

ATLANTIC 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 in continental shelf waters to the 100-m depth contour. In the western North Atlantic the species inhabits waters from central West Greenland to North Carolina (about 35°N) and perhaps as far east as 29°W in the vicinity of the mid-Atlantic Ridge (Evans 1987; Hamazaki 2002; Doksaeter *et al.* 2008; Waring *et al.* 2008). Distribution of sightings, strandings and incidental takes suggest the possible existence of three stock units: Gulf of Maine, Gulf of St. Lawrence and Labrador Sea stocks (Palka *et al.* 1997). Evidence for a separation between the population in the southern Gulf of Maine and the Gulf of St. Lawrence population comes from the reduced density of summer sightings along the Atlantic side of Nova Scotia. This was reported in Gaskin (1992), is evident in Smithsonian stranding records and in Canadian/west Greenland bycatch data (Stenson *et al.* 2011) and was obvious during summer abundance surveys that covered waters from Virginia to the Gulf of St. Lawrence and during the Canadian component of the Trans-North Atlantic Sighting Survey in the summer of 2007 (Lawson and Gosselin 2009, 2011). White-sided dolphins were seen frequently in Gulf of Maine waters and in waters at the mouth of the Gulf of St. Lawrence, but only a relatively few sightings were recorded between these two regions. This trend is less obvious since 2007.

The Gulf of Maine population of white-sided dolphins is most common in continental shelf waters from Hudson Canyon (approximately 39°N) to Georges Bank, and in the Gulf of Maine and lower Bay of Fundy. Sighting data indicate seasonal shifts in distribution (Northridge *et al.* 1997). During January to May, low numbers of white-sided dolphins are found from Georges Bank to Jeffreys Ledge (off New Hampshire), with even lower numbers south of Georges Bank, as documented by a few strandings collected on beaches of Virginia to South Carolina. From June through September, large numbers of white-sided dolphins are found from Georges Bank to the 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, particularly around Hudson Canyon, occur year round but at low densities. The Virginia and North Carolina observations appear to represent the southern extent of the species' range during the winter months. On 4 May 2008 a stranded 17-year old male white-sided dolphin with severe pulmonary distress and reactive lymphadenopathy stranded in South Carolina (Powell *et al.* 2012). In the absence of additional strandings or sightings, this stranding seems to be an out-of-range anomaly. The seasonal spatial distribution of this species appears to be changing during the last few years. There is evidence for an earlier distributional shift during the 1970s, from primarily offshore waters into the Gulf of Maine, hypothesized to be related to shifts in abundance of pelagic fish stocks resulting from depletion of herring by foreign distant-water fleets (Kenney *et al.* 1986).

Recent stomach-content analysis of both stranded and incidentally caught white-sided dolphins in U.S. waters determined that the predominant prey were silver hake (*Merluccius bilinearis*), spoonarm octopus (*Bathypolypus*

