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**ANALYSIS OF STRANDING DATA TO SUPPORT ESTIMATES OF
HUMAN-CAUSED MORTALITY AND SERIOUS INJURY IN COMMON
BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS TRUNCATUS*)
STOCK ASSESSMENTS FOR THE ATLANTIC OCEAN AND
GULF OF MEXICO**

BY

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TABLE OF CONTENTS

LIST OF TABLES	iv
LIST OF FIGURES	v
BACKGROUND	1
METHODS	2
Assigning Dolphin Strandings to Stock	2
Examining Stranding Data for Human and Fishery Interactions and for Live Strandings	7
Assigning Dolphin Strandings to Fishery or Gear Type	7
Special Handling of Stranded Mortalities with Hook and Line Fishing Gear Interactions.....	8
Serious Injury Determinations for Live Strandings and Opportunistic At-Sea Observations with Evidence of Human Interaction.....	9
ACKNOWLEDGMENTS	9
LITERATURE CITED	9

LIST OF TABLES

Table 1. Matrix depicting spatio-temporal distribution from New Jersey to North Carolina and overlap of four common bottlenose dolphin stocks (Northern Migratory Coastal=gray, Southern Migratory Coastal=pink, Northern North Carolina Estuarine System=blue, Southern North Carolina Estuarine System=yellow) across 16 geographic regions and bi-monthly periods (see Figure 1; adapted from Lyssikatos and Garrison (2018)). Stippling indicates stock overlap.....	13
Table 2. Stranded mortalities of common bottlenose dolphins (<i>Tursiops truncatus truncatus</i>) in U.S. Atlantic or Gulf of Mexico waters that were recovered with entangled and/or ingested hook and line (H&L; i.e., rod and reel) fishing gear. Strandings occurred from 2010 to 2017. Region of the U.S. and year of the stranding are indicated by the initial five letter-number combination of the NMFS Regional Number. For example, NER11-2034 is a case from the northeast region (Maine to Virginia) in 2011, and SER10-0797 is a case from the southeast region (North Carolina to Texas) in 2010. All 2015–2017 strandings involving H&L fishing gear were evaluated and are included in this table. However, for earlier years (2010–2014), strandings were evaluated only if the stock assessment report (SAR) for that stock was being updated for the 2016 or 2017 SARs. The table includes: regional and field stranding numbers, stock assignment, and carcass condition at the time of examination. Level A stranding data and comments were reviewed for each case, as well as any additional evidence available and provided by the stranding network responders, such as near-real time reports, Human Interaction (HI) forms, photos, necropsy reports, stomach content analysis, and/or gear analysis. Using all available information, an evaluation was made for each case as to whether the evidence indicated the H&L gear contributed to the stranding and/or death of the dolphin. In many instances, it could not be determined (CBD) if the H&L gear contributed to the stranding and/or death, usually due to the carcass being in a state of moderate or advanced decomposition or due to a lack of information. Table A includes Atlantic Ocean stranded mortality cases, and Table B includes Gulf of Mexico cases. Atlantic Ocean stock abbreviations: CFL Coastal = Central Florida Coastal; IRLES = Indian River Lagoon Estuarine System; JES = Jacksonville Estuarine System; NFL Coastal = Northern Florida Coastal; NNCES = Northern North Carolina Estuarine System; NGSSCES = Northern Georgia/Southern South Carolina Estuarine System; NM Coastal = Northern Migratory Coastal; SC/GA Coastal = South Carolina/Georgia Coastal; SM Coastal = Southern Migratory Coastal; SNCES = Southern North Carolina Estuarine System. Gulf of Mexico stock abbreviations: BSE = Northern Gulf of Mexico Bay, Sound, and Estuary Stocks (this SAR currently contains information on 25 individual bay, sound, and estuary stocks; when BSE is listed in the Stock Assignment(s) column, the individual stock name follows in parentheses); Copano Bay,... = Copano Bay/Aransas Bay/San Antonio Bay/Redfish Bay/Espiritu Santo Bay; PIS = Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay.....	14
Table 3. Gulf of Mexico bay, sound, and estuary (BSE) stocks of common bottlenose dolphins. BSE stocks are numbered 1–31 corresponding to the locations in Figure 4. Stocks are listed from west (Texas) to east (Florida). See Figures 5–11 for more detailed views of BSE stocks.	31

LIST OF FIGURES

- Figure 1. Range of the coastal form of common bottlenose dolphins from North Carolina (NC) to New Jersey (NJ), including estuarine (light blue) and ocean waters (dark and stippled blue). The range is divided into 16 geographic regions (see Table 1) where dolphins are assigned to stock(s) based on bimonthly periods: NM=Northern Migratory, SM=Southern Migratory, NNCES=Northern NC Estuarine System, SNCES=Southern NC Estuarine System (adapted from Lyssikatos and Garrison [2018]). Note in the inset that the regions closest to shore extend out to 3 km south of Oregon Inlet, NC, out to 1 km from Oregon Inlet to Assateague Island, Virginia, and out to the 20-m isobath from Assateague Island to NJ..... 32
- Figure 2. Common bottlenose dolphin stocks in the Atlantic Ocean from South Carolina (SC) to Florida (FL) showing assignment polygons for Bay, Sound, and Estuary (BSE) stocks (colored) and coastal stocks (gray patterns). Inset shows polygons for BSE stocks in SC and Georgia. See Figure 3 for closer views of BSE stocks in FL. ES = Estuarine System. 33
- Figure 3. Closer views of Bay, Sound, and Estuary stocks (colored) of common bottlenose dolphins along the Atlantic coast of Florida. Parts of the coast do not have a formally designated stock in their Estuarine Systems (ES). Coastal migratory stocks (gray patterns) are also shown; see Figure 2 for names. 34
- Figure 4. Bay, Sound, and Estuary (BSE) and coastal stocks of common bottlenose dolphins in the Gulf of Mexico. Assignment polygons for BSE stocks are numbered 1–31 and correspond to stocks names in Table 3. Boundaries for the three coastal stocks are displayed in gray pattern. See Figures 5–11 for more detailed views and BSE stock names; figures are arranged from west (Texas) to east (Florida). 35
- Figure 5. Common bottlenose dolphin stocks from southern Texas to near the Texas/Louisiana border showing assignment polygons for Bay, Sound, and Estuary stocks (colored). The top inset map shows Sabine Lake and Calcasieu Lake, both of which extend into coastal waters within the borders of the jetties. The bottom inset map shows the West Bay Stock that extends into coastal waters 1 km from shore and 3 km to the north and south of the inlet/pass..... 36
- Figure 6. Common bottlenose dolphin stocks in Louisiana west of the mouth of the Mississippi River showing assignment polygons for Bay, Sound, and Estuary stocks (colored). Note that Terrebonne-Timbalier Bay and Barataria Bay Estuarine System stocks extend into coastal waters out to 1 km from shore. 37
- Figure 7. Common bottlenose dolphin stocks in Louisiana east of the mouth of the Mississippi River towards Perdido Bay at the Alabama/Florida border showing assignment polygons for Bay, Sound, and Estuary stocks (colored). Note that the Mississippi Sound/Lake Borgne/Bay Boudreau Stock extends into coastal waters out to 1 km from shore along the barrier islands and east of barrier islands within Chandeleur Sound. 38
- Figure 8. Common bottlenose dolphin stocks from the Alabama/Florida border to St. Joseph Bay showing assignment polygons for Bay, Sound, and Estuary stocks (colored). The inset shows that the St. Joseph Bay Stock extends into coastal waters 2 km from shore. 39
- Figure 9. Common bottlenose dolphin stocks along the northwest coast of Florida showing assignment polygons for Bay, Sound, and Estuary stocks (colored)..... 40
- Figure 10. Common bottlenose dolphin stocks in western Florida showing assignment polygons for Bay, Sound, and Estuary stocks (colored). 41
- Figure 11. Common bottlenose dolphin stocks along the southwestern coast of Florida showing assignment polygons for Bay, Sound, and Estuary stocks (colored)..... 42

BACKGROUND

Section 117 of the Marine Mammal Protection Act (MMPA) requires the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service to prepare annual stock assessment reports (SARs) for marine mammal stocks that occur in U.S. waters. SARs are required to contain information on stock definition and geographic range, population size, potential biological removal level (PBR; see definition below), estimates of annual human-caused mortality and serious injury by source (e.g., U.S. commercial fisheries, recreational fisheries, research takes, ship strikes, shootings), habitat issues affecting a stock, and the status of the stock (strategic or non-strategic). A stock, or population stock, is defined by the MMPA as "a group of marine mammals of the same species or smaller taxa in a common spatial arrangement that interbreed when mature." For practical purposes, a stock is a management unit identifying a demographically independent biological population (NMFS 2016). PBR, as defined by the MMPA, is "...the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population." At-risk stocks are designated as "strategic", defined by the MMPA as "a marine mammal stock: A) for which the level of direct human-caused mortality and serious injury exceeds the PBR; B) based on the best available scientific information, is declining and is likely to be listed as a threatened species under the Endangered Species Act (ESA)...within the foreseeable future; or C) which is listed as a threatened species or endangered species under the ESA or is designated as depleted under the MMPA". For each stock, a PBR is calculated and compared to the estimate of annual human-caused mortalities and serious injuries for that stock. If mortalities and serious injuries exceed PBR, a stock is considered "strategic" and management actions may be triggered (e.g., take reduction teams); therefore, it is important to have an estimate of annual human-caused mortality and serious injury for each stock, and to identify the sources of mortality and serious injury that are impacting each stock.

