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) (Figure 1). 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 (32º 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 11ºC (Sergeant et al. 1970; Gowans and Whitehead 1995).

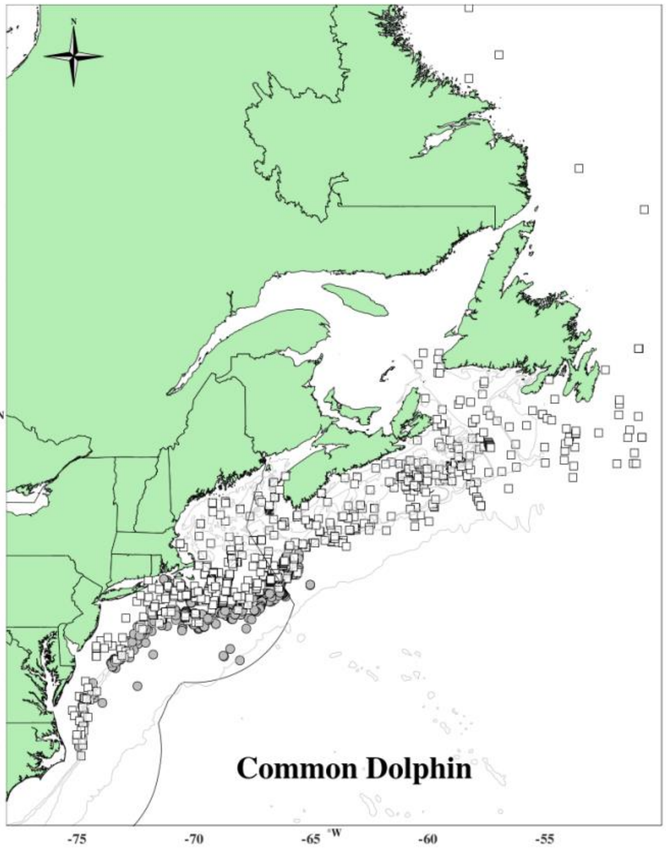

Figure 1. Distribution of common dolphin sightings from NEFSC and SEFSC shipboard (circles) and aerial surveys (squares) during the summers of 1998, 1999, 2002, 2004, 2006, 2007, 2010, 2011, 2016, and 2021 and Department of Fisheries and Oceans Canada 2007 TNASS and 2016 NAISS surveys. Isobaths are the 100-m, 1000-m and 4000-m depth contours.

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.

POPULATION SIZE

The current best abundance estimate for Western North Atlantic stock of common dolphins is 93,100 (CV=0.56) which is the total of NEFSC and SEFSC surveys conducted in 2021(Table 1). This estimate, derived from shipboard surveys, covers most of this stock's known range. Because the survey areas did not overlap, the estimates from the two surveys were added together and the CVs pooled using a delta method to produce a species abundance estimate for the stock area.

Earlier Abundance Estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent Surveys and Abundance Estimates

Abundance estimates of 48,723 (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 of the stock area 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 38ºN 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 38ºN 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.

More recent abundance estimates of 85,035 (CV=0.61) and 8,065 (CV=0.86) common dolphins were generated from vessel surveys conducted in U.S. waters of the western North Atlantic during the summer of 2021 (Table 1; Garrison and Dias 2023; Palka 2023). One survey was conducted from 16 June to 23 August in waters north of 36ºN latitude and consisted of 5,871 km of on-effort trackline along the shelf break and offshore to the outer edge of the U.S. EEZ (NEFSC and SEFSC 2022). The second vessel survey covered waters from central Florida (25ºN latitude) to approximately 38ºN latitude between the 200-m isobaths and the outer edge of the U.S. EEZ during 12 June–31 August. A total of 5,659 km of trackline was covered on effort (NEFSC and SEFSC 2022). 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 the current best 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_{est}) and coefficient of variation (CV). The estimate considered best is in bold font.***

Month/Year	Area	N_{est}	CV
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	48,723	0.48

Month/Year	Area	N_{est}	CV
June–Sep 2016	Bay of Fundy/Scotian Shelf/Gulf of St. Lawrence	43,124	0.28
June–Sep 2016	Florida to Newfoundland/Labrador (COMBINED)	172,974	0.21
Jun–Aug 2021	New Jersey to lower Bay of Fundy	85,035	0.61
Jun–Aug 2021	Central Florida to New Jersey	8,065	0.86
Jun–Aug 2021	**Central Florida to lower Bay of Fundy (COMBINED)**	**93,100**	**0.56**

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 93,100 animals (CV=0.56), derived from the 2021 shipboard surveys. The minimum population estimate for the western North Atlantic common dolphin is 59,897.