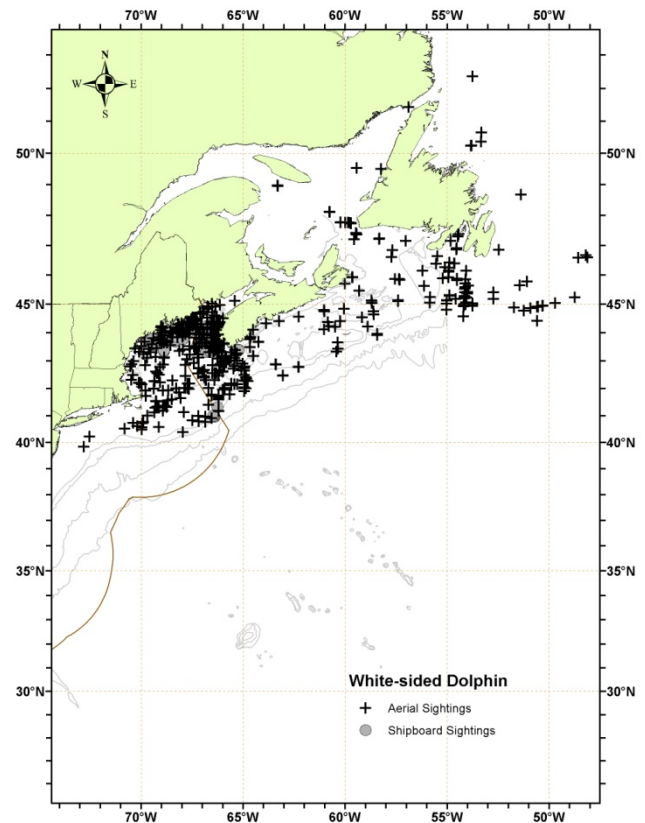


Figure 1. Distribution of white-sided dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010, and 2011, and DFO's 2007 TNASS survey. Isobaths are the 100-m, 1000-m and 4000-m depth contours.

bairdii) and haddock (*Melanogrammus aeglefinus*). Sand lances (*Ammodytes* spp.) were only found in the stomach of one stranded white-sided dolphin. Seasonal variation in diet was indicated; pelagic Atlantic herring (*Clupea harengus*) was the most important prey in summer, but was rare in winter (Craddock *et al.* 2009).

POPULATION SIZE

The best available current abundance estimate for white-sided dolphins in the western North Atlantic stock is 48,819 (CV= 0.61), resulting from a June–August 2011 survey.

Earlier abundance estimates

Please see Appendix IV for earlier abundance estimates. As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable to determine the current PBR.

Recent surveys and abundance estimates

An abundance estimate of 48,819 (CV=0.61) white-sided dolphins was generated from a shipboard and aerial survey conducted during June–August 2011 (Palka 2012). The aerial portion that contributed to the abundance estimate covered 5,313 km of tracklines that were over waters north of New Jersey from the coastline to the 100-m depth contour through the U.S. and Canadian Gulf of Maine and up to and including the lower Bay of Fundy. The shipboard portion covered 3,107 km of tracklines that were in waters offshore of central Virginia to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the U.S. EEZ). Both sighting platforms used a double-platform data-collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers, 2004). Estimation of the abundance was based on the independent-observer approach assuming point independence (Laake and Borchers 2004) and calculated using the MRDS option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

No white-sided dolphins were detected in the aerial and ship abundance surveys that were conducted concurrently (June-August 2011) in waters between central Virginia and central Florida. This shipboard survey included shelf-break and inner continental slope waters deeper than the 50-m depth contour within the U.S. EEZ. The survey employed the double-platform methodology searching with 25x150 “bigeye” binoculars. A total of 4,445 km of tracklines was surveyed, yielding 290 cetacean sightings.

Month/Year	Area	N_{best}	CV
Jun-Aug 2011	Central Virginia to lower Bay of Fundy	48,819	0.61

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 western North Atlantic stock of white-sided dolphins is 48,819 (CV=0.61). The minimum population estimate for these white-sided dolphins is 30,403.

Current Population Trend

A trend analysis has not been conducted for this stock. The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long survey interval. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV > 0.30) remains below 80% (alpha = 0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007).

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 30,403. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5, the default value for stocks of unknown status relative to OSP, and the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic stock of white-sided dolphin is 304.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Total annual estimated average fishery-related mortality or serious injury to this stock during 2010–2014 was 77 (CV=0.2) white-sided dolphins (Table 2).

Fishery Information

Detailed fishery information is reported in Appendix III.

Earlier Interactions

Historically, fishery interactions have been documented with white-sided dolphins in the Joint Venture and Foreign Atlantic mackerel fishery (1977–1991), the Atlantic pelagic drift gillnet fishery (1991–1998), the U.S. J.V midwater (pelagic) trawl fishery (2001), the mid-Atlantic gillnet fishery (1997), Northeast midwater pair trawls (2002, 2005), and the mid-Atlantic bottom trawl (1997, 2005, 2007). See Appendix V for more information on historical takes.