The common bottlenose dolphin (*Tursiops truncatus truncatus*, hereafter referred to as bottlenose dolphin(s) or dolphin(s)), occurs in estuarine, coastal, continental shelf, and oceanic waters of the western North Atlantic (WNA) and Gulf of Mexico (GMx). In the WNA, distinct morphological forms have been identified: a larger, more robust "offshore" morphotype occurring in deep waters of the continental shelf and slope from Florida's east coast to Canada, and a smaller "coastal" morphotype present in estuarine, coastal, and shelf waters from Florida to approximately Long Island, New York (Mead and Potter 1995; Torres *et al.* 2003; Rosel *et al.* 2009; Hayes *et al.* 2017). The offshore morphotype is considered a single separate stock (Offshore Stock). The coastal morphotype, however, comprises at least 11 bay, sound, and estuary (BSE) stocks in WNA waters from Florida through Virginia, and five coastal stocks that abut the BSE stocks (Hayes *et al.* 2017) (Figures 1–3). Many of the BSE stocks also occur in nearby coastal waters resulting in spatio-temporal overlap with coastal migratory stocks (e.g., Speakman *et al.* 2010; Hayes *et al.* 2017; Balmer *et al.* 2018; Lyssikatos and Garrison 2018). Additionally, spatio-temporal overlap occurs between different coastal migratory stocks in the WNA (e.g., Hayes *et al.* 2017; Lyssikatos and Garrison 2018). In the northern GMx (i.e., U.S. GMx), the coastal morphotype comprises at least 31 BSE stocks from Texas through Florida's west coast and three coastal stocks that abut the BSE stocks. As described for the WNA, there is known spatio-temporal overlap in distribution between some stocks in BSE and coastal waters (e.g., Balmer *et al.* 2016; Hayes *et al.* 2017; Mullin

et al. 2017; Wells *et al.* 2017). As more research is conducted and results become available, revisions to stock structure and/or stock boundaries will likely be necessary.

As mentioned above, each SAR contains information about annual human-caused mortality and serious injury by source. Region-wide and systematic data (e.g., observer coverage) to determine the magnitude and extent of injuries and mortalities of dolphins due to fishery interactions in U.S. estuarine and coastal waters are lacking for most fisheries. Exceptions include federal observer coverage of coastal gillnet fisheries in the mid-Atlantic (Lyssikatos and Garrison 2018), south Atlantic (Mathers *et al.* 2017), and portions of the Gulf of Mexico (Mathers *et al.* 2016), and state observer coverage of estuarine gillnets in North Carolina (McConnaughey *et al.* 2019). In addition, there is federal observer coverage of the shrimp otter trawl fishery in the U.S. Gulf of Mexico and southern U.S. Atlantic (e.g., Scott-Denton *et al.* 2012; Soldevilla *et al.* 2015), and federal observer coverage of the reef fish bottom longline and vertical line fisheries in the U.S. Gulf of Mexico (Scott-Denton *et al.* 2011). However, the levels of observer coverage in these fisheries are often not sufficient to detect statistically rare bycatch events (Lyssikatos and Garrison 2018). Due to this fact and the absence of systematic observer coverage throughout WNA and GMx fisheries, counts of stranded dolphins provide minimum rates of fishery interactions and baseline information on the spatial extent of interactions (Friedlaender *et al.* 2001; Byrd *et al.* 2008; Byrd and Hohn 2010; Byrd *et al.* 2014). Stranding data are also helpful for detecting real-time increases in fishery interaction occurrences and detecting trends that may be used to guide management efforts (Byrd *et al.* 2008).

In order for stranding data to be incorporated into the appropriate SARs for human-caused mortality and serious injury discussion, each dolphin stranding must be assigned to the stock of origin or to one or more potential stocks of origin (due to spatiotemporal overlap of stocks and the uncertainty of assigning an animal in an area of overlap to one stock, a stranding could be assigned to more than one stock). Details of how this is performed annually are given in the Methods section. For the WNA from North Carolina to the north, we follow the methods for assigning observed takes to stock outlined in Lyssikatos and Garrison (2018) to assigning stranded animals to stock. Observed takes (through an observer program), fisherman self-reported takes (through the Marine Mammal Authorization Program), and opportunistic at-sea observations by NOAA and non-NOAA researchers, marine patrol, and private citizens, are also assigned to stock. Some of the observed or self-reported takes are also included within the stranding data. Regardless, for all cases of documented takes or at-sea observations, the same methods used for strandings are followed for assigning animals to stock. The documented takes and at-sea observations are also incorporated into SARs and Serious Injury Determination Reports as described below for stranded cases. The methods outlined here will be updated as new information on stock structure, stock boundaries, and/or stranding data become available.

METHODS

Assigning Dolphin Strandings to Stock

The NMFS oversees and authorizes the Marine Mammal Health and Stranding Response Program (MMHSRP), a national program to coordinate emergency responses to injured, sick, distressed, entangled, and dead marine mammals. Stranding networks, including local, state, or federal agencies, provide data to the MMHSRP via a Level A stranding data report form. The

MMHSRP data are managed by the NMFS on a regional basis. For the development of SARs, Level A stranding data (e.g., species, geographic coordinates, sex, length, human interaction category) are requested annually from the Greater Atlantic (Maine to Virginia) and Southeast (North Carolina to Texas) Regional Marine Mammal Stranding Programs to include all strandings of all species occurring during the preceding five years. This five-year time period coincides with the time period covered by the next annual SAR cycle (i.e., each SAR generally covers a five-year period). The request occurs after the data have been through a quality assurance and quality control check by the stranding programs, which typically takes six months after the end of a given calendar year. For example, the stranding data for 2013–2017 would be provided around June 2018.

Initially, the stranding data received from the regional programs are reviewed and all bottlenose dolphin strandings are sorted and placed in a separate spreadsheet for further review and eventual stock assignment. Data from the first four years of the dataset are checked against the previous five-year dataset to detect any new records that were entered late by stranding responders and, therefore, not included in previous SARs. Generally, only the most recent year's stranding data plus any strandings from the preceding four years that were entered late need to be assigned to stock. However, in the event of changes to stock boundaries that result from recently published studies and/or new data, all strandings or strandings from an area of boundary change for the entire five years are reviewed and re-assigned to stock.

Using ArcGIS mapping software, stranding locations are plotted over a basemap of the United States (NOS80K.shp¹) and over polygons that represent the current best known boundaries of each dolphin stock as defined in the SARs. For BSE stocks, these polygons were created on a gross level to intentionally encompass internal rivers and creeks that do not necessarily represent a given stock's distribution, but would capture any out of habitat occurrence of an animal into the headwaters of a particular estuarine system (e.g., Figure 1). As such, these polygons cross over land and should not be interpreted as exact stock boundaries in contrast to polygons for coastal stocks. The ArcGIS tool, Spatial Join, is used to initially assign strandings to stock polygons. In general, strandings that plot within the stock polygon for a given stock are assigned to that stock. Several steps are taken before and after this process to ensure accuracy of the stock assignment, including accounting for spatio-temporally overlapping stocks.

Steps to verify accuracy of stranding locations:

1. Coordinates of strandings are reviewed to ensure they are in the correct format (decimal degrees [34.3599] as opposed to decimal minutes tenths [34° 35.99'] or decimal minutes seconds [34° 34' 59'']) and that all longitudes are negative (west).
2. Plotted strandings are assigned state-specific symbology (different colors and/or symbol shapes) to visually detect abnormalities. This process allows for the rapid detection of strandings that have incorrect coordinates. During this process, locations are also reviewed

¹ National Oceanic and Atmospheric, National Ocean Service (NOS), Office of Coast Survey. 1994. NOS80K/ALLUS80K: Medium Resolution Digital Vector U.S. Shoreline shapefile Long Island Sound GIS project area: NOAA/NOS/ORCA/SEA, Silver Spring, MD. <https://pubs.usgs.gov/of/2004/1003/data/basemaps/usa/nos80k-faq.htm>

for strandings that occur inland. The stranding program is contacted for location anomalies to get corrected coordinates.

