WHITE-SIDED DOLPHIN (*Lagenorhynchus acutus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

White-sided dolphins are found in temperate and sub-polar waters of the North Atlantic, primarily on continental shelf waters to the 100 m depth contour. The species occurs from central west Greenland to the Chesapeake Bay (about 37°N) and perhaps as far east as 55° W (Evans 1987). There is no information concerning stock structure within this range.

White-sided dolphins are most common in continental shelf waters from Hudson Canyon (approximately 39°N) north through Georges Bank, in the Gulf of Maine to the lower Bay of Fundy. Low numbers of white-sided dolphins occur from Chesapeake Bay to Jeffreys Ledge (off New Hampshire) during winter and early spring (January to April). From May through June, large aggregations are found from Georges Bank to the southwest Gulf of Maine, while some animals have been seen from the southern Grand Banks, along Newfoundland and into the Labrador Sea. From July to December, the distribution of sightings extends from Georges Bank to the lower Bay of Fundy (Payne and Heinemann 1990) and along Nova Scotia all the way along the coasts to the Labrador Sea and west Greenland (Gaskin 1992).

Before the 1960's, white-sided dolphins in U.S. waters were usually found offshore on the continental slope. There has been an apparent increase in the number of white-sided dolphins seen on the continental shelf from the 1960's to the present. This shift may be due to an increase in sand lance in continental shelf waters of the Gulf of Maine (Katona et al. 1993). With declining sand lance abundance (NMFS unpublished data), occurrence of white-sided dolphins in continental shelf waters may similarly decrease.

POPULATION SIZE

The total number of white-sided dolphins along the eastern U.S. and Canadian Atlantic coast is unknown, although two estimates from select regions do exist. Seasonal abundance estimates are available from an aerial survey line transect program conducted in continental shelf and continental shelf edge waters between Cape Hatteras, North Carolina, and Nova Scotia from 1978 to 1982 (CeTAP 1982), just after the cessation of extensive foreign fishing operations in this region. A population estimate based on an inverse variance weighted pooling of CeTAP spring, summer, and autumn data is 28,600 [coefficient of variation (CV) = 0.21]. An average for these three seasons was chosen because the greatest proportion of the population off the northeast U.S. coast appears to be in the CeTAP study area during these seasons. This estimate was not corrected for g(0), the probability of detecting an animal group on the trackline.

Shipboard line transect surveys in 1991, 1992, and 1993 have provided more recent abundance estimates and white-sided dolphin sightings during these surveys are shown in Figure 1. A weighted-average abundance for the northern Gulf of Maine/lower Bay of Fundy region during the summers of 1991 and 1992 is 20,400 (CV = 0.63), where each annual estimate is weighted by the inverse of its variance (NMFS unpublished data). Two independent teams on the same ship surveyed using the naked eye in non-closing mode. This estimate includes an

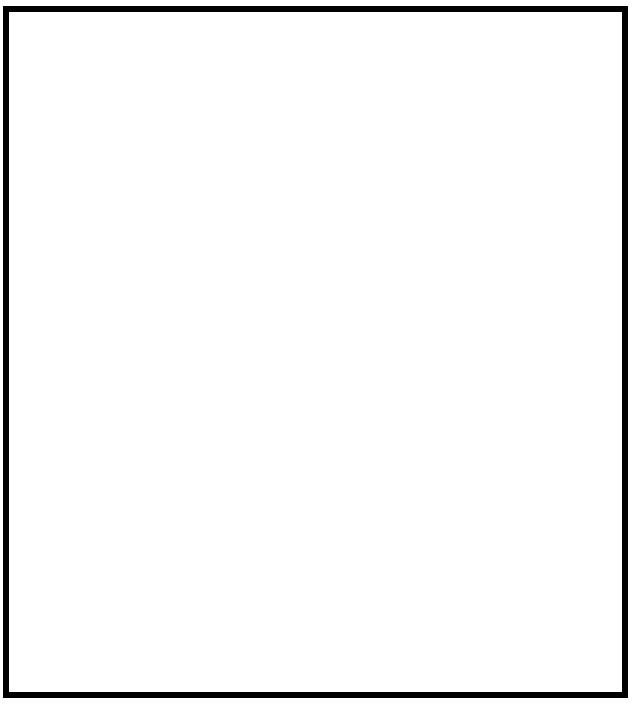

Figure 1. *Distribution of white-sided dolphin sightings from NEFSC shipboard surveys during the summer in 1990-1994. Isobaths are at 100 m and 1,000 m.*

