

COMMON DOLPHIN (*Delphinus delphis delphis*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The common dolphin (*Delphinus delphis delphis*) may be one of the most widely distributed species of cetaceans, as it is found world-wide in temperate and subtropical seas. In the North Atlantic, common dolphins are commonly found along the shoreline of Massachusetts in mass-stranding events (Bogomolni *et al.* 2010; Sharp *et al.* 2014). At-sea sightings have been concentrated over the continental shelf between the 100-m and 2000-m isobaths and over prominent underwater topography and east to the mid-Atlantic Ridge (29°W) (Doksaeter *et al.* 2008; Waring *et al.* 2008). Common dolphins have been noted to be associated with Gulf Stream features (CETAP 1982; Selzer and Payne 1988; Waring *et al.* 1992; Hamazaki 2002). The species is less common south of Cape Hatteras, although schools have been reported as far south as the Georgia/South Carolina border (32° N) (Jefferson *et al.* 2009). They exhibit seasonal movements, where they are found from Cape Hatteras northeast to Georges Bank (35° to 42°N) during mid-January to May (Hain *et al.* 1981; CETAP 1982; Payne *et al.* 1984), although some animals tagged and released after stranding in winters of 2010–2012 used habitat in the Gulf of Maine north to almost 44°N (Sharp *et al.* 2016). Common dolphins move onto Georges Bank, Gulf of Maine, and the Scotian Shelf from mid-summer to autumn. Selzer and Payne (1988) reported very large aggregations (greater than 3,000 animals) on Georges Bank in autumn. Migration onto the Scotian Shelf and continental shelf off Newfoundland occurs during summer and autumn when water temperatures exceed 11°C (Sergeant *et al.* 1970; Gowans and Whitehead 1995).

Westgate (2005) tested the proposed one-population-stock model using a molecular analysis of mitochondrial DNA (mtDNA), as well as a morphometric analysis of cranial specimens. Both genetic analysis and skull morphometrics failed to provide evidence ($p > 0.05$) of more than a single population in the western North Atlantic, supporting the proposed one-stock model. However, when western and eastern North Atlantic common dolphin mtDNA and skull morphology were compared, both the cranial and mtDNA results showed evidence of restricted gene flow ($p < 0.05$) indicating that these two areas are not panmictic. Cranial specimens from the two sides of the North Atlantic differed primarily in elements associated with the rostrum. These results suggest that common dolphins in the western North Atlantic are composed of a single panmictic group whereas gene flow between the western and eastern North Atlantic is limited (Westgate 2005, 2007). This was further supported by Mirimin *et al.* (2009) who investigated genetic variability using both nuclear and mitochondrial genetic markers and observed no significant genetic differentiation between samples from within the western North Atlantic region, which may be explained by seasonal shifts in distribution between northern latitudes (summer months) and southern latitudes (winter months). However, the authors point out that some uncertainty remains if the same population was sampled in the two different seasons.

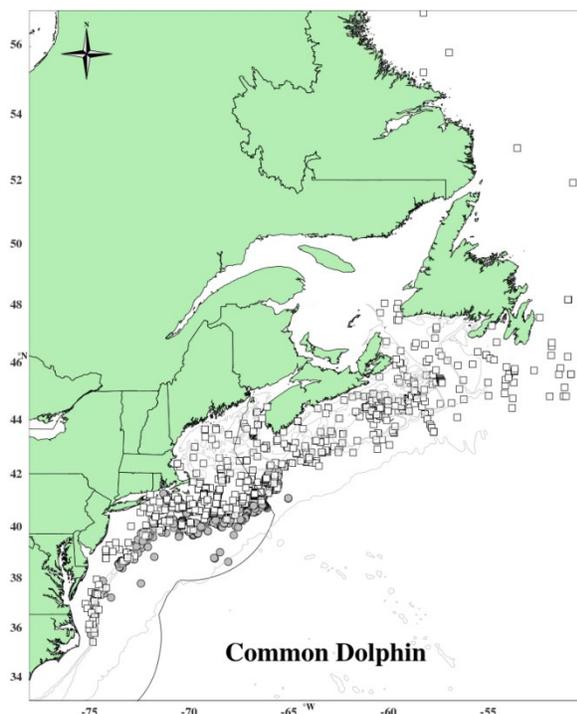


Figure 1. Distribution of common dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1998, 1999, 2002, 2004, 2006, 2007, 2010, 2011, 2016 and Department of Fisheries and Oceans Canada 2007 TNASS and 2016 NAISS surveys. Isobaths are the 100-m, 1000-m and 4000-m depth contours.