3. Plotted strandings are assigned county-specific symbology to visually detect abnormalities. Although occasionally an incorrect county is a data-entry error, a mis-aligned county can be a result of incorrect coordinates. The stranding program is contacted for location anomalies to get corrected coordinates.
4. Strandings that plot in open water are checked for accuracy of location data within the Level A stranding data. For example, locality details may describe that a floating carcass was recovered some distance from shore. If the record is not clear, the stranding program is contacted to request more information.
5. Anomalies in stranding location (e.g., inland, floating) are sometimes a result of changes to the shoreline since the production of the NOS80K basemap. This is especially true in areas of Louisiana and around non-stabilized inlets (e.g., Beaufort Inlet, North Carolina). Additionally, in some areas the land separating the ocean from inshore/estuarine waters (i.e., inside the 72 COLREGs line) is so narrow that assigning the stranding to coastal versus the adjacent estuarine stock may be unclear. In these cases, locality details are reviewed to check if any habitat designation was provided. In these scenarios, strandings are plotted in Google Earth™ in areas of known or suspected change before stranding programs are contacted to verify coordinates as necessary.

Steps to assign strandings to stock: Once the coordinates are verified using the steps listed above, strandings are assigned to stock based on their location within stock polygons. For some stocks, further scrutiny of the stranding records is required before stock assignments can be made, due in part, to spatio-temporal overlap of stocks (see Figures 1–3 for WNA and Figures 4–11 for GMx). The lists below for the Western North Atlantic and Gulf of Mexico provide additional details on how assignments are made for cases that require further scrutiny.

○ Western North Atlantic

1. General: For strandings in the WNA that are floating offshore of the 20-m isobath, a model that incorporates depth and month is used to estimate the probability that each stranding belongs to a coastal stock versus the Offshore Stock. This assignment is based upon a logistic regression model that estimates the probability of an observed carcass (or live animal) being from the coastal vs. offshore stock as a function of location and water depth. This model was derived from genetic identification of skin samples collected from free-swimming animals and is the same model used to partition abundance estimates between the two stocks in regions where they overlap (Garrison *et al.* 2017).
2. North of New York: Strandings north of New York are considered to belong to the Offshore Stock and they are not assigned to a BSE or coastal stock.
3. New York: Strandings from New York are dually assigned to the Northern Migratory Coastal Stock and the Offshore Stock regardless of where they are recovered (sound waters or coastal waters) and the month.
4. Virginia/North Carolina: Strandings from Virginia and North Carolina may be assigned to one or more of two estuarine and two coastal migratory stocks: Northern North Carolina Estuarine System (NNCES), Southern North Carolina Estuarine System (SNCES), Northern Migratory Coastal, and Southern Migratory Coastal stocks. A matrix of 16 geographic regions (New Jersey to the southern border of North Carolina) and six bimonthly periods was developed as a tool to identify the distribution of the four stocks,

including their overlap; the matrix was based on telemetry, photo-identification (photo-ID), biopsy, and stable isotope data (Table 1, Figure 1) (Lyssikatos and Garrison 2018). Only the Northern Migratory Coastal Stock is known to occur north of Virginia, except for Maryland's coastline in the Chesapeake Bay. Strandings from Chesapeake Bay (Maryland and Virginia), Virginia, and North Carolina are assigned to one of the 16 regions, and the month of the stranding is reviewed to assign them to stock(s) based on the matrix.

5. North Carolina: Records are checked for comments regarding coastal or estuarine waters as a means to double-check coordinates.
6. South Carolina: Strandings that occur on ocean-facing beaches of South Carolina during December–March are dually assigned to the South Carolina/Georgia (SC/GA) Coastal Stock and the Southern Migratory Coastal Stock. In all other months they are assigned to the South Carolina/Georgia (SC/GA) Coastal Stock.
7. South Carolina/Georgia: Five BSE stocks in South Carolina and Georgia are known to occasionally occur in coastal waters: Northern South Carolina Estuarine System (NSCES), Charleston Estuarine System (CES), Northern Georgia/Southern South Carolina Estuarine System (NGSSCES), Central Georgia Estuarine System (CGES), and Southern Georgia Estuarine System (SGES) stocks. However, the frequency and duration of these occurrences are uncertain. Until more information is available, strandings on ocean-facing beaches adjacent to these five BSE stocks are only assigned to the requisite coastal stock.
8. Georgia: Strandings that occur on ocean-facing beaches during January–February are dually assigned to the SC/GA Coastal Stock and the Southern Migratory Coastal Stock. In all other months they are assigned to the South Carolina/Georgia (SC/GA) Coastal Stock.
9. Florida: Strandings that occur on ocean-facing beaches off northern Florida as far south as 29.4°N during January–February are dually assigned to the Northern Florida (NFL) Coastal Stock and the Southern Migratory Coastal Stock. In all other months they are assigned to the Northern Florida (NFL) Coastal Stock.
10. General: Occasionally, strandings occur in estuarine areas that are not currently included within the polygon of any stock. These strandings are labeled "Undefined BSE" and occurrence of these strandings is included in the SAR for the adjacent BSE stock(s).

○ Gulf of Mexico

1. Texas: The polygon for the West Bay Stock includes a strip of coastal waters extending 1 km from shore and 3 km to the north and south of San Luis Pass because of the stock's known forays into coastal waters (Maze and Würsig 1999; Irwin and Würsig 2004; Ronje *et al.* 2018; Litz *et al.* 2019). Strandings from these coastal waters could belong to either the West Bay Stock or the adjacent coastal stock, and are dually assigned to both stocks. Strandings inside West Bay are assigned only to the BSE stock.
2. Texas and Louisiana: The polygons of Sabine Lake and Calcasieu Lake stocks extend out to include the pass opening and the inside of the jetty boundaries. Strandings in these areas could belong to either the corresponding BSE stock or the adjacent coastal stock, and are dually assigned to both stocks. Strandings inside the bays for these stocks are assigned only to the corresponding BSE stock.
3. Louisiana: The Barataria Bay Estuarine System Stock and Terrebonne-Timbalier Bay Estuarine System Stock overlap in Bayou Lafourche. Any strandings recovered from Bayou Lafourche are dually assigned to both stocks. The polygons for both stocks include a strip of coastal waters extending 1 km seaward of the barrier islands. Strandings on the

ocean side of these barrier islands could belong to either the corresponding BSE stock or the adjacent coastal stock, and are dually assigned to both stocks. Strandings inside the bays for these stocks are assigned only to the corresponding BSE stock.

4. Louisiana/Mississippi: The polygon for the Mississippi Sound/Lake Borgne/Bay Boudreau Stock includes a strip of coastal waters extending 1 km seaward from the barrier islands and includes the network of marsh islands on the western side of Chandeleur Sound. Strandings that occur on the ocean side of the barrier islands and along the outer marsh islands on the western side of Chandeleur Sound could belong to either the BSE stock or the adjacent coastal stock, and are dually assigned to both stocks. Strandings inside the bays are assigned only to the BSE stock. Strandings within Lake Pontchartrain, which is connected to Lake Borgne, are assigned to the Mississippi Sound/Lake Borgne/Bay Boudreau Stock.
5. Florida: The polygon for the St. Joseph Bay Stock includes a strip of coastal waters extending 2 km from the mainland along the entire length of the stock area. Strandings on the outer beach of the St. Joseph Peninsula and on the beaches to just north of Crooked Island could belong to either the BSE stock or the adjacent coastal stock, and are dually assigned to both stocks. Strandings inside St. Joseph Bay are assigned only to the BSE stock.
6. Florida: Waccasassa Bay is unique compared to most other bays in the GMx in that it consists of a series of marsh and tidal flats without barrier islands that separate it from coastal waters. The polygon for the Waccasassa Bay/Withlacoochee Bay/Crystal Bay Stock extends out into the GMx from Waccasassa Bay to contain these marsh habitats and does not ascribe to a particular distance from shore. Strandings therein are assigned only to the BSE stock.
7. Florida: The polygon for the Sarasota Bay/Little Sarasota Bay Stock includes Terra Ceia Bay and Manatee River. Occasionally, free-swimming bottlenose dolphins from the Tampa Bay Stock have been documented in these water bodies (Urian *et al.* 2009). As a result, strandings therein are compared to the dorsal fin photo-ID catalog managed by the Sarasota Dolphin Research Program to determine if the stranded animals are known members of the Sarasota Bay/Little Sarasota Bay Stock. Animals stranded within Terra Ceia Bay and the Manatee River that are not identified as members of the Sarasota Bay/Little Sarasota Bay Stock, despite having a well-marked fin, are assigned to the Tampa Bay Stock. Strandings within Terra Ceia Bay and the Manatee River that are not identifiable due to lack of dorsal fin markings or decomposition are dually assigned to both stocks.
8. Florida: Whitewater Bay is similar to Waccasassa Bay in that it consists of a series of marsh and tidal flats without barrier islands that separate it from coastal waters. The polygon for the Whitewater Bay Stock extends out into the GMx to contain these marsh habitats, including Ponce de León Bay, and does not ascribe to a particular distance from shore. Strandings therein are assigned only to the BSE stock.
9. Florida: The polygon for the Florida Keys Stock surrounds the keys and includes all beaches on both the Gulf and Atlantic sides of the lower Keys and Key West.
10. General: Occasionally, strandings occur in areas that are not currently included within the polygon of any BSE stock. These strandings are labeled "Undefined BSE" and occurrence of these strandings is included in the SAR for the adjacent BSE stock(s).