estimate of g(0) for both teams of 0.62 (CV = 0.90). (The average g(0) for each team separately is 0.35 (CV = 0.46)). In addition, the estimate takes in account of size bias (bias caused by large groups of dolphins being detected with higher probability than small groups). The g(0)-corrected abundance estimate was calculated using the product interval analytical method (Palka, in press) with size-biased corrected estimates of density for the two separate teams. The size-biased density estimates were derived using the computer program DISTANCE version 2.0 (Buckland et al. 1993; Laake et al. 1993). The variance was estimated by bootstrapping the size-biased team density estimates.

The data used were obtained from two shipboard line transect sighting surveys designed to estimate abundance of harbor porpoises (Palka, in press). The study area was stratified by water depth and expected density of harbor porpoises. This stratification scheme could cause uncertainties in a white-sided dolphin abundance estimate because white-sided dolphin habitat in the north-central Gulf of Maine was surveyed at a low intensity. White-sided dolphin abundance was estimated under the reasonable assumption that observed densities of white-sided dolphins in the surveyed offshore waters were similar to densities in the unsurveyed offshore waters.

An abundance estimate was also derived using data collected during a June-July 1993 fine-scale ship survey conducted principally between the 200 and 2,000 m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southwestern edge of the Scotian Shelf (NMFS unpublished data). The survey was conducted by one team searching through high-powered binoculars. The data were analyzed using DISTANCE (Buckland et al. 1993; Laake et al. 1993), where the confidence was estimated using the bootstrap log normal method, and group-size bias was considered. The abundance estimate for white-sided dolphins in this limited portion of their range was 729 (CV = 0.47).

There are no published abundance estimates for this species in Canadian waters which lie farther north or east of the above surveys (Gaskin 1992).

Minimum Population Estimate

The minimum population estimate was based on the 1991-92 shipboard survey abundance estimate of 20,400 white-sided dolphins (CV = 0.63) (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 12,538 white-sided dolphins.

Current Population Trend

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

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for this stock. Some of the life history parameters which have been estimated include: calving interval is 2-3 years; lactation period is 18 months; gestation period is 10-12 months and births occur from May to early August, mainly in June and July. Length at birth is 110 cm, length at sexual maturity is 230-240 cm for males, and 201-222 cm for females, age at sexual maturity is 8-9 years for males and 6-8 years for females, and the mean adult length is 250 cm for males and 224 cm for females (Evans 1987). Maximum reported age for males is 22 years and for females, 27 years (Sergeant et al. 1980).

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 generally grow at rates much greater than 4% given the constraints of their reproductive life history (Reilly and Barlow 1986).

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 0.50 because of the stock's status relative to its OSP level is unknown. PBR for this stock is 125 white-sided dolphins.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Incidental takes of white-sided dolphins have been recorded in the Gulf of Maine and Bay of Fundy groundfish gillnet fisheries (Gilbert and Wynne 1987; Gaskin 1992). In the mid 1980's, during a University of Maine study,

gillnet fishermen retained six carcasses for biological studies. NMFS foreign fishery observers have reported 44 takes of Atlantic white-sided dolphins incidental to fishing activities in the continental shelf and continental slope waters between March 1977 and December 1991 (Waring et al. 1990; NMFS unpublished data). Of these animals, 96% were taken in the Atlantic mackerel fishery. This total includes nine documented takes by U.S. vessels involved in joint-venture fishing operations in which U.S. captains transfer their catches to foreign processing vessels. Recently, white-sided dolphins have been caught in the pelagic drift gillnet fishery, and the New England trawl and sink gillnet fisheries. No mortalities were documented in the Atlantic swordfish/tuna/shark longline and Atlantic swordfish/tuna/shark pair trawl fisheries.

There is little information available which quantifies fishery interactions involving white-sided dolphins in Canadian waters. Two white-sided dolphins were reported caught in groundfish gillnets set in the Bay of Fundy during 1985 to 1989, and nine were taken in West Greenland between 1964 and 1966 in salmon drift nets (Gaskin 1992). Several (number not specified) were also taken in Newfoundland and Labrador groundfish gillnets in the 1960's. A few were taken in an experimental drift gillnet fishery for salmon off West Greenland which took place from 1965 to 1982 (Read 1994). More recent information on Canadian white-sided dolphin takes were not available.

