

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 inhabits waters from central west Greenland to North Carolina (about 35° N) and perhaps as far east as 43° W (Evans 1987). Distribution of sightings, strandings and incidental takes suggest the possible existence of three stocks units: a Gulf of Maine, a Gulf of St. Lawrence and a Labrador Sea stock (Palka *et al.* 1997). A genetic study is currently being conducted to test this proposed population structure and should be available during 2002. Evidence for a separation between the well documented unit in the southern Gulf of Maine and a Gulf of St. Lawrence population comes from a hiatus of summer sightings along the Atlantic side of Nova Scotia. This has been reported in Gaskin (1992), is evident in Smithsonian stranding records, and was seen during abundance surveys conducted in summers 1995 and 1999 that covered waters from Virginia to the entrance of the Gulf of St. Lawrence. White-sided dolphins were seen frequently in eastern Gulf of Maine waters and in waters at the mouth of the Gulf of St. Lawrence, but only a few sightings were recorded in the waters between these two regions.

The Gulf of Maine stock of white-sided dolphins is most common in continental shelf waters from Hudson Canyon (approximately 39°N) north through Georges Bank, and in the Gulf of Maine to the lower Bay of Fundy. Sightings data indicate seasonal shifts in distribution (Northridge *et al.* 1997). During January to April, low numbers of white-sided dolphins are found from Georges Bank to Jeffreys Ledge (off New Hampshire), and even lower numbers are south of Georges Bank, as documented by a few strandings collected on beaches of Virginia and North Carolina. From June through September, large numbers of white-sided dolphins are found from Georges Bank to lower Bay of Fundy. From October to December, white-sided dolphins occur at intermediate densities from southern Georges Bank to southern Gulf of Maine (Payne and Heinemann 1990). Sightings south of Georges Bank, in particular, around Hudson Canyon have been seen at all times of the year but at low densities. The Virginia and North Carolina observations appear to represent the southern extent of the species range.

Prior to the 1970's, white-sided dolphins in USA waters were found primarily offshore on the continental slope, while white-beaked dolphins (*L. albirostris*) were found on the continental shelf. During the 1970's, there was an apparent switch in habitat use between these two species. This shift may have been a result of the increase in sand lance in the continental shelf waters (Katona *et al.* 1993; Kenney *et al.* 1996).

POPULATION SIZE

The total number of white-sided dolphins along the eastern USA and Canadian Atlantic coast is unknown, although five estimates from select regions are available: 1) from spring, summer and autumn 1978-82; 2) July-September 1991-92; 3) June-July 1993; 4) July-September 1995 (Figure 1); and 5) July-August 1999 (Table 1). An abundance of 28,600 white-sided dolphins (CV=0.21) 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).

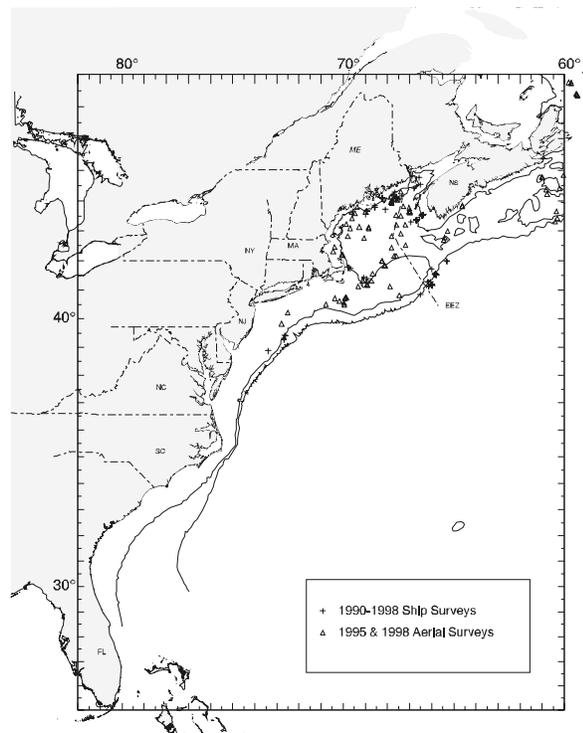


Figure 1. Distribution of white-sided dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1990-1998. Isobaths are at 100 m and 1,000 m.

