added into the human-caused mortality estimate. During 1997 to 2001, as determined from strandings and entanglement records, the estimated average annual mortality is 0.4 minke whales per year in unknown trawl fisheries, and 2.6 minke whales per year in unknown fisheries (Table 3).

CANADA

In Canadian waters, information about minke whale interactions with fishing gear is not well quantified or recorded, though some records are available. Read (1994) reported interactions between minke whales and gillnets in Newfoundland and Labrador, cod traps in Newfoundland, and 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 minke whales were observed taken.

Herring Weirs

During 1980 to 1990, 15 of 17 minke whales were released alive from herring weirs in the Bay of Fundy. Due to the formation of a cooperative program between Canadian fishermen and biologists it is expected that now most minke whales will be able to be released alive.

During January 1991 to September 2002, 26 minke whales were trapped in herring weirs in the Bay of Fundy. Of these 26, 1 died (H. Koopman, pers. comm.) and several (number unknown) were released alive and unharmed (A. Westgate, pers. comm.).

In USA and Canadian waters, the herring weir fishery occurs from May to October along the southwestern shore of the Bay of Fundy, and is scattered along the coasts of western Nova Scotia and northern Maine. In 1990 there were 180 active weirs in western Bay of Fundy (Read 1994). According to Canadian Dept. of Fisheries and Oceans (DFO) officials, for 1998, there were 225 licenses for herring weirs on the New Brunswick and Nova Scotia sides of the Bay of Fundy (60 from Grand Manan Island, 95 from Deer and Campobello Islands, 30 from Passamaquoddy Bay, 35 from East Charlotte area, and 5 from the Saint John area). The number of licenses has been fairly consistent since 1985 (Ed Trippel, pers. comm.), but the number of active weirs is less than the number of licenses, and the number has been decreasing every year, primarily due to competition with salmon mariculture sites (A. Read, pers. comm.). Around Grand Manan, there were 25 active weirs in 2001, and 21 in 2002 (H. Koopman, pers. comm). But numbers of weirs for the Nova Scotia shore, Campobello, Deer and the Wolves Islands, or the New Brunswick mainland shore are unknown (H. Koopman, pers. comm.).

Other Fisheries

Six minke whales were reported entangled during 1989 in the now non-operational groundfish gillnet fishery in Newfoundland and Labrador (Read 1994). One of these animals escaped and was still towing gear, the remaining 5 animals died.

Salmon gillnets in Canada, now no longer being used, had taken a few minke whales. In Newfoundland in 1979, one minke whale died in a salmon net. In Newfoundland and Labrador, between 1979 and 1990, it was estimated that 15% of the Canadian minke whale takes were in salmon gillnets. A total of 124 minke whale interactions were documented in cod traps, groundfish gillnets, salmon gillnets, other gillnets and other traps. This fishery ended in 1993 as a result of an agreement between the fishermen and North Atlantic Salmon Fund (Read 1994).

Five minke whales were entrapped and died in Newfoundland cod traps during 1989. The cod trap fishery in Newfoundland closed in 1993 due to the depleted groundfish resources (Read 1994).

Table 2. Summary of minke whales (*Balaenoptera acutorostrata*) released alive, by commercial fishery, years sampled (Years), ratio of observed mortalities recorded by on-board observers to the estimated mortality (Ratio), the number of observed animals released alive and injured (Injured), and the number of observed animals released alive and uninjured (Uninjured).

Fishery	Years	Ratio	Injured	Uninjured
Tuna purse seine	97-01	NA[1], NA[1], NA[1], 0/0, 0/0	NA[1], NA[1], NA[1], 0[2], 0[3]	NA[1], NA[1], NA[1], 0[2], 0[3]

NA=Not Available.

[1] No observer coverage during 1997 through 1999.

[2] Two trips were observed during October 2000.

[3] Four trips were observed during September 2001.

Table 3. From strandings and entanglement data, summary of confirmed incidental mortalities and serious injuries of minke whales (*Balaenoptera acutorostrata*) by commercial fishery: includes years sampled (Years), number of vessels active within the fishery (Vessels), type of data used (Data Type), mortalities and serious injuries assigned to this fishery (Assigned Mortality), and mean annual mortality and serious injuries. See Table 4 for details.