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Northeast Sink Gillnet

Annual white-sided dolphin mortalities were estimated using annual ratio-estimator methods (Table 2; Orphanides 2013; Hatch and Orphanides 2014, 2015, 2016). Recently white-sided dolphin bycatch has occurred mostly in the Gulf of Maine, with a few south of Cape Cod. Bycatch occurred nearly year round, though mostly in the winter and summer. There are large inter-annual differences in the magnitude of the level of bycatch, which may be due to inter-annual differences in the number of white-sided dolphins using the Gulf of Maine, as has been seen in the series of past abundance estimates for this species. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for long-term bycatch information.

Northeast Bottom Trawl

Fishery-related bycatch rates for years 2009–2013 were estimated using an annual stratified ratio-estimator (Lyssikatos 2015). Between 2008 and 2013, all white-sided dolphin bycatch occurred in the Gulf of Maine and Georges Bank eco-regions, primarily during the winter (January–April) season when sea surface temperatures are less than 10° C. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for long-term bycatch information.

Mid-Atlantic Bottom Trawl

Fishery-related bycatch rates were estimated using an annual stratified ratio-estimator (Lyssikatos 2015). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for long-term bycatch information.

Table 2. Summary of the incidental mortality of North Atlantic stock of white-sided dolphins (*Lagenorhynchus acutus*) by commercial fishery including the years sampled, the type of data used, the annual observer coverage, the serious injuries and mortalities recorded by on-board observers, the estimated annual serious injury and mortality, the estimated CV of the combined annual mortality and the mean annual mortality (CV in parentheses).

Fishery	Years	Data Type ^a	Observer Coverage ^b	Observed Serious Injury	Observed Mortality	Estimated Serious Injury ^d	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Combined Annual Mortality
Northeast Sink Gillnet ^c	10-14	Obs. Data Weighout Trip Logbook	.17, .19, .15, .11, .18	1, 0, 0, 0, 0	6, 5, 1, 1, 2	4, 1, 0, 0, 0	62, 17, 9, 4, 10	66, 18, 9, 4, 10	.90, .43, .92, 1.03, .66	21 (0.57)
Northeast Bottom Trawl	10-14	Obs. Data Trip Logbook	.16, .26, 0.17, .15, .17	0, 2, 0, 0, 0	10, 47, 9, 8, 3	1, 3, 0, 0, 0	36, 138, 27, 33, 16	37, 140, 27, 33, 16	.32, .24, .47, .31, .5	51 (0.16)
Mid-Atlantic Bottom Trawl	10-14	Obs. Data Trip Logbook	.06, .08, .05, .06, .08	0, 0, 0, 0, 0	0, 0, 0, 0, 1	0, 0, 0, 0, 0	0, 0, 0, 0, 9.67	0, 0, 0, 0, 9.67	0, 0, 0, 0, .94	1.9 (.94)
Total										74 (0.2)
a	Observer data (Obs. Data), used to measure bycatch rates, are collected within the Northeast Observer Program and At-sea Monitoring Program. NEFSC collects landings data (unallocated Dealer Data or Allocated Dealer Data) which are used as a measure of total landings and mandatory Vessel Trip Reports (VTR) (Trip Logbook) are used to determine the spatial distribution of landings and fishing effort in the sink gillnet, bottom trawl and mid-water trawl fisheries. In addition, the Trip Logbooks are the primary source of the measure of total effort (tow duration) in the mid-water and bottom trawl fisheries.									
b	Observer coverage is defined as the ratio of observed to total metric tons of fish landed for the gillnet fisheries, and the ratio of observed to total trips for bottom trawl and Mid-Atlantic mid-water trawl (including pair trawl) fisheries. Beginning in May 2010 total observer coverage reported for bottom trawl and gillnet gear includes samples collected from the at-sea monitoring program in addition to traditional observer coverage through the Northeast Fisheries Observer Program (NEFOP).									
c	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, 1999, 2001, 2002, and 2004, respectively, there were 2, 1, 1, 1, and 1 observed white-sided dolphins taken on pingered trips. No takes were observed on pinger trips during 1995, 1996, 1998, 2000, 2005 through 2007. Three of the 2008 takes were on non-pingered hauls and the fourth take was recorded as pinger condition unknown. Of the six 2010 observed takes, 4 were in pingered nets and 2 in non-pingered nets. Four of the 2011 takes were in pingered nets. The 2012 take was in a non-pingered net. The 2013 take was in a pingered net. In 2010, both observed mortalities were in pingered nets.									
d	Waring <i>et al.</i> 2014, 2015, Wenzel <i>et al.</i> 2015, 2016.									