POPULATION SIZE

The current best abundance estimate for Western North Atlantic stock of common dolphins is 172,825 (CV=0.21) which is the total of Canadian and U.S. surveys conducted in 2016. This estimate, derived from shipboard and aerial surveys, covers most of this stock's known range. Because the survey areas did not overlap, the estimates from the three surveys were added together and the CVs pooled using a delta method to produce a species abundance estimate for the stock area. The 2016 estimate is larger than those from 2011 because the 2016 estimate is derived from a survey area extending from Newfoundland to Florida, which is about 1,300,000 km² larger than the 2011 survey area. In addition, some of the 2016 survey estimates in US waters were corrected for availability bias (due to diving behavior), whereas the 2011 estimates were not corrected (Table 1).

Earlier estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions. As recommended in the guidelines for preparing Stock Assessment Reports (NMFS 2016), estimates older than eight years are deemed unreliable to determine a current PBR.

Recent surveys and abundance estimates

An abundance estimate of 67,191 (CV=0.29) common dolphins was generated from a shipboard and aerial survey conducted during June–August 2011 (Palka 2012). The aerial portion that contributed to the 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 between central Virginia and Massachusetts in waters 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 mark-recapture distance sampling (MRDS) option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

An abundance estimate of 2,993 (CV=0.87) common dolphins was generated from a shipboard survey 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 a double-platform visual team procedure searching with 25-150 “bigeye” binoculars. A total of 4,445 km of tracklines was surveyed. 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) (Table 1).

Abundance estimates of 48,574 (CV=0.48) for the Newfoundland/Labrador portion and 43,124 (CV=0.28) for the Bay of Fundy/Scotian Shelf/Gulf of St. Lawrence portion were generated from the Canadian Northwest Atlantic International Sightings Survey (NAISS) survey conducted in August–September 2016 (Table 1). This large-scale aerial survey covered Atlantic Canadian shelf and shelf break habitats from the northern tip of Labrador to the U.S. border off southern Nova Scotia (Lawson and Gosselin 2018). Line-transect density and abundance analyses were completed using Distance 7.1 release 1 (Thomas *et al.* 2010).

Abundance estimates of 80,227 (CV=0.31) and 900 (CV=0.57) common dolphins were generated from vessel surveys conducted in U.S. waters of the western North Atlantic during the summer of 2016 (Table 1; Garrison 2020; Palka 2020). One survey was conducted from 27 June to 25 August in waters north of 38°N latitude and consisted of 5,354 km of on-effort trackline along the shelf break and offshore to the outer limit of the U.S. EEZ (NEFSC and SEFSC 2018). The second vessel survey covered waters from Central Florida to approximately 38°N latitude between the 100-m isobaths and the outer limit of the U.S. EEZ during 30 June–19 August. A total of 4,399 km of trackline was covered on effort (NEFSC and SEFSC 2018). Both surveys utilized two visual teams and an independent observer approach to estimate detection probability on the trackline (Laake and Borchers 2004). Mark-recapture distance sampling was used to estimate abundance. Estimates from the two surveys were combined and CVs pooled to produce a species abundance estimate for the stock area.