Fishery	Years	Vessels	Data Type [1]	Assigned Mortality	Mean Annual Mortality
GOM and mid-Atlantic Lobster Trap/Pot	97-01	1997=6880 2000=7539 licenses[2]	Entanglement & Strandings	1, 0, 0, 0, 0	0.2
mid-Atlantic Coastal Gillnet	97-01	1998=302[3]	Entanglement & Strandings	0, 1, 0, 0, 0	0.2
Unknown Trawl	97-01	NA	Entanglement & Strandings	0, 0, 2, 0, 0	0.4
Unknown Fisheries	97-01	NA	Entanglement & Strandings	3, 0, 3, 2, 5	2.6
TOTAL					3.4 (unk)

NA=Not Available.

[1] Data from records in the entanglement and strandings data base maintained by the New England Aquarium and the Northeast Regional Office/NMFS (Entanglement and Strandings).

[2] Number of vessels licensed to harvest lobsters in federal and state waters, with lobster traps/pots, bottom trawls, and dredge gear.

[3] Number of sink gillnet vessels.

Table 4. Summarized records of mortality and serious injury likely to result in mortality. Canadian East Coast stock of minke whales, January 1997 - December 2001. This listing includes only confirmed records related to USA commercial fisheries and/or ship strikes in USA waters. Causes of mortality or injury, assigned as primary or secondary, are based on records maintained by NMFS/NER and NMFS/SER.

Date	Report Type	Sex, age, ID	Location	Assigned Cause: P=primary, S=secondary			Notes
				Ship strike	Entang./ Fsh.inter	Unk/ uncertain	
5/15/97	mortality	female 5.5 m (est)	Gloucester, MA (42°36' N 70°38' W)		P		Unknown fishery. Deep lacerations around tail stock, abrasions around flukes and mouth
5/16/97	mortality	female 5.5 m (est)	Rockport, MA (42°40' N 70°35' W)		P		Unknown fishery. Abrasions around flukes; feeding prior to entanglement
8/14/97	mortality	female 2.8 m	Jewell Island, ME (43°39' N 70°02' W)		P		Unknown fishery. Fresh lacerations on flukes and pectoral fins
8/30/97	mortality	female 8 m (est)	Cape Small, ME (43°40' N 69°57' W)		P		Lobster fishery. Observed entangled in lobster gear by ME Marine Patrol
6/24/98	mortality	male 3.4 m	Long Beach, NY (40° 34' N 73° 42' W)		P		mid-Atlantic coastal gillnet fishery. Alive initially, then died in a 6-inch mesh gillnet.
12/12/98	mortality	unk sex and size	Cape Cod Bay, MA	P			Body of whale seen in wake of a whale watching vessel.
5/9/99	mortality	female 5.6 m	Cape Lookout Bight (34° 61'N 76° 54'W)		P		Unknown fishery. Fresh open wounds around fluke and line marks from pectoral fins through mouth.
6/16/99	mortality	female 6.9 m	Orleans, MA (41° 48'N 65° 56'W)		P		Unknown fishery. Extensive rope markings with hemorrhaging.
7/3/99	mortality	unk sex and size	Sakonnet River, RI (41°48'N 71°12'W)		P		Trawl fishery. 4.5 inch stretched mesh driven into rostrum.
8/2/99	mortality	unk sex and size	Point Judith Light, RI (41°23'N 71°28'W)		P		Trawl fishery. 6 inch stretched mesh tightly wrapped around rostrum.
10/2/99	mortality	female 7.2 m	Provincetown, MA (42°03'N 70°21'W)		P		Unknown fishery. Rope marks on left gape of mouth, left pectoral fin, caudal peduncle, and dorsal and ventral surfaces of fluke blades.