An abundance of 20,400 (CV=0.63) white-sided dolphins 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; Palka *et al.* 1997). 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.

An abundance of 729 (CV= 0.47) white-sided dolphins 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 (Table 1; Anon. 1993).

An abundance of 27,200 (CV=0.43) white-sided dolphins 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 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 contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom contour line. Data collection and analysis methods used were described in Palka (1996).

An abundance of 51,640 (CV=0.38) white-sided dolphins was estimated from a 28 July to 31 August 1999 line-transect sighting survey conducted from a ship and an airplane covering waters from Georges Bank to the mouth of the Gulf of St. Lawrence (Table 1; Figure 1; D. Palka, pers. comm.). Total track line length was 8,212 km. Similar to that used in the above 1995 survey, shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and $g(0)$, the probability of detecting a group on the track line. Aerial data were not corrected for $g(0)$ (Palka 2000). The 1999 estimate is larger than the 1995 estimate due to, at least in part, the fact that the 1999 survey covered the upper Bay of Fundy and the northern edge of Georges Bank for the first time and white-sided dolphins were seen.

Kingsley and Reeves (1998) estimated there were 11,740 (CV=0.47) white-sided dolphins in the Gulf of St. Lawrence during 1995, and 560 (CV=0.89) white-sided dolphins in the northern Gulf of St. Lawrence during 1996 (Table 1). It is assumed these estimates apply to the Gulf of St. Lawrence stock. During the 1995 survey, 8,427 km of track lines were flown in an area of 221,949 km² during August and September. During the 1996 survey, 3,993 km of track lines were flown in an area of 94,665 km² 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 best available current abundance estimate for white-sided dolphins in the Gulf of Maine stock is 51,640 (CV=0.38) as estimated from the July to August 1999 line transect survey because this survey is recent and provided the most complete coverage of the known habitat.

Table 1. Summary of abundance estimates for western North Atlantic white-sided dolphins. 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
Gulf of Maine stock			
Jul-Sep 1991-92	No. Gulf of Maine and lower Bay of Fundy	20,400	0.63
Jun-Jul 1993	Georges Bank to Scotian shelf, shelf edge only	729	0.47
Jul-Sep 1995	Virginia to mouth of Gulf of St. Lawrence	27,200	0.43
Jul-Aug 1999	Georges Bank to mouth of Gulf of St. Lawrence	51,640	0.38
Gulf of St. Lawrence stock			
Aug-Sep 1995	entire Gulf of St. Lawrence	11,740	0.47
July-Aug 1996	northern Gulf of St. Lawrence	560	0.89

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the Gulf of Maine stock of white-sided dolphins is 51,640 (CV=0.38). The minimum population estimate for these white-sided dolphins is 37,904 (CV=0.38).

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: 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; mean adult length is 250 cm for males and 224 cm for females (Evans 1987); and maximum reported age for males is 22 years and for females, 27 years (Sergeant *et al.* 1980).

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 37,904 (CV=0.38). 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 0.48 because this stock is of unknown status and the CV of the mortality estimate is between 0.3 and 0.6. PBR for the Gulf of Maine stock of the western North Atlantic white-sided dolphin is 364.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Recently, within USA waters, white-sided dolphins have been observed caught in the Northeast sink gillnet, mid-Atlantic coastal gillnet, pelagic drift gillnet, North Atlantic bottom trawl, and Atlantic squid, mackerel, butterfish trawl fisheries (Table 2). Estimated average annual fishery-related mortality and serious injury to the Gulf of Maine stock of the western North Atlantic white-sided dolphin from these USA fisheries during 1996-2000 was 118 (CV=0.48) dolphins per year.

EARLIER INTERACTIONS

In the past, incidental takes of white-sided dolphins have been recorded in the Atlantic foreign mackerel fishery and pelagic drift gillnet fishery. In the mid 1980's, during a University of Maine study, gillnet fishermen reported 6 takes of white-sided dolphins of which 2 carcasses were necropsied for biological studies (Gilbert and Wynne 1987; Gaskin 1992).