CANADA

There is little information available that 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 1960s in the now non-operational Newfoundland and Labrador groundfish gillnets. A few (number not specified) 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 25-40% of large Canadian fishing vessels (greater than 100 feet long), and on approximately 5% of smaller Canadian fishing vessels. Bycaught 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 longline 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.

Estimation of small cetacean bycatch for Newfoundland fisheries using data collected during 2001 to 2003 (Benjamins *et al.* 2007) indicated that, while most of the estimated 862 to 2,228 animals caught were harbor porpoises, a few were white-sided dolphins caught in the Newfoundland nearshore gillnet fishery and offshore monkfish/skate gillnet fisheries.

Herring Weirs

Previously only 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. Fishery information is available in Appendix III.

Other Mortality

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During 2010–2014 there were 130 documented Atlantic white-sided dolphin strandings on the U.S. Atlantic coast (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 08 October 2015). Thirty of these animals were released alive. Human interaction was indicated in 5 records during this period. Of these, one was classified as a fishery interaction.

Mass strandings involving up to a hundred or more animals at one time are common for this species. 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. In an analysis of mortality causes of stranded marine mammals on Cape Cod and southeastern Massachusetts between 2000 and 2006, Bogomolni *et al.* (2010) found 69% (46 of 67) of stranded white-sided dolphins were involved in mass-stranding events with no significant cause determined, and 21% (14 of 67) were classified as disease-related.

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that 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.

CANADA

The Nova Scotia Stranding Network documented whales and dolphins stranded on the coast of Nova Scotia during 1991 to 1996 (Hooker *et al.* 1997). Researchers with Dept. of Fisheries and Oceans, Canada documented strandings on the beaches of Sable Island during 1970 to 1998 (Lucas and Hooker 2000). More recently whales and dolphins stranded on the coast of Nova Scotia have been recorded by the Marine Animal Response Society and the Nova Scotia Stranding Network (Table 3; Marine Animal Response Society, pers. comm.). In addition, stranded white-sided dolphins in Newfoundland and Labrador are being recorded by the Whale Release and Strandings Program (Table 3; Ledwell and Huntington 2010, 2011, 2012a, 2012b, 2013, 2014).

Table 3. White-sided dolphin (*Lagenorhynchus acutus*) reported strandings along the U.S. and Canadian Atlantic coast, 2010-2014.

Area	Year					Total
	2010	2011	2012	2013	2014	
Maine	1	2	1	1	2	7
New Hampshire	0	0	2	0	0	2
Massachusetts ^{a,b}	50	42	3	10	2	107
Rhode Island	0	1	1	1	0	3
Connecticut	0	0	0	0	0	0
New York	1	0	3	2	0	6
New Jersey	0	1	0	0	0	1
Delaware	0	1	0	0	0	1
Maryland	0	1	0	0	0	1
Virginia	0	0	0	0	0	0
North Carolina	0	1	0	0	0	1
South Carolina	0	0	0	0	0	0
Georgia	0	1	0	0	0	1
TOTAL US	52	50	10	14	4	130
Nova Scotia ^c	2	6	5	7	12	32
Newfoundland and Labrador ^d	2	0	3	0	5	10
GRAND TOTAL	56	56	18	21	21	172
^a Records of mass strandings in Massachusetts during this period are: March 2010 - 7 animals (one dead calf, 6 adults released alive), 16 animals (5 dead, 11 released alive) and 3 animals (one released alive); April 2010 - 2 animals (released alive); July 2010 - 2 animals (released alive); March 2011 - 4 animals (2 released alive), 2 animals (released alive); April 2013 - 2 animals (one released alive); December 2013 - 3 animals (all released alive).						
^b In 2010, 2 animals in Massachusetts were classified as human interactions, 1 of them a fishery interaction. In 2011, 1 animal in Massachusetts was classified as human interaction due to post-mortem mutilation. In 2014, 1 animal in Massachusetts was classified as human interaction due to attempts by public to return animal to sea. In 2014, 1 animal in Maine was classified as human interaction due to plastics ingestion.						
^c Data supplied by Nova Scotia Marine Animal Response Society (pers. comm.). 2014 data include a mass stranding of 7 animals all released alive and a single animal released alive.						
^d (Ledwell and Huntington 2010,2011, 2012a, 2012b, 2013, 2014, 2015).						