Date	Report Type	Sex, age, ID	Location	Assigned Cause: P=primary, S=secondary			Notes
				Ship strike	Entang./ Fsh.inter	Unk/ uncertain	
8/11/00	serious injury	unk sex and size	Port Clyde, ME (43°55'N 69°11'W)		P		Unknown fishery. Dark line with several bullet buoys. Unusual minke behavior - whale probably anchored.
8/26/00	mortality	unk sex and size	Rockland ME (44°05'N 69°01'W)		P		Unknown fishery. Very fresh carcass with fresh entanglement wounds on tail stock.
6/13/01	serious injury	unk sex, 7.6 m (est)	Cape Cod (42°06'N 70°08'W0		P		Unknown fishery. Animal free-swimming with tangle of line behind blowhole, trailing line on left side.
7/27/01	mortality	female, 3.9 m (est)	Whale Rock, RI (41°26'N 71°25'W)		P		Unknown fishery. Line wrapped behind head and dorsal fin.
8/17/01	mortality	male, 3.9 m	Middletown, RI (41°28'N 71°15'W)		P		Unknown fishery. Severe rope entanglement around mouth and rostrum caused malnutrition and infection.
10/20/01	serious injury	unk sex, 6.1 m (est)	Stellwagen Bank (42°11'N 70°10'W)		P		Unknown fishery. Line with high flyer attached.
12/13/01	mortality	unk sex, 7 m (est)	Massachusetts Bay (42° 21'N 70°43'W)		P		Unknown fishery. Pictures show evidence of fairly fresh entanglement marks on tail stock and across tail flukes.

Other Mortality

Minke whales have been and are still being hunted in the North Atlantic. 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 populations are presently still being harvested at low levels.

USA

Minke whales inhabit coastal waters during much of the year and are subject to collision with vessels. According to the NMFS/NER marine mammal entanglement and stranding database, on 7 July 1974, a necropsy of a minke whale suggested a vessel collision occurred; on 15 March 1992, a juvenile female minke whale with propeller scars was found floating east of the St. Johns Channel entrance (R. Bonde, USFWS, Gainesville, FL, pers. comm.); and on 15 July 1996 the captain of a vessel reported they hit a minke whale offshore of Massachusetts. After reviewing this record, it was concluded the animal struck was not a serious injury or mortality. On 12 December 1998, a minke whale was struck and presumed killed by a whale watching vessel in Cape Cod Bay off Massachusetts.

During 1997 to 2001, one minke whale was confirmed struck by a ship, thus, there is an annual average of 0.2 minke whales per year struck by ships (Table 4).

CANADA

Whales and dolphins stranded between 1991 and 1996 on the coast of Nova Scotia were documented by the Nova Scotia Stranding Network (Hooker *et al.* 1997). Strandings on the beaches of Sable Island were documented

by researchers with Dept. of Fisheries and Oceans, Canada (Lucas and Hooker 2000). Sable Island is approximately 170 km southeast of mainland Nova Scotia. Lucas and Hooker (2000) report 4 minke whales stranded on Sable Island between 1970 and 1998, 1 in spring 1982, 1 in January 1992, and a mother/calf in December 1998 (Table 5). On the mainland of Nova Scotia, a total of 7 reported minke whales stranded during 1991 to 1996 (Table 5). The 1996 stranded minke whale was released alive off Cape Breton on the Atlantic Ocean side, the rest were found dead. All the minke whales stranded between July and October. One was from the Atlantic Ocean side of Cape Breton, 1 from Minas Basin, 1 was at an unknown location, and the rest stranded in the vicinity of Halifax, Nova Scotia. It is unknown how many of the strandings can be attributed to fishery interactions.

Table 5. Documented number of stranded minke whales along the coast of Nova Scotia and on Sable Island by month and year, according to Hooker *et al.* (1997) and Lucas and Hooker (2000).

Year	Month	Number of strandings	
		Sable Isl.	Nova Scotia
1991	Sept		1
1992	Jan	1	
	July		1
1993	July		1
	Oct		2
1994	Aug		1
1996	July		1
1998	Dec	1	
TOTAL		2	7

STATUS OF STOCK

The status of minke whales, relative to OSP, in the US Atlantic EEZ is unknown. The minke whale is not listed as endangered under the Endangered Species Act (ESA). The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock because estimated fishery-related mortality and serious injury does not exceed PBR and the minke whale is not listed as a threatened or endangered species under the ESA.

REFERENCES

Anon. 1993. Cruise results, NOAA ship DELAWARE II, Cruise No. DEL 93-06, Marine Mammal Survey. 5 pp. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.

Barlow, J., S. L. Swartz, T. C. Eagle and P. R. Wade. 1995. U.S. Marine mammal stock assessments: Guidelines for preparation, background, and a summary of the 1995 assessments. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-6, 73 pp.

Bisack, K. D. 1997. Marine mammal bycatch estimates and their sampling distributions in the U.S. New England sink gillnet, pair trawl, Atlantic pelagic drift gillnet and North Atlantic bottom trawl fisheries: 1994 to 1996. Working paper SC/49/SM35 submitted to the IWC Scientific Committee meeting in Bournemouth, UK, Aug/Sept 1997.