Examining Stranding Data for Human and Fishery Interactions and for Live Strandings

Level A stranding data include an assignment to one of three human interaction (HI) categories: Yes (having evidence of some type of HI), No (having no evidence of some type of HI), and CBD (the presence or absence of evidence indicating some type of HI Could not Be Determined). In order to assess the annual human-caused mortality and serious injury for the SARs, the Level A data are filtered for those marked as "Yes" for HI and the type of HI is reviewed: Boat Collision, Shot, Fishery Interaction, or Other HI. Additionally, for records assigned to HI No or HI CBD, comment fields within the level A data ("Other Human Interaction Description," "Other Findings - Describe," "Other Describe Flag," "Condition Comments," "Additional Remarks") are reviewed to check that cases of HI are not inadvertently missed because they were not appropriately marked as such. Frequently, stranding responders will mark the HI, Fishery Interaction, or Other HI fields as "Yes" but will not provide any details as to the nature of the interaction. In these cases, the responders are contacted to request additional information describing the human or fishery interaction, such as a marine mammal human interaction form (Moore and Barco 2013), necropsy report, or photos.

Level A stranding data also include condition codes for animals to describe whether the animal was alive or dead, and if dead, the level of decomposition of the carcass (Geraci and Lounsbury 2005). These data are included in the fields "Observation Status" (condition code when the animal was first reported) and "Condition at Examination" (condition code when the animal was examined by the responder). These two fields are filtered to examine all stranding records in which the dolphin was noted as "alive" at some point. The live cases are then reviewed to see which need evaluating for serious injury (see serious injury determinations for live dolphins section below). An animal may have been alive when first observed but could have died shortly thereafter, for example, and would not need to be evaluated for serious injury because it would be treated as a mortality. Or the live animal could have been reported to the stranding network due to a situation not caused by a human interaction, such as a dolphin observed out-of-habitat (e.g., unusually far up a river or in a drainage ditch), and therefore will not require a serious injury evaluation.

Assigning Dolphin Strandings to Fishery or Gear Type

Bottlenose dolphin strandings can have two types of evidence of being involved in some sort of fishery interaction (FI): skin lesions consistent with gear entanglement (Kuiken *et al.* 1994; Read and Murray 2000) and/or attached or ingested gear. A document describing the process and limitations of assessing the possible source(s) of fishery from entanglement lesions and attached/ingested gear is forthcoming (S. Horstman pers. comm.). Attached gear is less common than entanglement lesions (Byrd *et al.* 2014), but is the most informative for assigning a specific fishery or gear type to the interaction. Assigning observed or collected gear from a stranded dolphin to a particular fishery or gear type is done when sufficient information is available to do so. In some cases gear may be labeled or marked, facilitating identification. The NMFS requests that gear attached to recovered bottlenose dolphin strandings (live or dead) is collected and sent to the NMFS Harvesting Systems Branch in Pascagoula, MS, for gear analysis and long-term storage in their repository. For some cases, the gear is examined by other agencies that may have responded to the case (e.g., state or federal law enforcement officers, state marine fisheries biologists, U.S. Coast Guard), or in other cases, only a photograph or video of the gear is available for examination. Gear experts from the Harvesting Systems Branch or other agencies attempt to identify and

characterize the gear type, identifying target species when possible to aid in determining a specific fishery, including whether or not the gear is for commercial versus recreational use. If the fishery can be identified, that specific information is included in Serious Injury Determination reports for live animals (see below) and SARs for live or dead animals. If the gear cannot be identified as belonging to a specific fishery, a stranding may be assigned to a general gear category, such as trap/pot gear. Occasionally, the gear is assigned as unknown fishery because it is not distinctive and could have belonged to more than one type of fishery.

When dead stranded dolphins are found with fishing gear attached to or entangled around their bodies, such as trap/pot gear, trawl gear, gillnets, pound nets, stop nets, haul/beach seines, and purse seines, it is assumed that the gear contributed to the stranding and/or death of the dolphin. Generally, any such mortalities are included within the annual human-caused mortality and serious injury total for a given stock and counted against the stock's PBR. One exception is for hook and line (i.e., rod and reel) fishing gear. Because of the range of possible outcomes for hook and line gear (e.g., Wells *et al.* 2008), it is not assumed the gear contributed to the stranding and/or death of the dolphin, but instead each dead stranding is further examined to see if the evidence suggests that the gear contributed to the stranding and/or death (see below). Live hook and line cases are evaluated according to serious injury policy and guidelines developed by NMFS and included in the Serious Injury Determination Reports for live animals (see below). A second exception is made if there is already an observer-program-based bycatch estimate for a stock, and the bycatch estimate is not zero. An additional animal recovered in the same gear would not be added to the bycatch estimate in this instance because the bycatch estimate would account for that instance. If the bycatch estimate for a given stock based on observer program data is zero, then the recovered animal would be added to the annual human-caused mortality and serious injury total. This exception has occurred previously for the mid-Atlantic gillnet fishery and details have been included within the appropriate SARs in each instance.

Special Handling of Stranded Mortalities with Hook and Line Fishing Gear Interactions

Each record of a stranded dead dolphin found entangled in or having ingested hook and line gear is evaluated to determine whether the evidence suggests that the hook and line gear contributed to the stranding and/or death of the dolphin. The stranding responder for each case is asked to provide any available information to assist in the evaluation, such as a necropsy report, a HI form, photos, stomach content analysis, etc. Initially, a NMFS Southeast Fisheries Science Center (SEFSC) staff member will evaluate each case and make a determination based on the best available information. All cases are then reviewed by NMFS Southeast Regional Office (SERO) staff members. Any disagreements are further discussed until consensus is reached. Some cases are data poor, often due to advanced decomposition of the carcass, and it cannot be determined (CBD) whether the gear contributed to the stranding and/or death of the dolphin. If the evaluation results in a "Yes" the evidence suggests that the gear contributed to the stranding and/or death, then this mortality is included within the annual human-caused mortality and serious injury total for the stock and counted against the stock's PBR. If the evaluation results in a "No" or "CBD", the mortality is not included within the annual human-caused mortality and serious injury total for the stock nor is it counted against the stock's PBR. However, it is documented within the applicable section of each SAR. See Table 2 for details and outcomes for cases of stranded mortalities during 2010–2017 involving hook and line gear that have been evaluated thus far.

Serious Injury Determinations for Live Strandings and Opportunistic At-Sea Observations with Evidence of Human Interaction

All stranding data records and all records of opportunistic at-sea observations for which a dolphin was reported or released alive related to a HI are evaluated for serious injury according to serious injury policy and guidelines developed by the NMFS (NMFS 2012a, b; e.g., Maze-Foley and Garrison 2016). Common types of HI occurrences include boat strike, entanglement in fishing gear or marine debris, and hooking in the mouth and elsewhere on the body by fishing lures/hooks. Initially, all available data for each live case are evaluated by two NMFS SEFSC marine mammal staff and determinations are made as to whether it was/was not considered seriously injured. Any disagreements are discussed to attain consensus. Following this initial evaluation, all determinations are reviewed by NMFS Determination Staff Working Group members from the NMFS Northeast Fisheries Science Center, the NMFS SERO, and the Atlantic Scientific Review Group. Any dolphin that is considered seriously injured is included within the annual human-caused mortality and serious injury total for the given stock and counted against the stock's PBR. If a dolphin is not seriously injured or it could not be determined if the dolphin was seriously injured, the case is not included within the annual human-caused mortality and serious injury total for the stock nor is it counted against the stock's PBR. However, it is documented within the applicable section of each SAR report. Annually, SEFSC staff prepare a SEFSC Center Reference Document summarizing serious injury determinations for small cetaceans in southeast U.S. waters. The reports are publicly available at: <https://www.sefsc.noaa.gov/publications>.

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Table 1. Matrix depicting spatio-temporal distribution from New Jersey to North Carolina and overlap of four common bottlenose dolphin stocks (Northern Migratory Coastal=gray, Southern Migratory Coastal=pink, Northern North Carolina Estuarine System=blue, Southern North Carolina Estuarine System=yellow) across 16 geographic regions and bi-monthly periods (see Figure 1; adapted from Lyssikatos and Garrison (2018)). Stippling indicates stock overlap.

