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 population, which inhabits the area from the eastern half of Davis Strait out to 45°W and south to the Gulf of Mexico. The relationship between this and the other three populations is uncertain. It is also uncertain if there are separate stocks within the Canadian east coast population.

The minke whale is 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. 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.

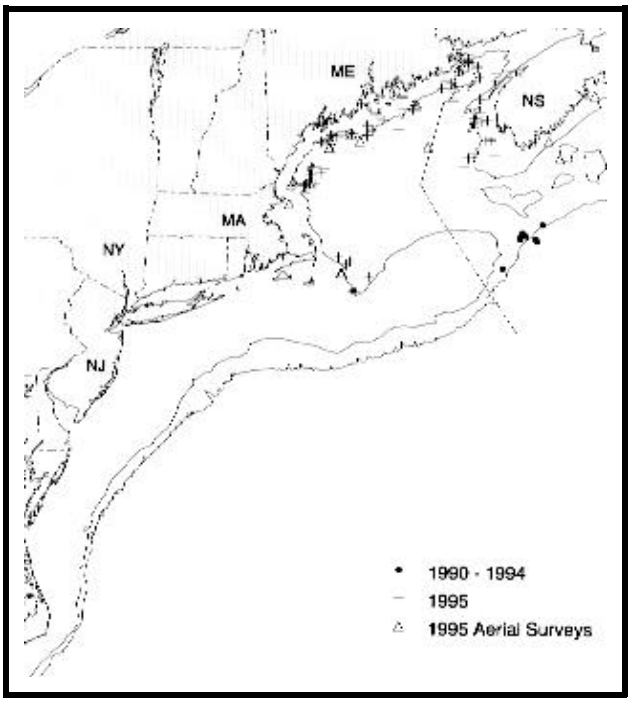

Figure 1. *Distribution of minke whale sightings from NEFSC shipboard and aerial surveys during the summer in 1990-1995. Isobaths are at 100 m and 1,000 m.*

POPULATION SIZE

The total number of minke whales in the Canadian East Coast population is unknown. However, four 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, and an estimate made from a combination of a shipboard and aerial surveys conducted during July to September 1995 (Table 1; Figure 1).

A population size 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 (Table 1; CETAP 1982). The estimate is based on spring data because the greatest proportion of the population off the northeast U.S. coast appeared in the study area during this season. This estimate does not include a correction for dive-time or g(0), the probability of detecting an animal group on the track line. This estimate may not reflect the current true population size because of its old age, and it was estimated just after cessation of extensive foreign fishing operations in the region.

A population size 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 (Table

1). This population size is a weighted-average of the 1991 and 1992 estimates, where each annual estimate was weighted by the inverse of its variance. The data were collected during surveys designed to estimate abundance of harbor porpoises (Palka 1995). Two independent teams of observers on the same ship surveyed using naked eye in non-closing mode. Using the product integral analytical method (Palka 1995) and DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993) the abundance included an estimate of school size-bias, if applicable, an estimate of g(0), probability of detecting a group on the track line, but no correction for dive-time or ship avoidance. Variability was estimated using bootstrap re-sampling techniques.

A population size 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 2,000m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (Table 1; Anon. 1993). Data were collected by two alternating teams that searched with 25x150 binoculars and were analyzed using DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993). Estimates include school size-bias, if applicable, but do not include corrections for g(0) or dive-time. Variability was estimated using bootstrap re-sampling techniques.

A population size 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; NMFS/NEFSC unpublished data). Total track line length was 32,600 km (17,600 nmi). The ships covered waters between the 50 and 1000 fathom depth contour lines, 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. This survey included the same region covered during the above 1991 and 1992 sighting surveys. Shipboard data were collected using a two independent sighting team procedure and were analyzed using the product integral method (Palka 1995) and DISTANCE (Buckland *et al.* 1993). Shipboard estimates were corrected for g(0) and, if applicable, also for school size-bias. Standard aerial sighting procedures with two bubble windows and one belly window observer were used during the aerial survey (Palka 1996). An estimate of g(0) was not made for the aerial portion of the survey. Estimates do not include corrections for dive-time or platform avoidance. Variability was estimated using bootstrap re-sampling techniques. Minke whales were only detected in the Georges Bank - Gulf of Maine - Bay of Fundy region by one of the ships and the plane, so this was the area included in this abundance estimate.

There are no estimates of abundance for this species in Canadian waters that lie farther north or east of the above survey's study area.

The best available current abundance estimate for minke whales is 2,790 (CV=0.32) as estimated from the July to September 1995 line transect surveys because this survey is 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).

Month/Year	Area	N_{best}	CV
spring 1978-82	Cape Hatteras, NC to Nova Scotia	320	0.23
Jul -Sep 1991-92	N. Gulf of Maine and Bay of Fundy	2,650	0.31
Jun-Jul 1993	Georges Bank to Scotian shelf, shelf edge only	330	0.66
Jul-Sep 1995	Virginia to Gulf of St. Lawrence	2,790	0.32

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 2,790 (CV=0.32). The minimum population estimate for Canadian East Coast minke whale is 2,145 (CV=0.32).