Atlantic foreign mackerel

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 9 documented takes by USA vessels involved in joint-venture fishing operations in which USA captains transfer their catches to foreign processing vessels. Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the USA. With implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA) in that year, an observer program was established which recorded fishery data and information of incidental bycatch of marine mammals. DWF effort in the USA Atlantic Exclusive Economic Zone (EEZ) under MFCMA had 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 US Atlantic EEZ. 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 1991, the numbers of foreign vessels operating within the US Atlantic 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%, 98%, respectively, in 1983-86 and 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.

Pelagic Drift Gillnet

In 1996 and 1997, NMFS issued management regulations which prohibited the operation of this fishery in 1997. The fishery operated 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). During 1991 to 2001, 2 white-sided dolphins were observed taken in the Atlantic pelagic drift gillnet fishery, both in 1993. In 1986, NMFS established a mandatory self-reported fisheries information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). 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 11, 12, 10, 0, and 11 vessels, respectively, in the fishery. 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, 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, suggest that the drift gillnet fishery is 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 were estimated for each year separately by summing the observed caught with the product of the average bycatch per haul and the number of unobserved hauls as recorded in logbooks. Variances were estimated using bootstrap re-sampling techniques (Bisack 1997b). Estimated annual fishery-related mortality and serious injury (CV in parentheses) was 4.4 (.71) in 1989, 6.8 (.71) in 1990, 0.9 (.71) in 1991, 0.8 (.71) in 1992, 2.7 (0.17) in 1993, and 0 in 1994 to 1998. There was no fishery during 1997.

North Atlantic Bottom Trawl

Because there have been no observed takes of white-sided dolphins in this fishery since 1995, this section was moved to the "Earlier Interactions" section. Three mortalities were documented between 1991 and 2000 in the North Atlantic bottom trawl fishery; one during 1992 and two during 1994. The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989, and since that year this fishery has been covered by the program, though at a low level. The observer coverage was 0.4% in 1994, 1.1% in 1995, 0.2% in 1996, 0.2% in 1997, 0.1% in 1998, 0.3% in 1999, and 0.4% in 2000. Vessels in the North Atlantic bottom 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 waters in all seasons. The 1 white-sided dolphin taken in 1992 was taken in a haul that was composed of 43% cod, 20% silver hake, and 17% pollock. One of the 1994 takes was in a haul that was composed of 42% white hake, 19% pollock, and 16% monkfish. The other 1994 take was in a haul that kept seven species of which none were dominant. The estimated fishery-related mortality in 1992 was 110 (CV=0.97), in 1994 it was 182 (CV=0.71), and it was 0 in other years (Bisack 1997b). The average annual estimate fishery-related mortality during 1996-2000 was 0 white-sided dolphins.

USA

Northeast Sink Gillnet

Between 1990 and 2000 there were 45 mortalities observed in the Northeast sink gillnet fishery (Table 2). The Northeast Fisheries Science Center (NEFSC) Sea Sampling Observer Program was initiated in 1989, and since that year this fishery has been covered by the program. In 1993 there were approximately 349 vessels (full and part

time) in the Northeast sink gillnet fishery (Walden 1996). During 1998, it was estimated there were 301 full and part-time vessels participating in this fishery. This is the number of unique vessels in the commercial landings database (Weighout) that reported catch from this fishery during 1998 from the states of Rhode Island and north. This does not include a small percentage of records where the vessel number was missing. Observer coverage, expressed as a percentage of the number of trips, has been 1%, 6%, 7%, 5%, 7%, 5%, 4%, 6%, 5%, 6%, and 6% for years 1990 to 2000, respectively. Most white-sided dolphins have been taken in waters south of Cape Ann during April to December. In recent years, the majority of the takes have been east and south of Cape Cod. Estimated annual fishery-related mortalities (CV in parentheses) were 49 (0.46) in 1991, 154 (0.35) in 1992, 205 (0.31) in 1993, 240 (0.51) in 1994, 80 (1.16) in 1995, 114 (0.61) in 1996 (Bisack 1997a), 140 (0.61) in 1997, 34 (0.92) in 1998, 69 (0.70) in 1999, and 26 (1.00) in 2000. Average annual estimated fishery-related mortality during 1996-2000 was 77 white-sided dolphins per year (0.33) (Table 2).