Stratum No.	Region	Stratum Habitat	Jan/Feb	Mar/Apr	May/June	July/Aug	Sept/Oct	Nov/Dec
1	Delaware	Estuary						
2	New Jersey, Delaware, Maryland	Coastal (0-20 m isobath)						
3	Maryland, Virginia	Estuary						
4	Virginia, North Carolina	Coastal (0-1 km)						
5	Virginia, North Carolina	Coastal (1 km - 20 m isobath)						
6	North Carolina	Estuary						
7	North Carolina	Coastal						
8	North Carolina	Coastal (3-20 km)						
9	North Carolina	Coastal (0-3 km)						
10	North Carolina	Coastal (3-20 km)						
11	North Carolina	Estuary						
12	North Carolina	Coastal (0-3 km)						
13	North Carolina	Coastal (3-20 km)						
14	North Carolina	Estuary						
15	North Carolina	Coastal (0-3 km)						
16	North Carolina	Coastal (3-20 km)						

Table 2. Stranded mortalities of common bottlenose dolphins (*Tursiops truncatus truncatus*) in U.S. Atlantic or Gulf of Mexico waters that were recovered with entangled and/or ingested hook and line (H&L; i.e., rod and reel) fishing gear. Strandings occurred from 2010 to 2017. Region of the U.S. and year of the stranding are indicated by the initial five letter-number combination of the NMFS Regional Number. For example, NER11-2034 is a case from the northeast region (Maine to Virginia) in 2011, and SER10-0797 is a case from the southeast region (North Carolina to Texas) in 2010. All 2015–2017 strandings involving H&L fishing gear were evaluated and are included in this table. However, for earlier years (2010–2014), strandings were evaluated only if the stock assessment report (SAR) for that stock was being updated for the 2016 or 2017 SARs. The table includes: regional and field stranding numbers, stock assignment, and carcass condition at the time of examination. Level A stranding data and comments were reviewed for each case, as well as any additional evidence available and provided by the stranding network responders, such as near-real time reports, Human Interaction (HI) forms, photos, necropsy reports, stomach content analysis, and/or gear analysis. Using all available information, an evaluation was made for each case as to whether the evidence indicated the H&L gear contributed to the stranding and/or death of the dolphin. In many instances, it could not be determined (CBD) if the H&L gear contributed to the stranding and/or death, usually due to the carcass being in a state of moderate or advanced decomposition or due to a lack of information. Table A includes Atlantic Ocean stranded mortality cases, and Table B includes Gulf of Mexico cases. Atlantic Ocean stock abbreviations: CFL Coastal = Central Florida Coastal; IRLES = Indian River Lagoon Estuarine System; JES = Jacksonville Estuarine System; NFL Coastal = Northern Florida Coastal; NNCES = Northern North Carolina Estuarine System; NGSSCES = Northern Georgia/Southern South Carolina Estuarine System; NM Coastal = Northern Migratory Coastal; SC/GA Coastal = South Carolina/Georgia Coastal; SM Coastal = Southern Migratory Coastal; SNCES = Southern North Carolina Estuarine System. Gulf of Mexico stock abbreviations: BSE = Northern Gulf of Mexico Bay, Sound, and Estuary Stocks (this SAR currently contains information on 25 individual bay, sound, and estuary stocks; when BSE is listed in the Stock Assignment(s) column, the individual stock name follows in parentheses); Copano Bay,... = Copano Bay/Aransas Bay/San Antonio Bay/Redfish Bay/Espiritu Santo Bay; PIS = Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay.

A) Atlantic Ocean

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence Available beyond Level A data comments	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
NER11-2034	VAQS20111068	SM Coastal or NNCES	Advanced decomposition	HI form, photos	animal was entangled in monofilament around the peduncle near insertion of flukes and left fluke blade (right was missing) with the hook embedded in the genital region; there were two impressions on the right front flipper; and another impression around the head (this one appeared thicker and couldn't tell if multifilament or several wraps of monofilament due to decomposition); on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted CBD due to level of decomposition	CBD
NER12-1433	VAQS20121049	SM Coastal or NM Coastal	Advanced decomposition	HI form, photos	animal was entangled in Spectra™ line around fluke insertion with trailing line loose around flukes; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted Probable due to tissue reaction at entanglement site, severity of entanglement, and tissue granulation at missing fluke blade	Yes

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence Available beyond Level A data comments	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
NER14-00199	VAQS20141019	NM Coastal	Advanced decomposition	HI form	small, three-pronged treble hook and some line found in animal's forestomach; no associated tissue damage or perforations but lining was sloughing off; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted CBD	CBD
SER10-0797	SC1067	SC/GA Coastal or SM Coastal	Fresh dead	None	monofilament line with swivel and rusted hook were ingested and wrapped around dislodged goosebeak of this animal	Yes
SER11-0646	SC1117	SC/GA Coastal or SM Coastal	Fresh dead	None	washing of this animal's stomach revealed a fish hook with gray monofilament line attached	CBD
SER12-0437	KLC126	NNCES or SM Coastal (NC)	Fresh dead	None	hook and line gear found in animal's stomach; original level A comments said it was a piece of gillnet, but gear analysis confirms it was actually hook and line gear	No
SER14-00618	Hubbs-1443-Tt	CFL Coastal	Advanced decomposition	None	small piece of fishing hook found in animal's stomach; all major organs were severely decomposed at examination and tissue autolysis prevented a determination of any significant gross pathology	CBD
SER14-00788	Hubbs-1471-Tt	CFL Coastal	Moderate decomposition	None	large fishing hook lodged in the caudal portion of animal's tongue with ~1 m of trailing, heavy fishing line wrapped loosely around the left pectoral flipper; animal very decomposed at necropsy	Yes
SER14-00983	mars1404	CFL Coastal	Advanced decomposition	Photos	ingestion of and entanglement in treble hook with stainless wire leader; hook was discovered underneath animal's tongue and line extended to and wrapped around the right flipper; advanced decomposition and partial carcass	Yes
SER15-00167	Hubbs-1509-Tt	IRLES	Moderate decomposition	HI form, photos	approximately 1 m of clear monofilament fishing line was present trailing from the mouth and extending down towards the larynx of this animal; the fishing line broke loose from the mouth/throat during recovery and was collected and had a small corroded hook eye at the end; multiple shallow lacerations are present inside the mouth along the posterior region of the right lower jaw (posterior to teeth); line lacerations bisect the cranial and caudal portions of the larynx; parallel lacerations are present along the dorsal aspect of the esophagus immediately dorsal to the larynx; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted Suspect, and significant damage to the goosebeak with associated lesions along the esophagus impairing the animal's ability to breathe and eat	Yes

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence Available beyond Level A data comments	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER15-00419	Hubbs-1520-Tt	IRLES	Fresh dead	HI form, photos	animal with clear monofilament fishing line wrapped tightly two times (looped through itself) around the mid-distal portion of the larynx with a metal swivel attached and presented along the anterior portion of the larynx; the line extended through the left gape and slightly outside the mouth; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted Probable, and that monofilament wrapped tightly around the larynx would have impaired the animal's ability to breathe	Yes
SER15-00431	Hubbs-1523-Tt	IRLES	Moderate decomposition	HI form, photos	a hook and small section of line were present in this animal's forestomach; there were also a few small ulcers in the forestomach lining; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted Improbable, single hook and 6 cm of monofilament attached were free-floating in the forestomach amongst a handful of vegetation, and responders would consider this an incidental finding	No
SER15-00525	Hubbs-1540-Tt	IRLES	Advanced decomposition	HI form, photos	animal entangled in high density polyethylene line, 80lb test; 50% of each half of the flukes is missing but the gear remained loosely attached to a deep cut along the trailing edge of the right fluke; gear is a braided line with three masses of barnacles; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted Probable, deeply embedded twisted line, animal observed in poor condition with skin lesions over majority of body and line prevented animal from raising flukes	Yes
SER15-00549	SC1551	NGSSCES	Moderate decomposition	Photo	small piece (4.6 cm) of monofilament line found in this animal's trachea	Yes
SER16-00044	VGT352	SM Coastal or NNCS	Moderate decomposition	None	a 1.5 cm x 0.1 cm wide fishing hook was present in animal's stomach but not embedded in stomach wall; examiner noted opinion that the hook likely did not contribute to death of this animal	No
SER16-00366	TtNEFL1608	NFL Coastal	Moderate decomposition	Near-real-time report; photo	monofilament line and leader were entangled around animal's goosebeak and extending out of the animal's mouth externally, and a J hook was embedded in the dermis above its right pectoral flipper with a short piece of monofilament attached	Yes