Estimated average annual fishery-related mortality and serious injury to the western North Atlantic white-sided dolphin stock during 1989-1993 was 127 dolphins (CV = 0.52). 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 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.

Fisheries Information

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 (MFCMA) in that year, an observer program was established which has recorded fishery data and information of incidental by-catch of marine mammals. DWF effort in the U.S. Atlantic Exclusive Economic Zone (EEZ) under MFCMA has been directed primarily towards Atlantic mackerel and squid. From 1977 through 1982, an average of 120 different foreign vessels per year (range 102-161) operated within the Atlantic coast EEZ. 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 1991, the numbers of foreign vessels operating within the Atlantic coast EEZ each year were 67, 52, 62, 33, 27, 26, 14, 13, and 9, respectively. Between 1983 and 1988, the numbers of DWF vessels included 3, 5, 7, 6, 8, and 8, respectively, Japanese longline vessels. Observer coverage on DWF vessels was 25-35% during 1977-82, and increased to 58%, 86%, 95%, and 98%, respectively, in 1983-86; 100% observer coverage was maintained during 1987-91. Foreign fishing operations for squid ceased at the end of the 1986 fishing season and for mackerel at the end of the 1991 season.

The estimated total number of hauls in the Atlantic large 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, and 1993 were 233, 243, and 232 respectively. Fifty-nine different vessels participated in this fishery at one time or another between 1989 and 1993. Observer coverage, expressed as percent of sets observed, ranged from 8% in 1989, 6% in 1990, 20% in 1991, to 40% in 1992, and 42% in 1993. 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, were obtained using the aggregated (pooled 1989-1993) catch rates, by strata (Northridge, in review). Estimated annual fishery-related mortality and serious injury (CV in parentheses) was 4.4 in 1989 (1.80), 6.8 in 1990 (1.50), 0.9 in 1991 (2.00), 0.8 in 1992 (1.30), and 2.7 in 1993 (0.32); estimated average annual mortality and serious injury during related to this fishery during 1989-1993 was 3.1 white-sided dolphins (1.88).

Vessels in the New England groundfish multispecies trawl fishery, a Category III fishery under the MMPA, were observed in order to meet fishery management needs, rather than marine mammal management needs. An average of 970 (CV = 0.04) vessels (full and part time) participated annually in the fishery during 1989-1993. The fishery is active in New England in all seasons. One mortality was documented between 1989 and 1993. The

estimated fishery-related mortality in 1992 was 110 (CV = 1.00) and average annual estimate fishery-related mortality during 1989-1993 was 22 white-sided dolphins (CV = 2.24).

The mid-Atlantic mackerel and squid trawl fisheries were combined into the Atlantic mid-water trawl fishery in the revised proposed list of fisheries in 1995. The fishery occurs along the U.S. mid-Atlantic continental shelf region between New Brunswick, Canada, and Cape Hatteras year around. The mackerel trawl fishery was classified as a Category II fishery since 1990 and the squid fishery was originally classified as a Category II fishery in 1990, but was reclassified as a Category III fishery in 1992. The combined fishery has been proposed for classification as a Category II fishery. One fishery-related mortality of a white-sided dolphin was reported in logbook reports from the mackerel trawl fishery between 1990-1992.

There are approximately 349 vessels (full and part time) in the New England multispecies sink gillnet fishery (Walden, in review). Observer coverage in trips has been 1%, 6%, 7.5%, and 5% for years 1990 to 1993. The fishery has been observed in the Gulf of Maine and in Southern New England. There have been 73 mortalities observed in this fishery between 1990 and 1993. One animal was released alive and not injured. Estimated annual fishery-related mortalities (CV in parentheses) were 49 in 1991 (0.46), 154 in 1992 (0.35), and 205 in 1993 (0.31); average annual estimated fishery-related mortality during 1991-1993 was 102 white-sided dolphins (0.42). In January to March, the by-catch occurred in Massachusetts Bay, south of Cape Ann and west of Stellwagen Bank. From April to June, by-catch locations became more dispersed, from Casco Bay to Cape Ann, along the 30 fathom contour out to Jeffreys Ledge, with one take location near Cultivator Shoal and one in southern New England near Block Island. In July through September, incidental takes occurred from Frenchman's Bay to Massachusetts Bay. In inshore waters, the takes were aggregated while offshore takes were more dispersed. In October through December, takes were confined from Cape Elizabeth out to Jeffreys Ledge and south to Nantucket Sound.