Mid-Atlantic Coastal Gillnet

One white-sided dolphin was observed taken in this fishery during 1997 (Table 2). None were taken in observed trips during 1993 to 1996, and none during 1998 to 2000. In July 1993, an observer program was initiated in the USA mid-Atlantic coastal gillnet fishery by the NEFSC Sea Sampling 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 the vessels operate right off the beach with some using drift nets, and others using sink nets attached to the bottom. 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 this fishery 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%, and 2% for 1995 to 2000, respectively (Table 2). Observed fishing effort was from New York to North Carolina, from the beach to 50 miles off the beach. Bycatch estimates were determined using methods similar to that used for bycatch estimates in the Northeast gillnet fishery (Bravington and Bisack 1996; Bisack 1997a). Using the observed takes of white-sided dolphins, the estimated annual mortality (CV in parentheses) attributed to this fishery was 0 for 1993 to 1996, and 1998 to 2000, and 45 (0.82) for 1997. However, because the spatial-temporal distribution of observer coverage did not cover all types of gillnet fisheries in the mid-Atlantic region during all times of the year, it is likely that these figures are under-estimates. Average estimated white-sided dolphin mortality and serious injury from the mid-Atlantic coastal gillnet fishery during 1996 to 2000 was 9 (CV=0.82) (Table 2).

Squid, Mackerel, Butterfish Trawl

One white-sided dolphin was observed taken in the mackerel sub-fishery during 1997 (Table 2). The squid, mackerel, butterfish trawl fishery, though managed under one fishery management plan by the mid-Atlantic Fisheries Management Council, is actually three independent fisheries operating in different areas during different times of the year (NMFS 1998). The *Loligo* squid sub-fishery is mostly in southern New England, New York and mid-Atlantic waters, where fishing patterns reflect the seasonal migration of the *Loligo* (offshore during October to March and inshore during April to September). The *Illex* squid sub-fishery is primarily on the continental slope during June to September. The mackerel sub-fishery during January to May is primarily in the southern New England and mid-Atlantic waters, while during May to December, it is primarily in the Gulf of Maine. Butterfish is primarily a bycatch of the squid and mackerel sub-fisheries. Butterfish migrate north and inshore during the summer, and south and offshore during the winter. In 1995, the squid, mackerel, butterfish trawl fishery was classified as a Category II fishery. Observer coverage was very low. Expressed as percentage of trips observed, it was 0.7% in 1996, 0.8% in 1997, 0.3% in 1998, 0.4% in 1999, and 0.7% in 2000. The bycatch, stratified by sub-fishery, season and geographical area, was estimated using the ratio estimator method, as was documented in Bisack (1997b). The estimated fishery-related mortality was 0 in 1996, 161 (CV=1.58) in 1997, and 0 in 1998 to 2000. The average annual estimated fishery-related mortality during 1996 to 2000 was 32 (CV=1.58) (Table 2).

Table 2. Summary of the incidental mortality of white-sided dolphins (*Lagenorhynchus acutus*) 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 CVs) 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
Northeast Sink Gillnet	96-00	1993=349 1998=301	Obs. Data Weighout Trip Logbook	.04, .06, .05, .06, .06	2 ³ , 4 ³ , 1 ³ , 4 ³ , 1 ³	114 ³ , 140 ³ , 34 ³ , 69 ³ , 26 ³	.61, .61, .92, .70, 1.00	77 (0.33)
mid-Atlantic Coastal Gillnet	96-00	1998=302 ⁶	Obs. Data Weighout	.04, .03, .05, .02, .02	0, 1, 0, 0, 0	0, 45, 0, 0, 0	0, .82, 0, 0, 0	9 (0.82)
Squid, Mackerel, Butterfish Trawl	96-00	Unk ⁵	Obs. Data Weighout	.007, .008, .003, .004, .007	0, 1 ⁴ , 0, 0, 0	0, 161 ⁴ , 0, 0, 0	0, 1.58 ⁴ , 0, 0, 0	32 (1.58)
Total								118 (.48)

¹ Observer data (Obs. Data), used to measure bycatch rates, are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. NEFSC collects landings data (Weighout) which is used as a measure of total effort. Mandatory trip logbook (VTR) (Trip Logbook) data are used to determine the spatial distribution of fishing effort in the sink gillnet fishery.

² Observer coverage for the Northeast sink gillnet and both trawl fisheries are measured in trips and the mid-Atlantic coastal gillnet fishery is measured in tons of fish landed.