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence Available beyond Level A data comments	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER16-00402	TtNEFL1612	JES	Moderate decomposition	Necropsy report; photos	animal had a single, loose wrap of monofilament around the left pectoral flipper with a hook and sinker attached and ~200 cm of monofilament trailing behind	CBD
SER16-00427	Hubbs-1622-Tt	IRLES	Moderate decomposition	HI form	animal's stomach contained several fish bones and one loose fishing hook (3 cm long); two large fish were lodged in the esophagus at the level of the goosebeak; the dorsal spine of one fish pierced the esophageal wall; HI form suggested asphyxiation as the likely cause of death	No
SER16-00475	TtNEFL1620	JES	Moderate decomposition	Necropsy report, HI form, photos	hook stuck in the right side of animal's rostrum with 282 cm of trailing monofilament attached; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted Improbable because this was an older animal with other health issues and the hooking was described as superficial	No
SER16-00631	Hubbs-1656-Tt	IRLES	Moderate decomposition	HI form, photos	4 cm fishing hook present in animal's forestomach; free-floating and not associated with any lesion or ulceration; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted Improbable	No
SER17-00002	SC1701	SC/GA Coastal or SM Coastal	Moderate decomposition	Necropsy report, photos	animal had both external and ingested gear; an ~42.8 cm long blue monofilament line was wrapped tightly around the lower jaw; it had to be cut out leaving an unmeasured amount of line embedded in the bone; lower jaw bone was broken; fishing hook was present in the fore chamber of the stomach; animal was emaciated; necropsy conclusion states: Septicemia is a probable cause of death likely from the severe entanglement and associated jaw lesions combined with yellow colored abdominal and thoracic fluid. Emaciation was likely a secondary cause of death for this animal.	Yes

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence Available beyond Level A data comments	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER17-00064	SC1712	SC/GA Coastal or SM Coastal	Advanced decomposition	Gear analysis	animal's remains included the head and a vertebral column; line was lying in ribs and went up through lower jaw but did not pass through esophagus so it looks like no ingestion, raising questions as to whether the line was discarded after the fact or had been attached externally and as the animal was scavenged and decomposed the line fell into the ribs; from Gear Analysis: Gear was likely external based on the size, configuration and condition; Two separate rigs, #1 Store bought bottom fishing rig with 3 hooks (3/O short shank with bent eye) connected to heavy 80-100 lb steel leader with large snap swivels, springs, attached to light 10 lb mono line. #2 80 lb test mono leader with single 3/O J hook badly corroded. A small piece (8") of steel leader was also included, it was bare on both ends and not part of the first 2 pieces of gear.	CBD
SER17-00222	Hubbs-1707-Tt	IRLES	Fresh dead	Photos	animal had braided recreational fishing line wrapped and embedded around the flukes and peduncle; there was a small amount of fouling on the gear and one loop was lengthy and floated free of the animal (subjective conclusion: this loop was likely wrapped around the rostrum and gape while the animal was swimming but loosened as tension was lessened post-mortem); there were deep lacerations across the rostrum and at both gapes leading caudally and a deep laceration at the axilla of the right pectoral flipper; there were abrasions and superficial line marks on the upper right pec and the upper and lower left pec flipper; there was a small partial shark bite on the ventral peduncle and a large nearly complete shark bite on the left lateral body below the dorsal; there was deep bruising in this area; line around the flukes and peduncle extended deep (3 cm) in several areas and there was significant tissue restructuring around the line	Yes

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence Available beyond Level A data comments	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER17-00376	HBOI-1703-Tt [CPEA]	IRLES	Fresh dead	Near-real-time report with photos	this animal was previously entangled in monofilament line in 2015 and disentangled during a NMFS led intervention (HBOI-1503-Tt (c3CHIC; CPEA); the team documented the monofilament line in CPEA's mouth and down the throat when securing the carcass; a fishing hook was visible on CT scan on the head; the animal was underweight and scavenged with tissue loss noted; the previously noted entanglement from 2015 appeared healed; the fishing line in the mouth led to the hook, which was embedded in the goose beak	Yes
SER17-00386	HBOI-1704-Tt	IRLES	Moderate decomposition	Near-real-time report with photos	forestomach was immensely distended at approx. 36 cm with food; a hook was also found loosely amongst the stomach content; a duodenal intestine intussusception was found likely causing blockage	No
SER17-00391	Hubbs-1719-Tt	IRLES	Advanced decomposition	Photos	this carcass had both hook and line gear and commercial blue crab trap/pot gear present; there was a red ring (ca. 5 cm diameter, probable crab pot ring) with fishing line and a dark black fishing hook wrapped loosely around the lower jaw; the sharp end of the hook is encased in what appears to be thickened, stringy animal tissue (not seagrass); at the base of the decomposed laryngeal cartilages (goosebeak), there is a dark gray to black discolored area that surrounds the goosebeak base with all other tissue in the area off-white and a different texture; while no gear was present around the goosebeak at exam time, the responders' subjective interpretation was that the ring and line may have been wrapped around the goosebeak and the hook was embedded in the esophagus or mouth; Gear analysis: red crab pot escape ring that was tangled with HDPE 40 lb test line (white) attached to a 6/O J hook; this was both recreational hook and line and probably commercial blue crab trap/pot fishery	Yes
SER17-00470	Hubbs-1728-Tt	IRLES	Fresh dead	Photos, stranding network provided an opinion based on necropsy findings	the main stomach contained a 3.5 cm long fishing hook; associated with the hook is a darkened area on the lining of the stomach (2 small black marks); opinion of responder: The hook did not create a significant issue for this animal. It most certainly stranded and died from lung issues as well as problems with its pancreas and spleen.	No

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence Available beyond Level A data comments	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER17-00555	TtNEFL1718	JES	Moderate decomposition	HI form, near-real-time report, photos	animal had ingested 2 fishing hooks, in 1st and 2nd stomachs; HI form has Improbable that the hooks contributed to the stranding event and noted the hooks were not embedded or obstructing the stomachs	No
SER17-00574	SC1745	Charleston Estuarine System	Moderate decomposition	Near-real-time report with photos	two monofilament lines were found near the lower jaw after the skull was thawed and while it was being flensed (white – 2.1 cm, clear – 11.2 cm)	CBD
SER17-00579	TtNEFL1723	Northern Florida estuarine (undefined stock area)	Moderate decomposition	Near-real-time report with photos	animal had both external and ingested gear; there was a wrapped up bundle of clear fishing line in its mouth that went down its throat and formed a loop around its goosebeak; a section of the line came out of its mouth and was wrapped around its left pectoral flipper	Yes
SER17-00605	Hubbs-1741-Tt	IRLES	Moderate decomposition	Stranding network provided an opinion based on necropsy findings	animal was slightly emaciated with some scavenger damage, moderate tooth wear, and a couple missing teeth; a large fish head and thorax (sheepshead) was lodged in the esophagus; there is a fishing hook with line and a 2.5 cm sinker in the forestomach; note from responder: we believe that the ingested gear was incidental to cause of death (by prey asphyxiation)	No

B) Gulf of Mexico

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence available beyond Level A data comments that was examined	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER10-0671	PA881	BSE (Copano Bay,...)	Moderate decomposition	None	animal was entangled in various forms of fishing line, leaders, hooks, lures, and weights; from hook in esophagus, line went the length of the left side, twisted and looped around rostrum, neck, left pectoral fin, peduncle and tail flukes; obvious impairment to mobility; circle hook in esophagus had ~61 cm red fish attached that impaired the airway; dorsal fin had a tight line wrap that cut 50% through fin	Yes
SER10-0677	PA889	BSE (Neuces Bay/Corpus Christi Bay)	Moderate decomposition	None	animal with one strand of monofilament line (no hooks, weights, etc.) found tangled with muscle connective tissues exposed by shark bite	No
SER10-0737	FMMSN1008	BSE (PIS)	Moderate decomposition	Necropsy report	lure and monofilament line found in animal's forestomach; spinner lure and hook found in stomach; 7.5 cm rattle lure was found just caudal to the epiglottis; lure associated treble hooks were embedded into the wall of the esophagus but did not penetrate through; approximately 15 cm of green line was trailing and entangled around the hooks; a fully intact 27 cm flounder was also found just caudal to the epiglottis	Yes
SER11-0881	54IMMS031111	Mississippi Sound/Lake Borgne/Bay Boudreau	Moderate decomposition	HI form, necropsy report	monofilament line found inside animal's mouth; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted Improbable, no internal signs of fishing line present or areas of necrosis due to line entanglement	No
SER11-1283	79IMMS040211	Mississippi Sound/Lake Borgne/Bay Boudreau	Advanced decomposition	Necropsy report	small pieces of very light mono, 6-8 lb test, found associated with seagrass and sand debris on animal's heavily scavenged carcass; all fins scavenged/missing; carcass was missing most of the skin layer; head and neck were connected by a strip of skin; advanced decomposition	CBD
SER11-2215	BCF-20110617-LA001	Barataria Bay Estuarine System	Moderate decomposition	HI form, necropsy report	animal with hook and line gear (spiderwire, pre-fabricated rig for bottom fishing) wrapped around flukes; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted Suspect	Yes