Other Mortality

Polychlorinated biphenyls (PCBs) and DDT, which have been found in moderate levels in the blubber (Gaskin 1985) are potential sources of human-caused mortality; however, the effect of the observed levels of pollutants is not known.

Mass strandings involving up to a hundred or more animals at one time are common for this species. From 1968 to 1993, 348 Atlantic white-sided dolphins are known to have stranded on the New England coast (Hain and Waring, in preparation). The causes of these strandings are not known. Because such strandings have been known since antiquity, it could be presumed that recent strandings are a normal condition (Gaskin 1992). It is unknown whether human causes, such as fishery interactions and pollution, have increased the number of strandings. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals which die or are seriously injured may wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

STATUS OF STOCK

The status of white-sided dolphins relative to OSP in the U.S. Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. In Canada, the Cetacean Protection Regulations of 1982, promulgated under the Standing Fisheries Act, prohibit the catching or harassment of all cetacean species. There are insufficient data to determine the population trends for this species. This is a strategic stock because average annual fishery-related mortality exceeds PBR.

REFERENCES

Anon. 1994. Report of the PBR (Potential Biological Removal) workshop. June 27-29, 1994. NOAA, NMFS Southwest Fisheries Science Center, La Jolla, California, 13 pp. + Appendices.

Buckland, S. T., D. R. Anderson, K. P. Burnham, and J. L. Laake. 1993. Distance Sampling: Estimating abundance of biological populations. Chapman & Hall, New York, 446 pp.

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.

Evans, P. G. H. 1987. The natural history of whales and dolphins. Facts on File Publications, New York, 343 pp.
Gaskin, D. E. 1985. The ecology of whales and dolphins. Heinemann Educational Books: London. 459 pp.
Gaskin, D. E. 1992. Status of Atlantic white-sided dolphin, *Lagenorhynchus acutus*, in Canada. Can. Fld. Nat. 106: 64-72.
Gilbert, J. R. and K. M. Wynne. 1987. Marine mammal interactions with New England gillnet fisheries. Final Report, Contract No. NA-84-EAC-00070, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, Massachusetts, 12 pp.
Hain, J. H. W. and G. T. Waring. In preparation. Marine mammals in New England shelf waters. *In* R. W. Langton and J. B. Pearce (editors), Selected living resources, habitat conditions, and human perturbations of the Gulf of Maine: Environmental and ecological considerations for fishery managements. NOAA Tech. Mem., Northeast Fisheries Science Center, Woods Hole, Massachusetts.
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, DC, 316 pp.
Laake, J. L., S. T. Buckland, D. R. Anderson, and K. P. Burnham. DISTANCE user's guide, V2.0. Colorado Cooperative Fish & Wildlife Research Unit, Colorado State University, Ft. Collins, Colorado, 72 pp.
Palka, D. In press. Abundance estimate of the Gulf of Maine harbor porpoise. Rep. Int. Whal. Commn. Special Issue 16.
Payne, M. and D. W. Heinemann. 1990. A distributional assessment of cetaceans in the shelf and shelf edge waters of the northeastern United States based on aerial and shipboard surveys, 1978-1988. Report to National Marine Fisheries Science Center, Woods Hole, Massachusetts.
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.
Reilly, S. B. and J. Barlow. 1986. Rates of increase in dolphin population size. Fish. Bull., U.S. 84(3): 527-533.
Sergeant, D. E., D. J. St. Aubin, and J. R. Geraci. 1980. Life history and northwest Atlantic status of the Atlantic white-sided dolphin, *Lagenorhynchus acutus*. Cetology No. 37: 1-12.
Walden, J. In review. Results of the Gulf of Maine gillnet survey 1989-92. NOAA, NMFS, NEFSC [Northeast Fisheries Science Center] Ref. Doc., Woods Hole, Massachusetts.
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.