Current Population Trend

There are insufficient data to support a population trend analysis for this species.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

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 that suggests 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 59,897 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 599.

Table 2. Best and minimum abundance estimates for the western North Atlantic common dolphin (**Delphinus delphis delphis*****) with Maximum Productivity Rate (R_{max}), Recovery Factor (F_r) and PBR.***

N_{est}	CV	N_{min}	F_r	R_{max}	PBR
93,100	0.56	59,897	0.5	0.04	599

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Average annual estimated fishery-related mortality or serious injury to this stock during this reporting period are presented in Table 3.

*Table 3. The total annual estimated average human-caused mortality and serious injury for the western North Atlantic common dolphin (***Delphinus delphis delphis***).*

Years	Source	Annual Est. Avg.	CV
2017–2021	U.S. fisheries using observer data	413	0.10
2017–2021	Research mortalities	0.2	
2017–2021	Non-fishery human-caused stranding mortalities	0.6	
TOTAL		413.8	

Uncertainties not accounted for include the potential that the observer coverage was not representative of the fishery during all times and places and was lower in multiple fisheries during the COVID-19 pandemic years (2020-2021) (Table 4). There are no major known sources of unquantifiable human-caused mortality or serious injury for this stock.

Pelagic Longline

Pelagic longline bycatch estimates of common dolphins for 2017–2021 were documented in Garrison and Stokes (2020a, 2020b, 2021, 2023a, 2023b). 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 4 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Northeast Sink Gillnet

Annual common dolphin mortalities were estimated using annual ratio-estimator methods (Orphanides 2020, 2021; Precoda and Orphanides 2022, Precoda 2023). See Table 4 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 and Chavez-Rosales 2022). See Table 4 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 and Chavez-Rosales 2022). See Table 4 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 during observed trips in most years. Annual common dolphin mortalities were estimated using annual ratio-estimator methods (Orphanides 2019, 2020, 2021; Precoda and Orphanides 2022, Precoda 2023). See Table 4 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Research Takes

The Northeast Fisheries Science Center reported a common dolphin mortality that occurred during the fall research trawl survey in 2021.

Table 4. 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 Estimated Mortality
Northeast Sink Gillnet	2017 2018 2019 2020 2021	Obs. Data, Trip Logbook, Allocated Dealer Data	0.12 0.11 0.13 0.02 0.11	0 0 0 0 0	20 10 1 2 3	0 0 0 0 0	133 93 5.0 50 39	133 93 5.0 50 39	0.28 0.45 0.68 0.25 0.24	64(0.129)
Mid-Atlantic Gillnet	2017 2018 2019 2020 2021	Obs. Data, Weighout	0.09 0.09 0.13 0.03 0.01	1 0 0 0 0	1 1 3 0 0	11 1 0 5 4	11 7.7 20 25 20	22 7.7 20 30 24	0.71 0.91 0.56 0.55 0.33	21(0.33)
Northeast Bottom Trawl[c]	2017 2018 2019 2020 2021	Obs. Data, Logbook	0.12 0.12 0.16 0.08 0.19	0 0 0 0 0	0 4 2 2 8	0 0 0 0 0	0 28 10 50 38	22 16 0 28 10 50 43	0 0.54 0.62 0.25 0.42	64(0.18)
Mid-Atlantic Bottom Trawl[c]	2017 2018 2019 2020 2021	Obs. Data, Dealer Data	0.14 0.12 0.12 0.02 0.04	0 1 2 0 0	66 34 52 54 13	0 5 15 7 0	380 200 380 237 230	380 205 395 333 230	0.23 0.54 0.23 0.14 0.57	309(0.13)
Pelagic Longline	2017 2018 2019 2020 2021	Obs. Data, Logbook Data	0.12 0.10 0.10 0.09 0.08	1 1 0 0 0	0 0 0 0 0	4.92 1.44 0 0 0	0 0 0 0 0	4.92 1.44 0 0 0	1 1 0 0 0	1.27(0.81)
TOTAL										413(0.10)

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.

c. Fishery related bycatch rates were estimated using an annual stratified ratio-estimator (Lyssikatos and Chavez-Rosales 2022).

d. Serious injuries were evaluated for the period and include both at-sea monitor and traditional observer data (Josephson and Lyssikatos 2023)

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 2017–2021 average annual human-related mortality does not exceed PBR. The total U.S. fishery-related mortality and serious injury for this stock is over 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 Optimum Sustainable Population (OSP), in the U.S. Atlantic EEZ is unknown.

