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 (32º N) (Jefferson *et al*. 2009). They have 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˚ (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).

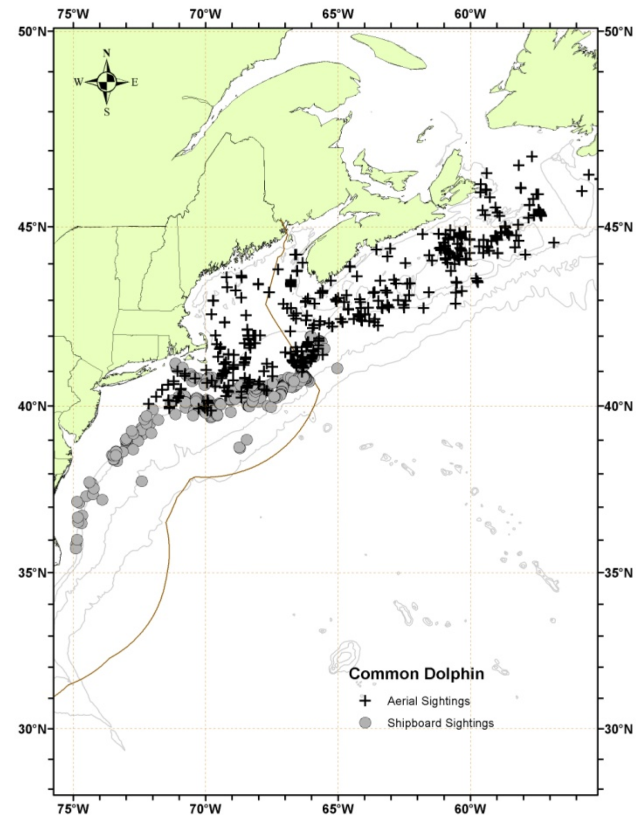

Figure 1. *1Distribution of common dolphin sightings from NEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008 2010 and 2011. Isobaths are the 100-m, 1,000-m, and 4,000-m depth contours.*

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 common dolphins off the U.S. Atlantic coast is 70,184 (CV=0.28). This estimate, derived from 2011 shipboard and aerial surveys, is the only current estimate available. This estimate is substantially lower than the estimate from the 2015 SAR (173,486, CV=0.55). This is because the previous estimate included data from the 2007 TNASS surveys of Canadian waters. For the purposes of this SAR, as recommended in the guidelines for preparing Stock Assessment Reports (NMFS 2016), estimates older than eight years are deemed unreliable, so this new estimate must not include data from the 2007 TNASS survey. This new estimate should not be interpreted as a decline in abundance of this stock, as previous estimates are not directly comparable.

A key uncertainty in the current abundance estimate is the number of animals in Canadian waters. The northern part of the stock's range was not surveyed in the 2011 shipboard survey (Palka 2012). This new abundance estimate largely represents only the US portion of this stock, and a small portion in Canadian waters. Additionally, the current abundance estimate does not account for availability bias due to submerged animals. Without a correction for this bias, the abundance estimate is likely biased low. Finally, since the most current estimate dates from a survey done in 2011, the ability for that estimate to accurately represent the present population size has become increasingly uncertain.

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. 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

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 70,184 animals (CV=0.28), derived from the 2011 aerial and shipboard surveys. The minimum population estimate for the western North Atlantic common dolphin is 55,690.

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).

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 55,690 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 557.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Average annual estimated fishery-related mortality or serious injury to this stock during 2011–2015 was 437 (CV=0.10) common dolphins.

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, US 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 (Orphanides 2013; Hatch and Orphanides 2014, 2015, 2016; Orphanides and Hatch 2017). 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 (Orphanides 2013; Hatch and Orphanides 2014, 2015, 2016; Orphanides and Hatch 2017). 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 (Chavez-Rosales *et al.* 2017). 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 (Chavez-Rosales *et al.* 2017). 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 Mid-water Trawl Fishery (Including Pair Trawl)

A common dolphin mortality was observed in this fishery in 2012 (Table 2). An expanded bycatch estimate has not been calculated so the minimum raw count is reported.

Pelagic Longline

Pelagic longline bycatch estimates of common dolphins for 2011–2015 were documented in Garrison and Stokes (2012, 2013, 2014, 2016, 2017). 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.

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	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Annual Combined Mortality