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence available beyond Level A data comments that was examined	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER11-2371	PA913	BSE (Copano Bay,...)	Fresh dead	None	animal entangled in monofilament line, floats, lures, and pier lift net; live oysters made the net heavy and cut into the fluke area	Yes
SER11-2486	28DISL120911	Mississippi Sound/Lake Borgne/Bay Boudreau	Moderate decomposition	Stomach content analysis*	stomach content analysis found fishing lure with hook in animal's forestomach, not embedded in stomach lining	No
SER11-2525	GA1697	BSE (Galveston Bay/East Bay/Trinity Bay)	Moderate decomposition	Photos of lure only, not in situ	animal with fishing lure found in first stomach among other fish and squid; stomach ulcer found in first stomach	CBD
SER12-0146	GA1759	BSE (Galveston Bay/East Bay/Trinity Bay)	Advanced decomposition	Photos	fishing line, lead weight, and hook attached to animal's right pectoral fin with fishing line trailing to peduncle and wrapped tightly around peduncle at the base of the flukes; photos showed animal was "hog-tied" and stayed that way despite advanced decomposition	Yes
SER12-0228	FMMSN1206	BSE (Caloosahatchee River)	Moderate decomposition	None (necropsy results were noted within level A data)	necropsy revealed that this dolphin swallowed a fish with a hook and 83cm of trailing line; the line had wrapped tightly once around the epiglottis; there was associated hemorrhage with the line wrap	Yes
SER12-0528	MML1205 [Beggar]	BSE (Sarasota Bay/Little Sarasota Bay)	Moderate decomposition	None (necropsy results were noted within level A data)	32-yr-old male with 20-year history of begging leading to provisioning, and frequent very close approaches to boats/propellers; animal with three fishing hooks and small bits of line found in first stomach; no definitive cause of death was determined, but combined findings indicated overall lack of good health; internally, two stingray barbs were found; one barb had migrated through the ribs and embedded near the small intestine with necrotic tissue surrounding the barb and a large area (about the size of volleyball) of GI tract that was adhered to the body wall and to itself; the second barb was found near the right shoulder blade and was very close to puncturing the thoracic cavity; multiple broken ribs and vertebral processes were found; Sarasota resident dolphin	No

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence available beyond Level A data comments that was examined	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER12-0680	MML1210 [FB93]	BSE (Sarasota Bay/Little Sarasota Bay) [FB93, freeze-branded animal]	Fresh dead	None	27-yr-old female with a hook embedded in its melon with line leading to the mouth and tightly encircling the goosebeak with associated bruising; full stomach with whole fish; prior to death, accompanied by young-of-the-year calf; Sarasota resident dolphin	Yes
SER12-0767	MML1211 [C936]	BSE (Sarasota Bay/Little Sarasota Bay)	Moderate decomposition	None	abandoned young-of-the-year female calf of SER12-0680 (FB93), above; mother died as a result of hook and line gear interaction; Sarasota resident dolphin	Yes
SER12-0754	GW2012013D	BSE (St. Andrew Bay)	Advanced decomposition	Stomach content analysis	fishing hook was found in the stomach during stomach contents analysis (February 2017); hook was not embedded in stomach lining tissue and no reactive tissue was observed	No
SER12-0739	GA1768	BSE (Galveston Bay/East Bay/Trinity Bay)	Moderate decomposition	Photos, gear analysis	small metal piece of fish hook in stomach between 1st and 2nd chamber; no barb, badly corroded, only shaft, no hook	No
SER12-0765	MML1208	BSE (Tampa Bay)	Moderate decomposition	None	large shark hook was present in this animal's mouth at time of recovery, and animal also had what appeared to be a gaff wound on its right side, near the dorsal fin, deep to the muscle	Yes
SER12-0806	FMMSN1212-R2 [Lobo]	BSE (PIS)	Moderate decomposition	Necropsy report	animal had been previously disentangled twice during 2012; found dead with entanglements to the dorsal fin, pectorals, peduncle and left fluke blade; the primary entanglement was of green high tech wire (spider wire/fire wire) that had wrapped around the pectorals, dorsal fin and peduncle along with a lead weight; additionally, there was a small hook embedded on the right side of the dorsal fin near the leading edge with a section of monofilament trailing; dorsal fin and left fluke blade entanglements were a mixture of several different recreational fishing line types and algae; also attached to the dorsal fin entanglement was a small rubber lure and a ~46 cm section of drain hose of unknown origin	Yes
SER13-0188	CMA-Tt-1306	BSE (Waccasassa Bay/Withlacoochee Bay/Crystal Bay)	Fresh dead	HI form, necropsy report	hook and leader found in animal's first stomach during necropsy; hook was not embedded and no reactive tissue was observed; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted Improbable	No

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence available beyond Level A data comments that was examined	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER13-0405	SMM-20130429-LA001	Mississippi Sound/Lake Borgne/Bay Boudreau	Advanced decomposition	Necropsy report	monofilament was found on the left front flipper (unable to tell if wrapped due to decomposition), in the same area where gashes and jagged cuts were; monofilament was easily removed	CBD
SER13-0822	PA1009	BSE (Neuces Bay/Corpus Christi Bay)	Moderate decomposition	HI form	single monofilament line wrapped and partially embedded in tip of animal's right fluke; scarring evidence of monofilament line entanglement on rostrum, mandible, and dorsal fin but no gear present; on HI form, for how likely is it that the documented HI contributed to the stranding, responders noted Uncertain and: due to large amount of puss in the spinal column, it is unclear whether the entanglement of the fluke was the direct cause of the stranding, or an unfortunate incident due to the animal's pre-existing illness and resortment to opportunistic feeding	CBD
SER13-1250	MML1309	BSE (Sarasota Bay/Little Sarasota Bay) [1495]	Moderate decomposition	HI form, necropsy report	3-yr-old female with free-floating line, leader wire, and hook found in animal's stomach; necropsy report listed cause of death as undetermined and noted advanced decomposition and trauma of unknown origin; Sarasota resident dolphin	CBD
SER14-00106	02ECWR020914	BSE (Pensacola Bay/East Bay)	Moderate decomposition	Necropsy report, gear analysis, photos	animal was entangled in an anchor line and hook and line gear (line, wire leaders, lead weights, swivels); necropsy report indicated gross findings were consistent with animal drowning; gear analysis indicated gear had been on the bottom for some time, and it was not possible to determine if the anchor line or fishing gear caused the entanglement; knot on anchor indicated inexperienced operator; stranding responder suggested the hook and line gear may have attracted animal to anchor line	CBD

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence available beyond Level A data comments that was examined	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER14-00543	FMMSN1442	BSE (PIS)	Moderate decomposition	HI form, necropsy report, photos	fishing gear was present externally and consisted of a leader and 345 cm of neon yellow heavy test monofilament protruding from animal's mouth; there was an 8 cm J-hook lodged in the mucosa of the forestomach with 123 cm of heavy test monofilament attached; there was a small area of erosion in the mucosa surrounding the hook; there were two additional small circle hooks found in the stomach contents; one was 3.5 cm in length with 35 cm of monofilament attached; the other was 3 cm with 48 cm of monofilament to a leader and an additional 15 cm of monofilament; another large 8 cm J-hook was visible in the forestomach with the other half lodged just past the sphincter in the main stomach; this J-hook was connected by 116 cm of clear monofilament, through the forestomach and esophagus, to the leader and neon yellow monofilament protruding from the mouth; the dolphin was emaciated in appearance; necropsy report lists human interaction as the probable cause of death	Yes
SER14-00695	GA1921	West Bay	Alive (animal died later in rehab facility)	Photos, stranding network provided a summary based on veterinary examination and necropsy notes	monofilament line embedded deeply and wrapped around animal's tail at base of flukes and also embedded into right fluke; chronic wrap; animal's muscles concave, emaciated/poor body condition; summary from stranding network said: According to the veterinary examination and necropsy notes on GA1921, we do feel that the gear wrap contributed to this animal's death. Observations included starvation and muscle concavity indicative of an animal dragging gear. The gear was embedded very deep around the peduncle at the base of the tail flukes into the caudal vascular bundle and as a result the vets believed that the injury allowed toxins into the blood stream causing the animal to go septic and to die as a result.	Yes