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 2,145 (CV=0.32). 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 21.

ANNUAL HUMAN-CAUSED MORTALITY AND INJURY

Fishery Information

Recent minke whale takes have been observed in U.S. waters in the New England multispecies sink gillnet, Atlantic pelagic drift gillnet, bluefin tuna purse seine fisheries, and in fish weirs; though all takes have not resulted in a mortality. The annual mortality estimate from these fisheries during 1992 to 1996 is 0.8 (CV=0) minke whales per year.

USA

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. Prior to 1977, there was no documentation of marine mammal by-catch in distant-water fleet (DWF) activities off the northeast coast of the U.S. With implementation of the Magnuson Fisheries Conservation and Management Act in that year, an observer program was established which recorded fishery data and information of incidental by-catch 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 U.S. 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 number of Japanese longline vessels operating within the EEZ each year were 3, 5, 7, 6, 8, and 8, respectively. Observer coverage was 100%.

Data on current incidental takes in U.S. fisheries are available from several sources. In 1986, NMFS established a mandatory self-reported fishery information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989, and since that year several fisheries have been covered by the program. In late 1992, the SEFSC started observer coverage of pelagic longline vessels fishing off the Grand Banks (Tail of the Banks) south of Cape Hatteras.

New England Multispecies Sink Gillnet

Two minke whales were taken in the New England multispecies sink gillnet fishery. 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 (Table 3). There were approximately 349 vessels (full and part time) in the New England multispecies sink gillnet fishery in 1993 (Walden 1996). Observer coverage as a percentage of trips has been 1%, 6%, 7%, 5%, 7%, 5%, and 4% for years 1990 to 1996. Because no mortalities have been observed within the most recent five years (1992 to 1996), the annual estimated average New England multispecies sink gillnet fishery-related mortality for minke whales is zero (Table 2).

Pelagic Drift Gillnet

Four minke whale mortalities were observed in the Atlantic pelagic drift gillnet fishery during 1995 (Table 2). 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, 1992, 1993, 1994, 1995 and 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, 1995, and 1996 there were 12, 11 and 10 vessels, respectively, in the fishery (Table 2). Observer coverage, expressed as percent of sets observed, was 8% in 1989, 6% in 1990, 20% in 1991, 40% in 1992, 42% in 1993, 87% in 1994, 99% in 1995, and 64% in 1996 (Table 2). Observer coverage dropped during 1996 because some vessels were deemed too small or unsafe by the contractor that provided observer coverage. 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 by-catch, for each year from 1989 to 1993, were obtained using the aggregated (pooled 1989-1993) catch rates, by strata (Northridge 1996). Estimates of total annual by-catch for 1994, 1995, and 1996 were estimated separately for each year by summing the observed caught and the product of the average by-catch 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, and 0 for 1996. Estimated average annual mortality and serious injury related to this fishery during 1992-1996 was 0.8 minke whales (CV=0.00) (Table 2).

Bluefin Tuna Purse Seine

In a bluefin 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. The tuna purse seine fishery occurring between Cape Hatteras and Cape Cod is directed at small and medium bluefin and skip jack for the canning industry, while the fishery north of Cape Cod is directed at large medium and giant bluefin tuna (NMFS 1995). The latter fisheries are entirely separate from any other Atlantic tuna purse seine fishery. Spotter aircraft are used to locate fish schools. The official start date, set by regulation, is 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 bluefin 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.

Other Fisheries

A minke whale was trapped and released alive in a herring weir off northern Maine in 1990. In U.S. and Canadian waters the herring weir fishery occurs from May to September each year along the southwestern shore of the Bay of Fundy, and scattered along the western Nova Scotia and northern Maine coasts. In 1990 there were 180 active weirs in western Bay of Fundy, and 56 active weirs in Maine (Read 1994). It is unknown how many herring weirs currently exist in U.S. and Canadian waters.

For U.S. waters, an entanglement database maintained by NE Regional Office for 1975-1992 included 36 records of minke whales. The gear includes unspecified fishing net, unspecified cable or line, fish trap, weirs, seines, gillnets, and lobster gear. A review of these records is not complete, however, it was reported that an immature female minke whale, entangled with line around the tail stock, came ashore on the Jacksonville, Florida, jetty on 31 January 1990 (R. Bonde, USFWS, Gainesville, FL, pers. comm.). The 1997 List of Fisheries (62FR33, January 2, 1997) reported seven minke whale mortalities and serious injuries which have been attributed to the lobster fishery during 1990 to 1994.

The NE Regional Office entanglement/stranding database also contains records of minke whales entangled during 1993 to 1997. The records are currently be audited and summaries should be available in the next assessment report.