STATUS OF STOCK

White-sided dolphins are not listed as threatened or endangered under the Endangered Species Act. The Western North Atlantic stock of white-sided dolphins is not considered strategic under the Marine Mammal Protection Act. The estimated average annual human-related mortality does not exceed PBR but is not less than 10% of the calculated PBR; therefore, it cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of white-sided dolphins, relative to OSP, in the U.S. Atlantic EEZ is unknown. A trend analysis has not been conducted for this species.

REFERENCES CITED

- 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. NOAA Tech. Memo. NMFS-OPR-6. 73 pp.
- Benjamins, S., J.W. Lawson and G.B. Stenson 2007. Recent harbor porpoise bycatch in Newfoundland, Canada's gillnet fisheries. *J. Cetacean Res. Manage.* 9(3):189–200.
- Bogomolni, A.L., K.R. Pugliares, S.M. Sharp, K. Patchett, C.T. Harry, J.M. LaRocque, K.M. Touhey, and M. Moore 2010. Mortality trends of stranded marine mammals on Cape Cod and southeastern Massachusetts, USA, 2000 to 2006. *Dis. Aquat. Organ.* 88:143–155
- Craddock, J.E., P.T. Polloni, B. Hayward and F. Wenzel 2009. Food habits of Atlantic white-sided dolphins (*Lagenorhynchus acutus*) off the coast of New England. *Fish. Bull.* 107:384–394.
- Doksaeter, L., E. Olsen, L. Nottestad and A. Ferno 2008. Distribution and feeding ecology of dolphins along the mid-Atlantic Ridge between Iceland and the Azores. *Deep-Sea Res. II* 55:243–253.
- 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. Field-Nat.* 106:64–72.
- Hamazaki, T. 2002. Spatiotemporal prediction models of cetacean habitats in the mid-western North Atlantic Ocean (from Cape Hatteras, No. Carolina, USA to Nova Scotia, Canada). *Mar. Mamm. Sci.* 18(4):920–939.
- Hatch, J.M. and C.D. Orphanides 2014. Estimates of cetacean and pinniped bycatch in the 2012 New England sink and mid-Atlantic gillnet fisheries. *Northeast Fish Sci Cent Ref Doc.14-02.* 20 pp.
- Hatch, J.M. and C.D. Orphanides 2015. Estimates of cetacean and pinniped bycatch in the 2013 New England sink and mid-Atlantic gillnet fisheries. *Northeast Fish Sci Cent Ref Doc 15-15.* 33 pp.
- Hatch, J.M. and C.D. Orphanides 2015. Estimates of cetacean and pinniped bycatch in the 2013 New England sink and mid-Atlantic gillnet fisheries. *Northeast Fish Sci Cent Ref Doc 16-05.* 22 pp.
- Hooker, S.K., R.W. Baird and M.A. Showell 1997. Cetacean strandings and bycatches in Nova Scotia, Eastern Canada, 1991–1996. *International Whaling Commission SC/49/O5.* 11 pp. http://www.st-andrews.ac.uk/~sh43/pubs/Hooker_etal_1997_IWC.pdf