Northeast Sink Gillnet[d]	11-15	Obs. Data, Trip Logbook, Allocated Dealer Data	.19, .15, .11, .18, .14	0, 0, 0, 0, 0	6, 6, 5, 11, 3	0, 0, 0, 0, 0	49, 95, 104, 111, 55	49, 95, 104, 111, 55	.71, .40, .46, .47, .54	86 (.23)
Mid-Atlantic Gillnet	11-15	Obs. Data, Trip Logbook, Allocated Dealer Data	.02, .02, .03, .05, .06	0, 0, 0, 0, 0	3, 1, 2, 1, 3	0, 0, 0, 0, 0	29, 15, 62, 17, 30	29, 15, 62, 17, 30	.53, .93, .67, .86, .55	31(.34)
Northeast Mid-water Trawl - Including Pair Trawl	11-15	Obs. Data Trip Logbook	.41, .45, .37, .42, .08	0, 0, 0, 0, 0	0, 1, 0, 0, 0	0, 0, 0, 0, 0	0, na, 0, 0, 0	0, 1, 0, 0, 0	0, 1, 0, 0, 0	0.2
Northeast Bottom Trawl[c]	11-15	Obs. Data Trip Logbook	.26, .17, .15, .17, .19	0, 0, 0, 0, 0	22, 10, 4, 3, 4	3, 2, 0, 0, 0	73, 42, 17, 17, 22	73, 42, 17, 17, 22	32, .47, .54, .53, .45	34 (.22)
Mid-Atlantic Bottom Trawl[c]	11-15	Obs. Data Trip Logbook	.08, .05, .06, .08, .09	1, 0, 0, 3, 0	29, 32, 24, 35, 26	8, 7, 0, 24, 0	263, 316, 269, 305, 250	271, 323, 269, 329, 250	.25, .26, .29, .29, .32	285(.12)
Pelagic Longline	11-15	Obs. Data Logbook	.09, .07, .09, .10, .12	0, 0, 0, 0, 1	0, 0, 0, 0, 0	0, 0, 0, 0, 9.05	0, 0, 0, 0. 0	0, 0, 0, 0, 9.05	0, 0, 0, 0, 1.0	1.81 (1.0)
TOTAL										437 (.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 2011-2015 were estimated using an annual stratified ratio-estimator (Chavez-Rosales *et al.* 2017).

d. Serious injuries were evaluated for the 2011–2015 period and include both at-sea monitor and traditional observer data (Josephson *et al. 2017*)

CANADA

One common dolphin was reported as a bycatch mortality in Canadian bottom otter trawl fishing on Georges Bank in 2012 (pers. comm. Marine Animal Response Society, Nova Scotia). Canadian mortalities are not added to the U.S. estimates for this SAR, as the abundance estimate and PBR apply mainly to U.S. waters.

Other Mortality

From 2011 to 2015, 654 common dolphins were reported stranded between Maine and Florida (Table 3; (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2016). The total includes mass-stranded common dolphins in Massachusetts during 2011 (a total of 30 animals in 5 events), 2012 (a total of 192 animals in 23 group stranding events), 2013 (a total of 9 in 3 events), 2014 (a total of 14 in 4 events), and 2015 (a total of 37 in 13 events); one mass stranding in North Carolina in 2011 (4 animals); and 2 mass strandings in Virginia in 2013 (a total of 6 in 2 events). Fifteen animals in 2011, 71 animals in 2012, 13 in 2013, and 12 in 2014 were released or last sighted alive. In 2011, 3 animals were classified as having human interactions, 2 of which were fishery interactions (one of these was satellite-tagged and released). Twelve human interaction cases were reported in 2012 (7 in Massachusetts, 3 in New York, and 2 in New Jersey), 6 of which (2 in Massachusetts, 2 in New York, and 1 in New Jersey) were classified as fisheries interactions. 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. 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 2 common dolphins (one a fisheries interaction) stranded in 2011, 0 in 2012 and 2013, 3 in 2014 and 2 in 2015 (Tonya Wimmer/Andrew Reid, pers. comm.).

Table 3. Common dolphin (*Delphinus delphis delphis*) reported strandings along the U.S. Atlantic coast, 2011-2015.						
STATE	2011	2012	2013	2014	2015	**TOTALS**
Maine	0	2	0	0	0	**2**
Massachusetts[a]	64	221	48	38	40	**411**
Rhode Island[c]	5	6	6	6	7	**30**
Connecticut	0	0	0	0	2	**2**
New Hampshire	0	0	0	0	1	**1**
New York [c]	17	13	24	7	3	**68**
New Jersey[a, c]	9	14	19	8	3	**53**
Delaware[c]	1	1	3	0	2	**7**
Maryland	1	1	3	0	1	**6**
Virginia[a,c]	9	4	13	9	2	**37**
North Carolina[a,c]	18	0	9	6	4	**37**
TOTALS	**124**	**262**	**125**	**74**	**65**	**654**

a. Massachusetts mass strandings (2011-3,3,4,7,13; 2012 - 23 group events ranging from 2 to 22 animals each, 2013 - 4, 3 2, 2014 – 2, 2, 5, 5, 2015-2, 2, 2, 2, 2, 2, 3, 3, 3, 4, 4, 4, 4). North Carolina mass stranding of 4 animals in 2011. Two mass strandings in Virginia in April 2013 - a group of 4 and a group of 2. Three animals (one released alive) involved in mass stranding in NJ in 2012.

b. Three HI cases in 2011, all in Massachusetts, 2 of which were classified as fishery interactions (but one of those fishery interaction animals was released alive). Twelve HI cases in 2012 (7 in Massachusetts, 3 in New York and 2 in New Jersey), 6 of which (2 in Massachusetts, 2 in New York and 1 in New Jersey) were classified as fisheries interactions. 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.

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.

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 2011–2015 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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