Table 1. Summary of recent abundance estimates for western North Atlantic common dolphin (*Delphinus delphis delphis*) by 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
Jul–Aug 2011	Central Virginia to lower Bay of Fundy	67,191	0.29
Jun–Aug 2011	Central Florida to Central Virginia	2,993	0.87
Jun–Aug 2011	Central Florida to lower Bay of Fundy (COMBINED)	70,184	0.28
June–Sep 2016	Central Virginia to lower Bay of Fundy	80,227	0.31
June–Aug 2016	Florida to Central Virginia	900	0.57
June–Sep 2016	Newfoundland/Labrador	48,574	0.48
June–Sep 2016	Bay of Fundy/Scotian Shelf/Gulf of St. Lawrence	43,124	0.28
June–Sep 2016	Florida to Newfoundland/Labrador (COMBINED)	172,825	0.21

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 common dolphins is 172,825 animals (CV=0.21), derived from the 2016 aerial and shipboard surveys. The minimum population estimate for the western North Atlantic common dolphin is 145,091.

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 (see Appendix IV for a survey history of this stock). 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). There is current work to standardize the strata-specific previous abundance estimates to consistently represent the same regions and include appropriate corrections for perception and availability bias. These standardized abundance estimates will be used in state-space trend models that incorporate environmental factors that could potentially influence the process and observational errors for each stratum.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

There is limited published life-history information that could be used to estimate net productivity. Westgate (2005) and Westgate and Read (2007) have provided reviews with a number of known parameters. There is a peak in parturition during July and August with an average birth date of 28 July. Gestation lasts about 11.7 months and lactation lasts at least a year. Given these results, western North Atlantic female common dolphins likely average 2–3 year calving intervals. Females become sexually mature earlier (8.3 years and 200 cm) than males (9.5 years and 215 cm) as males continue to increase in size and mass. There is significant sexual dimorphism present with males being on average about 9% larger in body length.

Due to uncertainties about the stock-specific life-history parameters, the maximum net productivity rate was assumed to be the default value for cetaceans of 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 145,216 animals. 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 and with the CV of the average mortality estimate

less than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic stock of common dolphin is 1,452.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Average annual estimated fishery-related mortality or serious injury to this stock during 2013–2017 was 419 (CV=0.10) common dolphins from estimated annual bycatch in observed fisheries plus 0.2 from research takes, for a total of 419.2.

Uncertainties not accounted for include the potential that the observer coverage was not representative of the fishery during all times and places. There are no major known sources of unquantifiable human-caused mortality or serious injury for this stock.

Fishery information

Detailed fishery information is reported in Appendix III. Earlier Interactions

Historically, U.S. fishery interactions have been documented with common dolphins in the northeast and mid-Atlantic gillnet fisheries, northeast and mid-Atlantic bottom trawl fisheries, northeast and mid-Atlantic mid-water trawl fishery, and the pelagic longline fishery. See Appendix V for more information on historical takes.

Northeast Sink Gillnet

Annual common dolphin mortalities were estimated using annual ratio-estimator methods (Hatch and Orphanides 2015, 2016; Orphanides and Hatch 2017, Orphanides 2019, 2020). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Mid-Atlantic Gillnet

Common dolphins were taken in observed trips during most years. Annual common dolphin mortalities were estimated using annual ratio-estimator methods (Hatch and Orphanides 2015, 2016; Orphanides and Hatch 2017, Orphanides 2019, 2020). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Northeast Bottom Trawl

This fishery is active in New England waters in all seasons. Annual common dolphin mortalities were estimated using annual stratified ratio-estimator methods (Lyssikatos *et al.* 2020). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Mid-Atlantic Bottom Trawl

Annual common dolphin mortalities were estimated using annual stratified ratio-estimator methods (Lyssikatos *et al.* 2020). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Pelagic Longline

Pelagic longline bycatch estimates of common dolphins for 2013–2017 were documented in Garrison and Stokes (2014, 2016, 2017, 2020). There is a high likelihood that dolphins released alive with ingested gear or gear wrapped around appendages will not survive (Wells *et al.* 2008). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Research Takes

In October 2016; the University of Rhode Island, Graduate School of Oceanography reported the incidental capture/drowning of a 206-cm female, common dolphin during a routine, weekly research trawl fishing trip in Narragansett Bay, Rhode Island. The incident was reported to Mystic Aquarium, Mystic, Connecticut; NOAA GARFO Office, Gloucester, Massachusetts; NOAA law enforcement; and NOAA Protected Species Branch, Woods Hole, Massachusetts. A complete necropsy was conducted at the Wood Hole Oceanographic Institution, Woods Hole, Massachusetts.