- Kenney, R.D., P.M. Payne, D.J. Heinemann, and H.E. Winn. 1996. Shifts in Northeast shelf cetacean distributions relative to trends in Gulf of Maine/Georges Bank finfish abundance. Pages 169–196 *in*: K. Sherman, N. A. Jaworski, and T. J. Smayda, (eds). *The Northeast Shelf ecosystem: assessment, sustainability, and management.* Blackwell Science, Boston.
- Laake, J.L., and D.L. Borchers 2004. Methods for incomplete detection at distance zero, Pages 108–189 *in*: S.T. Buckland, D.R. Andersen, K.P. Burnham, J.L. Laake, and L. Thomas, (eds.). *Advanced distance sampling.* Oxford University Press, New York.
- Lawson, J.W. and J.-F. Gosselin 2009. Distribution and preliminary abundance estimates for cetaceans seen during Canada's Marine Megafauna Survey - A component of the 2007 TNASS. *Can. Sci. Advisory Sec. Res. Doc.* 2009/031. 33 pp. http://www.dfo-mpo.gc.ca/csas-sccs/publications/resdocs-docrech/2009/2009_031-eng.htm
- Lawson, J.W. and J.-F. Gosselin 2011. Fully-corrected cetacean abundance estimates from the Canadian TNASS survey. Working Paper 10. National Marine Mammal Peer Review Meeting. Ottawa, Can. 28 p.
- Ledwell, W. and J. Huntington 2010. Whale, leatherback sea turtles, and basking sharks entrapped in fishing gear in Newfoundland and Labrador and a summary or the strandings, sightings and education work during 2009–2010. A preliminary report to Fisheries and Oceans Canada, St. John's, Newfoundland, Canada 20 pp.
- Ledwell, W. and J. Huntington 2011. Whale, leatherback sea turtles, and basking sharks entrapped in fishing gear in Newfoundland and Labrador and a summary or the strandings, sightings and education work during 2010–2011. A preliminary report to Fisheries and Oceans Canada, St. John's, Newfoundland, Canada. 25 pp.
- Ledwell, W. and J. Huntington 2012a. Incidental entanglements of cetacean and leatherback sea turtles in fishing gear reported during 2011–2012 and a summary of the Whale Release and Strandings Group activities. A preliminary report to Fisheries and Oceans Canada, St. John's, Newfoundland, Canada. 17 pp.
- Ledwell, W. and J. Huntington 2012b. Incidental entrapments in fishing gear and stranding reported to and responded to by the Whale Release and Strandings Group in Newfoundland and Labrador and a summary of the Whale Release and Strandings program during 2012. Report to Fisheries and Oceans Canada, St. John's, Newfoundland, Canada. 18 pp.
- Ledwell, W. and J. Huntington 2013. Incidental entrapments in fishing gear and stranding reported to and responded to by the Whale Release and Strandings Group in Newfoundland and Labrador and a summary of the Whale Release and Strandings program during 2013. Report to Fisheries and Oceans Canada, St. John's,

