FIN WHALE (*Balaenoptera physalus*):
Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The Scientific Committee of the International Whaling Commission (IWC) has proposed stock boundaries for North Atlantic fin whales. Fin whales off the eastern U.S., north to Nova Scotia and on to the southeast coast of Newfoundland are believed to constitute a single stock under the present IWC scheme (Donovan 1991); however, the stock identity of North Atlantic fin whales has received relatively little attention. Whether the current stock boundaries define biologically isolated units is uncertain, and confirmation or revision awaits input from techniques such as molecular genetics or telemetry. The existence of a subpopulation structure was suggested by local depletions that resulted from commercial over harvesting (Mizroch et al. 1984).

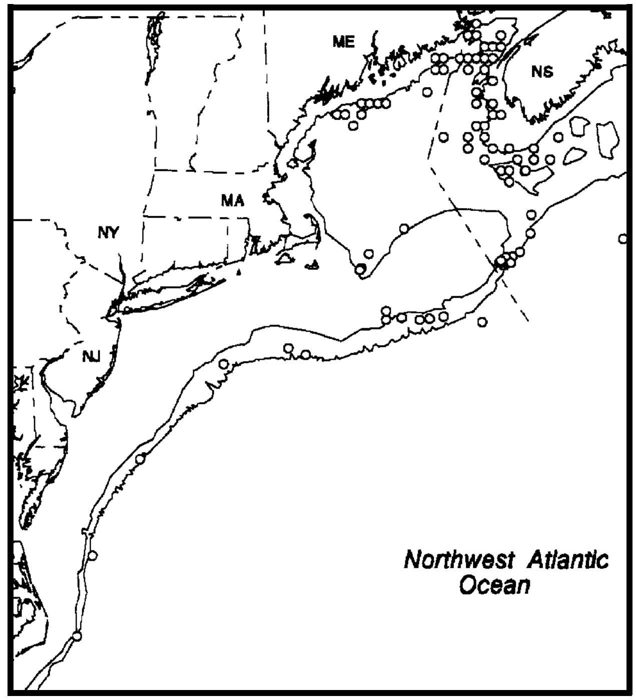

Figure 1. *Distribution of fin whale sightings from NEFSC shipboard surveys during the summer in 1990-1994. Isobaths are at 100 m and 1,000 m.*

Fin whales are common in waters of the U.S. Atlantic Exclusive Economic Zone (EEZ), principally from Cape Hatteras northward (Fig. 1). Fin whales accounted for 46% of the large whales and 24% of all cetaceans sighted over the continental shelf during aerial surveys (CeTAP) between Cape Hatteras and Nova Scotia during 1978-82. While a great deal remains unknown, the magnitude of the ecological role of the fin whale is impressive. In this region fin whales are the dominant cetacean species in all seasons, with the largest standing stock, the largest food requirements, and therefore the largest impact on the ecosystem of any cetacean species (Hain et al. 1992).

There is little doubt that New England waters constitute a major feeding grounds for the fin whale. There is evidence of site fidelity by females, and perhaps some substock separation on the feeding range (Agler et al. 1993). Seipt et al. (1990) reported that 49% of identified fin whales on Massachusetts Bay area feeding grounds were resighted within years, and 45% were sighted between years. While recognizing localized as well as more extensive movements, these authors suggested that fin whales on these grounds exhibited patterns of seasonal occurrence and annual return that are in some respects similar to those shown for humpback whales. Information on life history and vital rates is also available in data from the Canadian fishery, 1965-1971 (Mitchell 1974). In seven years, 3,528 fin whales were taken at three whaling stations. The station at Blandford, Nova Scotia, took 1,402.

Hain et al. (1992), based on an analysis of neonate stranding data, suggested that calving takes place during approximately four months from October-January in latitudes of the U.S. mid-Atlantic region; however, it is unknown where calving, mating, and wintering for most of the population occurs. Preliminary results from the Navy's IUSS program (C. Clark, unpublished data) suggest a deep-ocean component to fin whale distribution. It is likely that fin whales occurring in the U.S. Atlantic EEZ undergo migrations into Canadian waters, open-ocean areas, and perhaps more equatorial regions.

POPULATION SIZE

A population estimate based on an inverse variance weighted pooling of CeTAP (1982) spring and summer data is 4,680 fin whales [coefficient of variation (CV) = 0.23] and includes a dive-time correction factor of 4.85. An average for these two seasons was chosen because the greatest proportion of the population off the northeast U.S. coast appears to be in the CeTAP study area in these seasons. However, this estimate is highly uncertain because the data are a decade old, and values were estimated just after cessation of extensive foreign fishing operations in the region.

More recent abundance estimates, based on aerial surveys in August-October 1991, a shipboard survey during June-July 1991, and shipboard surveys conducted during the summer in 1991 and 1992, are available. In each case, the estimates are for a portion of the northeastern U.S. Atlantic EEZ during one or two seasons.