Table 2. Summary of the incidental serious injury and mortality of North Atlantic common dolphins (*Delphinus delphis delphis*) 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 combined serious injury and mortality estimate, the estimated CV of the annual combined serious injury and mortality and the mean annual serious injury and mortality estimate (CV in parentheses).

Fishery	Years	Data Type ^a	Observer Coverage ^b	Observed Serious Injury ^d	Observed Mortality	Estimated Serious Injury ^d	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Combined Annual Mortality
Northeast Sink Gillnet	2013	Obs. Data,	0.11	0	5	0	104	104	0.46	97 (.19)
	2014	Trip	0.18	0	11	0	111	111	0.47	
	2015	Logbook, Allocated Dealer Data	0.14	0	3	0	55	55	0.54	
	2016		0.10	0	8	0	80	80	0.38	
	2017		0.12	0	20	0	133	133	0.28	
Mid-Atlantic Gillnet	2013	Obs. Data,	0.03	0	2	0	62	62	0.67	18 (.25)
	2014	Weighout	0.05	0	1	0	17	17	0.86	
	2015		0.06	0	3	0	30	30	0.55	
	2016		0.08	0	1	0	7	7	0.97	
	2017		0.09	1	1	11	11	22	0.71	
Northeast Bottom Trawl ^c	2013	Obs. Data,	0.15	0	4	0	17	17	0.54	14 (.25)
	2014	Logbook	0.17	0	3	0	17	17	0.53	
	2015		0.19	0	4	0	22	22	0.45	
	2016		0.12	0	2	0	16	16	0.46	
	2017		0.16	0	0	0	0	0	0	
Mid-Atlantic Bottom Trawl ^c	2013	Obs. Data,	0.06	0	24	0	254	254	0.29	278(.13)
	2014	Dealer Data	0.08	3	38	24	305	329	0.29	
	2015		0.09	0	26	0	250	250	0.32	
	2016		0.10	0	22	0	177	177	0.33	
	2017		0.10	0	66	0	380	380	0.23	
Pelagic Longline	2013	Obs. Data,	0.09	0	0	0	0	0	0	2.8 (.74)
	2014	Logbook	0.10	0	0	0	0	0	0	
	2015	Data	0.12	1	0	9.05	0	9.05	1	
	2016		0.15	0	0	0	0	0	0	
	2017		0.12	1	0	4.92	0	4.92	1	
TOTAL	-	-	-	-	-	-	-	-	-	419 (.10)

a. Observer data (Obs. Data), used to measure bycatch rates, are collected within the Northeast Fisheries 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.

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. Fishery related bycatch rates for years 2013-2017 were estimated using an annual stratified ratio-estimator (Lyssikatos *et al.* 2020).

d. Serious injuries were evaluated for the 2013–2017 period and include both at-sea monitor and traditional observer data (Josephson *et al.* 2019)

Other Mortality

From 2013 to 2017, 608 common dolphins were reported stranded between Maine and Florida (Table 3; (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 23 October 2018). The total includes mass-stranded common dolphins in Massachusetts during 2013 (a total of 9 in 3 events), 2014 (a total of 14 in 4 events), 2015 (a total of 37 in 13 events), and 2016 (a total of 35 animals in 9 events), and 2 mass strandings in Virginia in 2013 (a total of 6 in 2 events). Animals released or last sighted alive include 13 animals in 2013, 12 in 2014, 9 in 2015, 23 in 2016 and 70 in 2017. In 2013, 10 cases were classified as human interaction, 4 of

which were fishery interactions. In 2014, 5 cases were classified as human interaction, 1 of which was a fishery interaction. In 2015, 2 cases were classified as human interactions, both in Rhode Island. Seven cases in 2016 were coded as human interaction, 1 of which was a fishery interaction. Six cases in 2017 were coded as human interaction, 2 of which were classified as fishery interactions and 1 of which was classified as a boat collision. In an analysis of mortality causes of stranded marine mammals on Cape Cod and southeastern Massachusetts between 2000 and 2006, Bogomolni (2010) reported that 61% of stranded common dolphins were involved in mass-stranding events, and 37% of all the common dolphin stranding mortalities were disease-related.