- Newfoundland, Canada. 19 pp.
- Ledwell, W. and J. Huntington 2014. Incidental entrapments and entanglements of cetaceans and leatherback sea turtles, strandings, ice entrapments reported to the Whale Release and Strandings Group in Newfoundland and Labrador and a summary of the Whale Release and Strandings program during 2014. Report to the Department of Fisheries and Oceans Canada, St. John's, Newfoundland, Canada. 23 pp.
- Lyssikatos, M. 2015. Estimates of Cetacean and Pinniped Bycatch in Northeast and mid-Atlantic bottom trawl fisheries, 2008-2013. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-19. 20 p. Available at <http://www.nefsc.noaa.gov/publications/>.
- Lucas, Z.N. and S.K. Hooker 2000. Cetacean strandings on Sable Island, Nova Scotia, 1970–1998. *Can. Field-Nat.* 114(1):46–61.
- 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. Comm.* 47:797-805.
- Orphanides, C.D. 2013. Estimates of cetacean and pinniped bycatch during 2010 and 2011 in the New England Sink Gillnet fishery, Mid-Atlantic Gillnet fishery, and two NMFS gillnet experiments. Northeast Fish Sci Cent Ref Doc. 13-13. 38 pp. Available at: <http://nefsc.noaa.gov/publications/crd/crd1313/>.
- Palka, D., A. Read and C. Potter 1997. Summary of knowledge of white-sided dolphins (*Lagenorhynchus acutus*) from U.S. and Canadian Atlantic waters. *Rep. Int. Whal. Comm.* 47:729–734.
- Palka, D.L. 2012. Cetacean abundance estimates in US northwestern Atlantic Ocean waters from summer 2011 line transect survey. Northeast Fish. Sci. Cent. Ref. Doc. 12-29. 37 pp. <http://www.nefsc.noaa.gov/nefsc/publications/crd/crd1229/>
- 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 NMFS. [Available from National Marine Fisheries Science Center, 166 Water St., Woods Hole, MA 02543], 108 pp.
- Powell, J.W.B., D.S. Rotstein and W.E. McFee. 2012. First records of the melon-headed whale (*Peponocephala electra*) and Atlantic white-sided dolphin (*Lagenorhynchus acutus*) in South Carolina. *Southeastern Nat.* 11(1):23–34.
- Read, A.J. 1994. Interactions between cetaceans and gillnet and trap fisheries in the northwest Atlantic. *Rep. Int. Whal. Comm.* (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* 37:1–12.
- Stenson, G.B., S. Benjamins and D.G. Reddin. 2011. Using bycatch data to understand habitat use of small cetaceans: lessons from an experimental driftnet fishery. *ICES J. Mar. Sci.* 68:937-946.
- Taylor, B.L., M. Martinez, T. Gerrodette, J. Barlow and Y.N. Hrovat. 2007. Lessons from monitoring trends in abundance in marine mammals. *Mar. Mamm. Sci.* 23(1):157–175.
- Thomas L, J.L. Laake, E. Rexstad, S. Strindberg, F.F.C. Marques, S.T. Buckland, D.L. Borchers, D.R. Anderson, K.P. Burnham, M.L. Burt, S.L. Hedley, J.H. Pollard, J.R.B. Bishop and T.A. Marques 2009. Distance 6.0. Release 2. [Internet]. University of St. Andrews (UK): Research Unit for Wildlife Population Assessment. Available from: <http://www.ruwpa.st-and.ac.uk/distance/>
- 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. NOAA Tech. Memo. NMFS-OPR-12. 93 pp.
- Waring, G.T., L. Nøttestad, E. Olsen, H. Skov and G. Vikingsson. 2008. Distribution and density estimates of cetaceans along the mid-Atlantic Ridge during summer 2004. *J. Cetacean Res. Manage.* 10(2):137–146.
- Waring, G.T., M.C. Rossman and F.W. Wenzel. 2014 Serious Injury Determinations for small cetaceans and pinnipeds caught in commercial fisheries off the northeast U.S. coast, 2007–2011. Northeast Fish. Sci. Cent. Ref. Doc. Northeast Fish. Sci. Cent. Ref. Doc. 14-13. 32 pp.
- Waring, G.T., E. Josephson, M.C. Rossman and F.W. Wenzel. 2015 Serious Injury Determinations for small cetaceans and pinnipeds caught in commercial fisheries off the northeast U.S. coast, 2012. Northeast Fish. Sci. Cent. Ref. Doc. 15-12. 19 pp.
- Wenzel F, G.T. Waring, E. Josephson M.C. Lyssikatos, B.L. Byrd, S.C. Horstman and J.R. Powell. 2015. [Serious Injury Determinations for Small Cetaceans and Pinnipeds Caught in Commercial Fisheries off the Northeast U.S. Coast, 2013](#). NOAA Tech Memo NMFS NE-236; 36 p.
- Wenzel F, G.T. Waring, E. Josephson M.C. Lyssikatos. 2016. [Serious Injury Determinations for small cetaceans and pinnipeds caught in commercial fisheries off the northeast U.S. coast, 2014](#). Northeast Fish. Sci. Cent. Ref. Doc. 16-11. 24 pp.