An aerial survey in the CeTAP study area, which included an interplatform experiment between a Twin Otter and an AT-11, was conducted from August-October 1991. The survey repeated many of the CeTAP-defined survey blocks and added several continental slope survey blocks; however, due to weather and logistical constraints, several survey blocks south and east of Georges Bank were not surveyed. The data were analyzed using DISTANCE (Buckland et al. 1993; Laake et al. 1993) and confidence intervals were calculated using the bootstrap log-normal method. The resulting abundance estimates were 529 fin whales (CV = 0.19) and 194 fin whales (CV = 0.18), respectively, for the AT-11 and Twin Otter. Data were not pooled because the interplatform calibration analysis has not been conducted. These estimates are not comparable to the CeTAP estimates, because the 1991 data are from a single survey, August-October and the CeTAP estimates were based on data pooled over several years of seasonal surveys.

The abundance estimate from the June-July 1991 shipboard survey along the southern and northeast margin of Georges Bank, approximately between the 200 and 2,000 m isobaths, was 35 fin whales (CV = 0.56).

For the summer 1991-92 shipboard surveys, a weighted-average abundance for the northern Gulf of Maine-lower Bay of Fundy region is 2,700 fin whales (CV = 0.59), where each annual estimate is weighted by the inverse of its variance (NMFS unpublished data). The data used were obtained from two shipboard line transect sighting surveys designed to estimate abundance of harbor porpoises (Palka, in press). Two independent teams of observers on the same ship surveyed using the naked eye in non-closing mode. The abundance estimate includes an estimate of g(0), probability of detection, for both teams combined, of 0.52 (CV = 0.19). [Using each team's data separately produces a g(0) value of 0.32 (CV = 0.26)]. The g(0)-corrected abundance estimate was calculated using the product interval analytical method (Palka, in press). Variability was estimated using bootstrap resampling techniques. Several qualifications are appropriate. First, the study area was stratified by water depth and expected density of harbor porpoises. This stratification scheme could cause uncertainties in a fin whale abundance estimate because offshore waters in the central northern Gulf of Maine, which may be part of the fin whale habitat but not part of the harbor porpoise habitat, were surveyed at a low intensity. To produce the fin whale abundance estimate, it was assumed that observed densities of fin whales in the surveyed offshore waters were similar to densities in the unsurveyed offshore waters. This is not unreasonable. Second, this estimate has not explicitly accounted for dive times and ship avoidance; both factors are expected to influence the abundance estimate for this species.

Minimum Population Estimate

The minimum population estimate is based on the 1991-92 shipboard survey abundance estimate of 2,700 whales (CV = 0.59) (NMFS unpublished data). The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate, which is equivalent to the 20th percentile of the log-normal distribution as specified by NMFS (Anon. 1994), and was 1,704 fin whales.

Current Population Trend

There are insufficient data to determine the population trends for this species. Even at a conservatively estimated rate of increase, however, the numbers of fin whales may have increased substantially in recent years (Hain et al. 1992).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for this stock. The maximum net productivity rate was assumed to be 0.04 for purposes of this assessment. This value is based on theoretical calculations showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Anon. 1994). Based on photographically identified fin whales, Agler et al. (1993) estimated that the gross annual reproduction rate was at 8%, with a mean calving interval of 2.7 years.

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal (PBR) was specified as the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) (Anon. 1994). The recovery factor was set at 0.10 because the fin whale is listed as endangered under the Endangered Species Act (ESA). PBR for this stock is 3.4 whales.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The number of fin whales taken at three whaling stations in Canada from 1965-71 totaled 3,528 whales (Mitchell 1974). Reports of non-directed takes of fin whales are fewer over the last two decades than for other endangered large whales such as right and humpback whales.

There was no reported fishery-related mortality or serious injury to fin whales in fisheries observed by NMFS during 1989-1993. The total fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and can be considered insignificant and approaching zero mortality and serious injury rate. This determination cannot be made for specific fisheries until the implementing regulations for Section 118 of the MMPA have been reviewed by the public and finalized.

Fishery Information

No fishery-related mortality or serious injury of fin whales was reported in the Sea Sampling by-catch database; therefore, no detailed fishery information is presented here.

Fin whales were reported as entangled on nine occasions in an entanglement database maintained by NMFS NE Regional Office including records from 1975-1992. Two of the nine were dead and the fate of others is unknown. Five of the entanglement records were of whales entangled in or trailing line of an unspecified source and three records were of entanglement with lobster-pot gear and line.

Because of the large role of fin whales in their ecosystem (Hain et al. 1992), there is likely a link between the abundance of fin whales and the fishery resources. Foreign fishing activities in the 1960s and 70s may have been more important ecologically to the fin whale, as compared to direct interactions, since these activities over-exploited several fish stocks (i.e., herring, mackerel, etc.) that are known fin whale prey. On the other hand, Sissenwine et al. (1984) speculated that fin whales contributed to the demise of the already overfished Georges Bank herring stock in the mid- and late 1970s.

Ship Strikes

There are nine records of ship collisions, boat strikes, and propeller scars between 1980-1994 in the Smithsonian Institution's Marine Mammal database. This is a small number of individuals relative to the size of the population.

STATUS OF STOCK

The status of this stock relative to OSP is unknown, but the species is listed as endangered under the ESA. There are insufficient data to determine the population trends for fin whales. The total level of human-caused mortality and serious injury is unknown, but it is believed to be insignificant. Any fishery-related mortality would be illegal because there is no recovery plan currently in place. This is a strategic stock because the fin whale is listed as an endangered species under the ESA.

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