The Marine Animal Response Society of Nova Scotia reported no common dolphins stranded in 2013, 3 in 2014, 2 in 2015, 5 in 2016 and 5 in 2017 (Tonya Wimmer/Andrew Reid, pers. comm.).

Table 3. Common dolphin (*Delphinus delphis delphis*) reported strandings along the U.S. Atlantic coast, 2013-2017.

STATE	2013	2014	2015	2016	2017	TOTALS
New Hampshire	0	0	1	1	2	4
Massachusetts ^{a, b}	48	38	40	67	166	359
Rhode Island ^b	6	6	7	4	5	28
Connecticut	0	0	2	1	1	4
New York ^b	24	7	3	3	15	56
New Jersey	19	8	3	5	0	35
Delaware	3	0	2	0	0	5
Maryland	3	0	1	0	0	4
Virginia ^a	13	9	2	0	1	25
North Carolina	9	6	4	1	0	20
TOTALS	125	74	65	82	190	540

a. Massachusetts mass strandings (2013–4, 3 2, 2014 – 2, 2, 5, 5, 2015–2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 4, 4, 4, 4), 2016–8,5,4,4,4,3,3,2,2, 2017–2x5, 3x3, 4x4, 5x5, 7x3, 14x1). Two mass strandings in Virginia in April 2013 - a group of 4 and a group of 2.

b. Ten records with indications of human interactions in 2013 (3 in New York, 1 in Rhode Island and 6 in Massachusetts), 4 of which (1 in Massachusetts and 3 in New York) were classified as fishery interactions. Five records of human interaction in 2014 (1 fisheries interaction in Rhode Island, 2 other human interactions in Massachusetts and 2 in Rhode Island). Two of the human interactions in 2014 (1 Massachusetts and 1 Rhode Island) involved live animals. Two records of HI in 2015, both in Rhode Island. Seven HI cases in 2016 (6 in Massachusetts and 1 in Rhode Island), 5 of which were relocation responses to live animals. Of the 2 dead HI, 1 in Massachusetts was coded as a fishery interaction and 1 in Rhode Island had unauthorized public intervention prior to euthanasia by stranding responders. Six HI cases in 2017 (1 in Rhode Island and 5 in Massachusetts), 2, of which were classified as fishery interactions (1 in Rhode Island and 1 in Massachusetts). One of the Massachusetts HI cases was classified as a boat collision.

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. However a recently published human interaction manual (Barco and Moore 2013) and case criteria for human interaction determinations (Moore *et al.* 2013) should help with this.

HABITAT ISSUES

The chronic impacts of contaminants (polychlorinated biphenyls [PCBs] and chlorinated pesticides [DDT, DDE,

dieldrin, etc.]) on marine mammal reproduction and health are of concern (e.g., Pierce *et al.* 2008; Jepson *et al.* 2016; Hall *et al.* 2018; Murphy *et al.* 2018), but research on contaminant levels for the western north Atlantic stock of common dolphins is lacking.

Climate-related changes in spatial distribution and abundance, including poleward and depth shifts, have been documented in or predicted for plankton species and commercially important fish stocks (Nye *et al.* 2009; Head *et al.* 2010; Pinsky *et al.* 2013; Poloczanska *et al.* 2013; Hare *et al.* 2016; Grieve *et al.* 2017; Morley *et al.* 2018) and cetacean species (e.g., MacLeod 2009; Sousa *et al.* 2019). There is uncertainty in how, if at all, the distribution and population size of this species will respond to these changes and how the ecological shifts will affect human impacts to the species.

STATUS OF STOCK

Common dolphins are not listed as threatened or endangered under the Endangered Species Act, and the Western North Atlantic stock is not considered strategic under the Marine Mammal Protection Act. The 2013–2017 average annual human-related mortality does not exceed PBR. The total U.S. 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. The status of common dolphins, relative to OSP, in the U.S. Atlantic EEZ is unknown. Population trends for this species have not been investigated.

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