Total annual estimated average U.S. fishery-related mortality and serious injury to this minke whale stock in fisheries observed by NMFS during 1992-1996 was 0.8 minke whales (CV = 0), though the total from all fisheries is unknown. After U.S. stranding and entanglement records are audited an updated mortality and serious injury estimate will be made.

CANADA

In Canadian waters, information about minke whale interactions with fishing gear is not well quantified or recorded in most parts of Canada, 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.

Herring Weirs

During 1980 to 1990, 15 of 17 minke whales were released alive from herring weirs in the Bay of Fundy. In 1990, ten minke whales were trapped in the Bay of Fundy weirs, but all were released alive. More recent records of interactions are currently being audited and will be reported in the next assessment. In U.S. and Canadian waters the herring weir fishery occurs from May to September each year along the southwestern shore of the Bay of Fundy, and scattered along the western Nova Scotia and northern Maine coasts. In 1990 there were 180 active weirs in western Bay of Fundy, and 56 active weirs in Maine (Read 1994). It is unknown how many herring weirs currently exist in U.S. and Canadian waters. Due to the formation of a cooperative program between Canadian fishermen and biologists it is expected that in the future more minke whales will be able to be released alive (A. Westgate, pers. comm.).

Other Fisheries

Six minke whales were reported entangled during 1989 in the now non-operational groundfish gillnet fishery in the Newfoundland and Labrador (Read 1994). One of these animals escaped towing gear, the rest 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, where 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 the incidental mortality of minke whales (*Balaenoptera acutorostrata*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CV) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [1]	Observer Coverage [2]	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
New England[3] Multispecies Sink Gillnet	92-96	1993=349	Obs. Data Weighout Trip logbook	.07, .05, .07, .05, .04	0, 0, 0, 0, 0	0, 0, 0, 0, 0	0	0 (0)
Pelagic Drift Gillnet	92-96	1994=12[4] 1995=11 1996=10	Obs. Data Logbook	.40, .42, .87, .99, .64	0^5, 0^5, 0^5, 4^5, 0^5	0^5, 0^5, 0^5,$4.5^{5,6}$, 0^5	0	0.8 (0)
TOTAL								0.8 (0)

[1] Observer data (Obs. Data) are used to estimate by-catch rates, and the data are collected by the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. NEFSC collects Weighout (Weighout) landings data, which are used as a measure of total effort for the sink gillnet fishery. Mandatory trip logbook (Trip logbook) data are used to determine the spatial distribution of some fishing effort in the New England multispecies sink gillnet fishery. Mandatory logbook (Logbook) data are used to measure total effort for the pelagic drift gillnet fishery, and these data are collected at the Southeast Fisheries Science Center (SEFSC).

[2] The observer coverage for the New England multispecies sink gillnet fishery is expressed as percentage of trips, and for the pelagic drift gillnet fishery, the unit of effort is expressed as percentage of sets.

[3] By-catch and fishery related information for this fishery remain in this table, despite no observed mortalities during 1992 to 1996 because there was one uninjured minke whale released from this fishery in 1992 (see Table 3).

[4] 1994-1996 shown, other years not available on an annual basis.

[5] For 1991-1993, pooled by-catch rates were used to estimate by-catch in months that had fishing effort but did not have observer coverage (Northridge 1996). In 1994, 1995, and 1996, observer coverage increased substantially, and by-catch rates were not pooled (Bisack 1997).

[6] One vessel, not observed during 1995, recorded in the SEFSC mandatory logbook 1 set in a 10 day trip. If it is assumed that the vessel fished 1.4 sets per day, as estimated from the 1995 Sea Sampling data, the point estimate increases by 0.42 animals. However, the SEFSC mandatory logbook data were taken at face value, and therefore it was assumed 1 set was fished within this trip; thus the point estimate increases by 0.03 animals.

Table 3. 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
New England multispecies sink gillnet	92-96	0/0, 0, 0, 0, 0	0, 0, 0, 0, 0	1[1], 0, 0, 0, 0
Tuna purse seine	96	0/0	0	1[2]

[1] The whale was wrapped up in the float rope where the rope was wrapped in front of and behind the dorsal fin and around the tail. The rope was cut by a crew member while the whale was in the water. It was believed that the whale was released without any rope around it, because all the rope was hauled in. There was no visible bleeding or tears in the skin.

[2] The minke whale escaped by diving beneath the net.

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.

Minke whales inhabit coastal waters during much of the year and are subject to collision with vessels. According to the NE Regional Office marine mammal entanglement and stranding database, on 7 July 1974, a necropsy suggested a vessel collision; 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 MA. Other reported minke whales that had injuries suggestive of a vessel collision are currently being audited and will be summarized in the next stock assessment report.

STATUS OF STOCK

The status of minke whales, relative to OSP, in the U.S. 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 less than 10% of the calculated PBR and, therefore, can 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.

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