OTHER FACTORS THAT MAY BE AFFECTING THE STOCK

Strandings

Common dolphin strandings between Maine and Florida are reported in Table 5 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 19 October 2022). The total includes mass-stranded common dolphins in Massachusetts during 2017 (over 90 animals in 20 events), 2018 (a total of 28 animals in 9 events), 2019 (28 animals in 9 events), 2020 (79 animals in ~8 events) and 2021 (47 animals in ~11 events). Animals released or last sighted alive include 70 in 2017, 18 in 2018, 29 in 2019, 60 in 2020 and 48 in 2021. Six common dolphin mortalities in 2017 were coded as confirmed human interaction (HI), 1 in Rhode Island and 5 in Massachusetts. Of these, 2 were classified as fishery interactions (1 in Massachusetts and 1 in Rhode Island), 1 was classified as a possible boat collision, and 1 was released alive. Another dolphin was euthanized after multiple restrandings, and another was determined to be a human interaction case due to beachgoer intervention. In 95 stranding cases in 2017, human interaction was listed as CBD (could not be determined). In 2018, 5 cases were coded as definite human interactions, 1 in Virginia and 4 in Massachusetts. Of these, two were public harassment and 3 involved fishing gear, though only one was classified as a fishery interaction. (In the other 2 cases, HI was deemed “other human interaction” instead of fishery interaction possibly because it was unknown if gear was actively fished). Another 55 records in 2018 had CBD listed in the HI column. Eight stranding mortalities in Massachusetts in 2019 were classified as human interactions and 1each in New York and Rhode Island. The New York case was a fishery interaction. All were either coded as unlikely or undetermined that the HI contributed to the stranding. Another 69 mortalities in 2019 were listed as CBD in the HI column. In 2020, a total of 6 common dolphin strandings were classified as confirmed HI, and another 88 as CBD HI, with 1 North Carolina and 1 New York stranding classified as fisheries interaction. However, only 1 of those had the fishery interaction deemed a “probable” contribution to cause stranding. In 2021, 11 stranding mortalities were classified as confirmed human interactions, 4 in New York and 7 in Massachusetts and 72 as CBD human interactions. One of those NY HI cases was classified as a fishery interaction. This was the only case where the interaction event was coded as a probable contributor to the stranding. In this 5-year period, only 3 interactions (the boat strike in 2017 and the 2 “other HI” cases in 2018) were likely non-fishery human-caused mortalities.

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 5 common dolphins stranded in 2017, 5 in 2018, 4 in 2019, 4 in 2020 and 15 in 2021 (Tonya Wimmer/Andrew Reid, pers. comm.).

Table 5. Common dolphin (**Delphinus delphis delphis*****) reported strandings along the U.S. Atlantic coast, 2017–2021.***

STATE	2017	2018	2019	2020	2021	TOTALS
Maine	0	0	0	1	1	2
New Hampshire	2	0	0	0	1	3
Massachusetts	166	61	95	136	122	580
Rhode Island	5	4	5	13	6	33
Connecticut	1	0	0	0	0	1
New York	15	11	9	15	31	81
New Jersey	0	2	4	6	5	17
Delaware	0	0	1	0	1	2
Maryland	0	0	2	2	2	6
Virginia	1	3	5	2	2	13
North Carolina	0	3	4	7	0	14
TOTALS	190	84	125	182	171	752

It should be recognized that evidence of human interaction does not always indicate cause of death or stranding, but rather only that there was evidence of interaction with a fishery (e.g., line marks, net marks) or evidence of a boat strike, gunshot wound, mutilation, etc., at some point, including post-stranding. Stranding data probably underestimate the extent of 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 human interaction manual (Barco and Moore 2013) and case criteria for human interaction determinations (Moore et al. 2013) published in 2013 aimed to improve determination consistency among responders.

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.

Anthropogenic sound in the world's oceans has been shown to affect marine mammals, with vessel traffic, seismic surveys, and active naval sonars as the main contributors to low- and mid-frequency noise in oceanic waters (e.g., Nowacek et al. 2015; Gomez et al. 2016; NMFS 2018). The long-term and population consequences of these impacts are not well-documented and likely vary by species and other factors. Impacts on marine mammal prey from sound are also possible (Carroll et al. 2017), but the duration and severity of any such prey effects on marine mammals are unknown.

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.

Chavez-Rosales et al. (2022) documented an overall 178 km northeastward spatial distribution shift of the seasonal core habitat of Northwest Atlantic cetaceans that was related to changing habitat/climatic factors. Results varied by season and species. This study used sightings data collected during seasonal aerial and shipboard line transect abundance surveys during 2010 to 2017. During this time frame, the weighted centroid of the common dolphin core habitat moved farthest during fall (216 km towards the northeast) and least during summer (111 km). There is uncertainty in how, if at all, the changes in distribution and population size of cetacean species may interact with changes in distribution of prey species and how the ecological shifts will affect human impacts to the species.

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