³ White-sided dolphins taken before 1997 in observed pinger trips were added directly to the estimated total bycatch for that year. After 1998, a weighted bycatch rate was applied to effort from both pingered and non-pingered hauls within the stratum where white-sided dolphins were observed taken. During the years 1997 and 1999, respectively, there were 2 and 1 observed white-sided dolphins taken on pingered trips. No takes were observed on pinger trips during 1995, 1996, 1998, and 2000.

⁴ The observed take was in the mackerel sub-fishery.

⁵ Number of vessels is unknown.

⁶ Number of sink gillnet vessels, undetermined number of drift gillnet vessels.

CANADA

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 gillnet sets in the Bay of Fundy during 1985 to 1989, and 9 were reported taken in West Greenland between 1964 and 1966 in the now non-operational salmon drift nets (Gaskin 1992). Several (number not specified) were also taken during the 1960's in the now non-operational Newfoundland and Labrador groundfish gillnets. A few were taken in an experimental drift gillnet fishery for salmon off West Greenland which took place from 1965 to 1982 (Read 1994).

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 25-40% of large Canadian fishing vessels (greater than 100 feet long), and on approximately 5% of smaller Canadian fishing vessels. By-caught marine mammals were noted as weight in kilos rather than by the numbers of animals caught. Thus the number of individuals was estimated by dividing the total weight per species per trip by the maximum recorded weight of each species. During 1991 through 1996, an estimated 6 white-sided dolphins were observed taken. One animal was from a long line trip south of the Grand Banks (43° 10'N 53° 08'W) in November 1996 and the other 5 were taken in

the bottom trawl fishery off Nova Scotia in the Atlantic Ocean; 1 in July 1991, 1 in April 1992, 1 in May 1992, 1 in April 1993, 1 in June 1993 and 0 in 1994 to 1996.

Herring Weirs

During the last several years, one white sided dolphin was released alive and unharmed from a herring weir in the Bay of Fundy (A. Westgate, pers. comm.). Due to the formation of a cooperative program between Canadian fishermen and biologists, it is expected that most dolphins and whales will be able to be released alive.

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 180 active weirs in western Bay of Fundy (Read 1994). According to Canadian DFO officials, for 1998, there were 225 weir 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.).

Other Mortality

USA

Mass strandings involving up to a hundred or more animals at one time are common for this species. From 1968 to 1995, 349 Atlantic white-sided dolphins were known to have stranded on the New England coast (Hain and Waring 1994; Smithsonian stranding records 1996). 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 all of the marine mammals which die or are seriously injured may not 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.

During 1997, there were 17 recorded stranded white-sided dolphins, of which 16 died and 1 was released alive (from Rhode Island during February), according to the NE Regional Office/NMFS strandings and entanglement database. One stranding was in Virginia during March, the rest were from Maryland to Maine during January to August, where 10 were from Massachusetts. The cause of death of these strandings were not determined.

During 1998, there were 88 stranded white-sided dolphins documented in the NE Regional Office/NMFS strandings and entanglement database. One stranding, from Delaware during May, was probably a fishery interaction. The rest of the recorded strandings were from Massachusetts, where 65, 16, 2 and 4 were recorded during January, February, April, May, and November, respectively. There were 70 animals found in a mass stranding, near Wellfleet, Massachusetts, during the week of January 29 to February 3. Of these, 2 were released alive. Of the 4 found during the November mass stranding, 1 was released alive.

During 1999, there were 72 stranded white-sided dolphins documented in the NE Regional Office/NMFS stranding and entanglement database. Most were from Massachusetts (66), of which 53 stranded in Wellfleet, MA during 19-24 March 1999. Thirteen white-sided dolphins stranded in New Jersey (May and June), while 1 stranded in each of the following states: Delaware (May), Virginia (April), and Maine (November). Of all 72 strandings, 38 were found alive, and 3 of these animals were released alive. It is not known how many strandings, if any, were fishery interactions.

During 2000, there were 24 stranded white-sided dolphins documented in the NE Regional Office/NMFS stranding and entanglement database. All were from Massachusetts, they were found in March (1), April (7), May (1), August (14), and October (1). Five were found alive (3 in April and 2 in August), and 2 of these were released alive (from August). It is not known how many, if any, were fishery interactions.