CETAP. 1982. A characterization of marine mammals and turtles in the mid- and north Atlantic areas of the U.S. outer continental shelf. Cetacean and Turtle Assessment Program, University of Rhode Island. Final Report, Contract AA51-C78-48, Bureau of Land Management, Washington, DC, 538 pp.

Donovan, G. P. 1991. A review of IWC stock boundaries. *Rep. int Whal. Commn* Special Issue 13: 39-68.

Hooker, S. K., R. W. Baird and M. A. Showell. 1997. Cetacean strandings and bycatches in Nova Scotia, Eastern Canada, 1991-1996. Meeting document SC/49/O5 submitted to the 1997 International Whaling Commission meeting in Bournemouth, UK.

IWC [International Whaling Commission]. 1991. Appendix 11. Biological parameters of North Atlantic minke whales in Annex F Report of the sub-committee on North Atlantic Minke whales. *Rep. int Whal. Commn* 41: 160.

IWC [International Whaling Commission]. 1992. Annex K. Report of the working group on North Atlantic Minke trials. *Rep. int Whal. Commn* 42: 246-251.

Katona, S. K., V. Rough and D. T. Richardson. 1993. *A field guide to whales, porpoises, and seals from Cape Cod to Newfoundland*. Smithsonian Institution Press. Washington D.C. 316 pp.
Kingsley, M.C.S. and R.R. Reeves. 1998. Aerial surveys of cetaceans in the Gulf of St. Lawrence in 1995 and 1996. *Can. J. Zool.* 76:1529-1550.
Lucas, Z. N. and S. K. Hooker. 2000. Cetacean strandings on Sable Island, Nova Scotia, 1970-1998. *Can. Field-Nat.* 114(1): 46-61.
Mitchell, E. D. 1991. Winter records of the minke whale (*Balaenoptera acutorostrata* Lacepede 1804) in the southern North Atlantic. *Rep. int Whal. Commn* 41: 455-457.
Molyneaux, P. 2000. Tradition at stake. *National Fisherman* 80(11): 26-29.
National Marine Fisheries Service (NMFS). 1995. Final environmental impact statement for a regulatory amendment for the western Atlantic bluefin tuna fishery. July 20, 1995.
Northridge, S. 1996. Estimation of cetacean mortality in the U.S. Atlantic swordfish and tuna driftnet and pair trawl fisheries. Final report to the Northeast Fisheries Science Center, Contract No. 40ENNF500160. Available from: NMFS, Northeast Fisheries Science Center, 166 Water St., Woods Hole, MA 02543.
Palka, D. 2000. Abundance of the Gulf of Maine/Bay of Fundy harbor porpoise based on shipboard and aerial surveys during 1999. NOAA/NMFS/NEFSC Ref. Doc. 00-07; 29 pp. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543.
Palka, D. 1995. Abundance estimate of the Gulf of Maine harbor porpoise. pp. 27-50. *In*: A. Bjørge and G.P. Donovan (eds.) Biology of the Phocoenids. *Rep. int Whal. Commn* Special Issue 16.
Palka, D. 1996. Update on abundance of Gulf of Maine/Bay of Fundy harbor porpoises. NOAA-NMFS-NEFSC Ref. Doc. 96-04; 37p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543.
Palka, D., G. Waring and D. Potter. (in review). Abundances of cetaceans and sea turtles in the northwest Atlantic during summer 1995 and 1998. *Fish. Bull., U.S.*
Read, A. J. 1994. Interactions between cetaceans and gillnet and trap fisheries in the northwest Atlantic. *Rep. int Whal. Commn* Special Issue 15: 133-147.
Wade, P. R. and R. P. Angliss. 1997. Guidelines for assessing marine mammal stocks: Report of the GAMMS workshop April 3-5, 1996, Seattle, Washington. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-12, 93 pp.
Walden, J. 1996. The New England gillnet effort study. NOAA-NMFS-NEFSC Ref. Doc. No. 96-10, 38pp. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543.
Waring, G. T., P. Gerrior, P. M. Payne, B. L. Parry and J. R. Nicolas. 1990. Incidental take of marine mammals in foreign fishery activities off the northeast United States, 1977-1988. *Fish. Bull., U.S.* 88(2): 347-360.