CANADA

Whales and dolphins stranded during 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 during 1970 to 1998 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. The white-sided dolphins stranded at nearly all times of the year on the mainland and on Sable Island. On the mainland of Nova Scotia, a total of 34 stranded white-sided dolphins was recorded between 1991 and 1996: 2 in 1991 (August and October), 26 in July 1992, 1 in Nov 1993, 2 in 1994 (February and November), 2 in 1995 (April and August), and 1 in October 1996. During July 1992, 26 white-sided dolphins stranded on the Atlantic side of Cape Breton. Of these 26, 11 were released alive and the rest were found dead. Among the rest of the Nova Scotia strandings, 1 was found in Minas Basin, 2 near Yarmouth and the rest near Halifax. On Sable Island, 10 stranded white-sided dolphins were documented between 1991 and 1998, all were males, 7 were young males (< 200 cm), 1 in January 1993, 5 in March 1993, 1 in August 1995, 1 in December 1996, 1 in April 1997, and 1 in February 1998.

STATUS OF STOCK

The status of white-sided dolphins, relative to OSP, in the US Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for this species. 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 a non-strategic stock because estimated average annual fishery-related mortality and serious injury does not exceed PBR.

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. 1997a. Harbor porpoise bycatch estimates in the New England multispecies sink gillnet fishery: 1994 and 1995. *Rep. int Whal. Comm* 47: 705-14.
- Bisack, K. D. 1997b. 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. NOAA, NMFS, NEFSC. Woods Hole, MA. Working paper SC/49/SM35 submitted to the IWC Scientific Committee meeting in Bournemouth, UK, Aug/Sept 1997.
- Bravington, M. V. and K. D. Bisack. 1996. Estimates of harbor porpoise bycatch in the Gulf of Maine sink gillnet fishery, 1990-1993. *Rep. int Whal. Comm* 46: 567-74.
- 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. 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, to National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, Massachusetts, 12 pp.
- Hain, J. H. W. and G. T. Waring. 1994. Status of and human effects upon marine mammals. Pp. 9-20 in: R. W. Langton, J. B. Pearce, and J.A. Gibson (eds), Selected living resources, habitat conditions, and human perturbations of the Gulf of Maine: Environmental and ecological considerations for fishery managements. NOAA Tech. Mem. NMFS-NE-106, Northeast Fisheries Science Center, Woods Hole, Massachusetts.
- 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.
- 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.
- Kenney, R. D., P. M. Payne, D. W. Heinemann and H. E. Winn. 1996. Shifts in Northeast shelf cetacean distributions relative to trends in Gulf of Maine/Georges Bank finfish abundance. Pp. 169-196 in: K.

- Sherman, N.A. Jaworski and T. Smada (eds.). The northeast shelf ecosystem: assessment, sustainability, and management. *Blackwell Science*, Cambridge, MA 02142, USA.
- 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. *Canadian Field-Naturalist* 114(1): 46-61.
- NMFS (National Marine Fisheries Service). 1998. Status of the fishery resources off northeastern United States for 1998. NOAA Technical Memorandum NMFS-NE-115.
- Northridge, S. 1996. Estimation of cetacean mortality in the U.S. Atlantic swordfish and tuna driftnet and pair trawl fisheries. Final report to the NMFS Contract No. 40ENNF500160.
- Northridge, S., M. Tasker, A. Webb, K. Camphuysen and M. Leopold. 1997. White-beaked *Lagenorhynchus albirostris* and Atlantic white-sided dolphin *L. acutus* distributions in northwest European and U.S. North Atlantic waters. *Rep. int. Whal. Commn* 47:797-805.
- 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 02543-1026.
- Palka, D. 1996. Update on abundance of Gulf of Maine/Bay of Fundy harbor porpoises. NOAA/NMFS/NEFSC Ref. Doc. 96-04. 37 pp. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.
- 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., A. Read and C. Potter. 1997. Summary of knowledge of white-sided dolphins (*Lagenorhynchus acutus*) from the U.S. and Canadian North Atlantic waters. *Rep. int Whal. Commn* 47: 729-34.
- 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.*
- 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. 108p.
- 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.
- 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.
- 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. 38 pp. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.
- Waring, G. T., P. Geriorr, 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.