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence available beyond Level A data comments that was examined	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER14-00919	FMMSN1457	BSE (PIS)	Moderate decomposition	HI form, necropsy report, photos	a significant amount of recreational fishing gear (monofilament line and firewire) was entangled on leading and trailing edges of animal's flukes causing deep lacerations; Necropsy report says: "Although the dolphin stranded with a full stomach, it was emaciated in appearance. The fisheries interaction almost severed the right fluke blade and likely limited the swimming and feeding ability of the dolphin. There was also evidence of infection, enlarged lymph nodes, gritty serosa and adhesions of the intestines. It is presumed the entanglement may have also contributed to a systemic infection. Due to the level of decomposition, histology samples were not collected. Therefore, the cause of death determination is Undetermined; Too Decomposed but it is very likely the fisheries interaction contributed to the stranding and subsequent death of this bottlenose dolphin."	Yes
SER15-00381	CMA-Tt-1510	Eastern Coastal	Fresh dead	Necropsy report, photos	a single stainless-steel hook with a 9 cm piece of clear, 15-20 lb test monofilament line attached was present in animal's first stomach; according to the necropsy report, the hook was not embedded in the stomach wall and no reactive tissue was observed	No
SER15-00029	02ECWR012315	Northern Coastal	Moderate decomposition	HI form, necropsy report, photos	animal had a chronic monofilament entanglement associated with oral cavity and pectoral fin; emaciated animal; gear likely lead to starvation; necropsy report says: Due to the emaciated state of the carcass and the monofilament entanglement associated with the oral cavity, it is suggestive that the animal may have starved to death.	Yes
SER15-00598	22DISL111715	Mississippi Sound/Lake Borgne/Bay Boudreau	Moderate decomposition	HI form, necropsy report, photos	animal had two fishing hooks embedded in its right eye lid and right upper mouth; also linear impressions and lacerations; according to necropsy report, the regions surrounding the embedded fish hooks appeared infected and lymph nodes were enlarged; hook and line interaction and other HI impressions and lacerations were probable cause of death, according to necropsy report	Yes

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence available beyond Level A data comments that was examined	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER15-00648	15ECWR122115	Choctawhatchee Bay	Moderate decomposition	HI form, necropsy report, photo	animal had chronic entanglement injuries to the caudal peduncle and flukes from a large ball of ~50 lb test monofilament line entangled around both flukes; no hooks, swivels, or leader present; the animal had a deteriorated catfish carcass in its oral cavity; a catfish spine was found embedded in the animal's upper pallet; the animal's body condition was poor; the necropsy report says: "The cause of death [was] likely due to starvation and weakness causing inability to properly hunt and manipulate its prey. This led to the injury caused by the catfish found with its pectoral spines lodged in the dolphin's mouth."	Yes
SER15-00651	MMPL1515	BSE (Tampa Bay)	Moderate decomposition	HI form, necropsy report, photos	animal was entangled in line, leader and a lure; green fishing line wrapped around its right flipper and was trailing some silver plastic and a fish-shaped lure; the original complainant said the line wrapped around both flippers when he first saw the carcass; necropsy findings indicate the mouth and peduncle were also involved in entanglement; vegetation in GI tract; thin body condition; necropsy report noted it is probable the entanglements hindered the dolphin's ability to feed which led to death.	Yes
SER16-00121	06ECWR022716	Choctawhatchee Bay	Advanced decomposition	Stomach content analysis	soft, plastic fishing lure was found in animal's stomach during stomach contents analysis (March 2017); gear was not embedded in stomach lining tissue and no reactive tissue was observed, however the animal was in a state of advanced decomposition	CBD
SER16-00350	FMMSN1609	BSE (PIS)	Moderate decomposition	HI form, photos	a very large hook and attached line were found in animal's digestive tract; animal also had been struck by a boat and had broken bones; queries re. this case have not yet been answered and it is difficult to evaluate the case based on the current information available	CBD

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence available beyond Level A data comments that was examined	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER16-00394	11DISL032516-R [Alli]	BSE (Perdido Bay)	Fresh dead	Necropsy report, photos	a hook was found in animal's stomach; in addition, a net fragment was found attached to the dorsal fin tag, and gear analysis indicated the net was dipped nylon twine used for inshore recreational/commercial shrimp trawls; the necropsy report indicated drowning was the probable cause of death; this was an intervention case for an out-of-habitat female removed from a lake; it was tracked via satellite-linked tag from 25 March 2016 to 18 June 2016	No
SER16-00432	CMA-Tt-1604	BSE (Tampa Bay)	Moderate decomposition	Necropsy report, photos	a 3.0 cm long x 1.2 cm wide J hook was found in the stomach contents but was not embedded in stomach lining tissue; ~1 cm of approximately 17 lb test diameter clear monofilament was knotted and attached to the hook	No
SER17-00063	CMA-Tt-1703	BSE (St. Joseph Sound/Clearwater Harbor)	Moderate decomposition	Near-real-time report, photos	animal had both external and ingested gear; a large fishing lure was observed obstructing the esophagus, along with a treble hook embedded in the right gape of the mouth	Yes
SER17-00209	FMMSN17102	BSE (Estero Bay)	Moderate decomposition	Necropsy report, photos	propeller wounds to back of head and hook and line on fish in the main stomach; necropsy report suggests watercraft interaction as likely COD	No

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence available beyond Level A data comments that was examined	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER17-00428	GW2017008A	Northern Coastal	Moderate decomposition	Photos, notes	a young calf was reported entangled on 1 and 2 June 2017; while NMFS was consulting vets on intervention, calls continued to come in about calf, and just as responders came on scene on 3 June 2017, people on/around the fishing pier tried to help and the calf was likely killed; fisherman fishing off pier accidentally "caught" the fishing line on the calf on 3 June 2017; responders were instructing him to cut the line but it was taking awhile; meanwhile, people went in water with cast nets to try to disentangle the calf; fishing line from angler was finally cut and while people were handling calf, it went underwater and wasn't seen again; calf stranded moderately decomposed on 5 June 2017 west of the City Pier. Gear analysis: "Tumbleweed" ball of mixed sport fishing gear - large treble hook used a pier gaff, mixture of mono and HDPE lines, Sabiki lures, wired leader; very large ball of 20-30 kinds of line and gear commonly used around fishing piers, likely broken off while fishing and overtime created the tumbleweed - dolphin likely encountered the entire mass and did not add to it	Yes
SER17-00436	MCT-20170514-LA001	Barataria Bay Estuarine System	Fresh dead	Necropsy report, photos, note from responder	a lure without any hooks was found in the second stomach of the dolphin during necropsy; note from responder: artificial lure was just in the stomach "free-floating" and did not contain any hook/hooks or line even when we checked further in all stomach chambers and intestines; the animal was older and teeth were all worn down and was very weak when we arrived on site; being as though the artificial lure was just free-floating in the second stomach, and didn't have a hook or any line obstructing the stomach we cannot say that the artificial lure contributed to the death of this individual	No
SER17-00551	MML1710 [RTMW]	BSE (Tampa Bay)	Advanced decomposition	Near-real-time report, photos	upon necropsy, a chug bug fishing lure was found perforating the esophagus, with monofilament line attached and trailing caudally; known animal from SDRP's catalog for Tampa Bay (RTMW)	Yes

NMFS Regional Number	Field Number	Stock Assignment(s)	Carcass Condition at Examination	Evidence available beyond Level A data comments that was examined	Comments	Does evidence suggest the H&L gear contributed to stranding and/or death?
SER17-00699	MMPL1713	BSE (Tampa Bay)	Moderate decomposition	Photos, note from responder	gear consisted of braided line with a piece of fishing hook attached; line was wrapped around animal's goosebeak; severed cartilage; surrounding tissue was necrotic	Yes

Table 3. Gulf of Mexico bay, sound, and estuary (BSE) stocks of common bottlenose dolphins. BSE stocks are numbered 1–31 corresponding to the locations in Figure 4. Stocks are listed from west (Texas) to east (Florida). See Figures 5–11 for more detailed views of BSE stocks.

Stock Number	Stock Name Corresponding to Number in Figure 4
1	Laguna Madre
2	Neuces Bay/Corpus Christi Bay
3	Copano Bay/Aransas Bay/San Antonio Bay/Redfish Bay/Espiritu Santo Bay
4	Matagorda Bay/Tres Palacios Bay/Lavaca Bay
5	West Bay
6	Galveston Bay/East Bay/Trinity Bay
7	Sabine Lake
8	Calcasieu Lake
9	Vermilion Bay/West Cote Blanche Bay/Atchafalaya Bay
10	Terrebonne-Timbalier Bay Estuarine System
11	Barataria Bay Estuarine System
12	Mississippi River Delta
13	Mississippi Sound/Lake Borgne/Bay Boudreau
14	Mobile Bay/Bonsecour Bay
15	Perdido Bay
16	Pensacola Bay/East Bay
17	Choctawhatchee Bay
18	St. Andrew Bay
19	St. Joseph Bay
20	St. Vincent Sound/Apalachicola Bay/St. George Sound
21	Apalachee Bay
22	Waccasassa Bay/Withlacoochee Bay/Crystal Bay
23	St. Joseph Sound/Clearwater Harbor
24	Tampa Bay
25	Sarasota Bay/Little Sarasota Bay
26	Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay
27	Caloosahatchee River
28	Estero Bay
29	Chokoloskee Bay/Ten Thousand Islands/Gullivan Bay
30	Whitewater Bay
31	Florida Keys (southwest Marathon Key to Marquesas Keys)

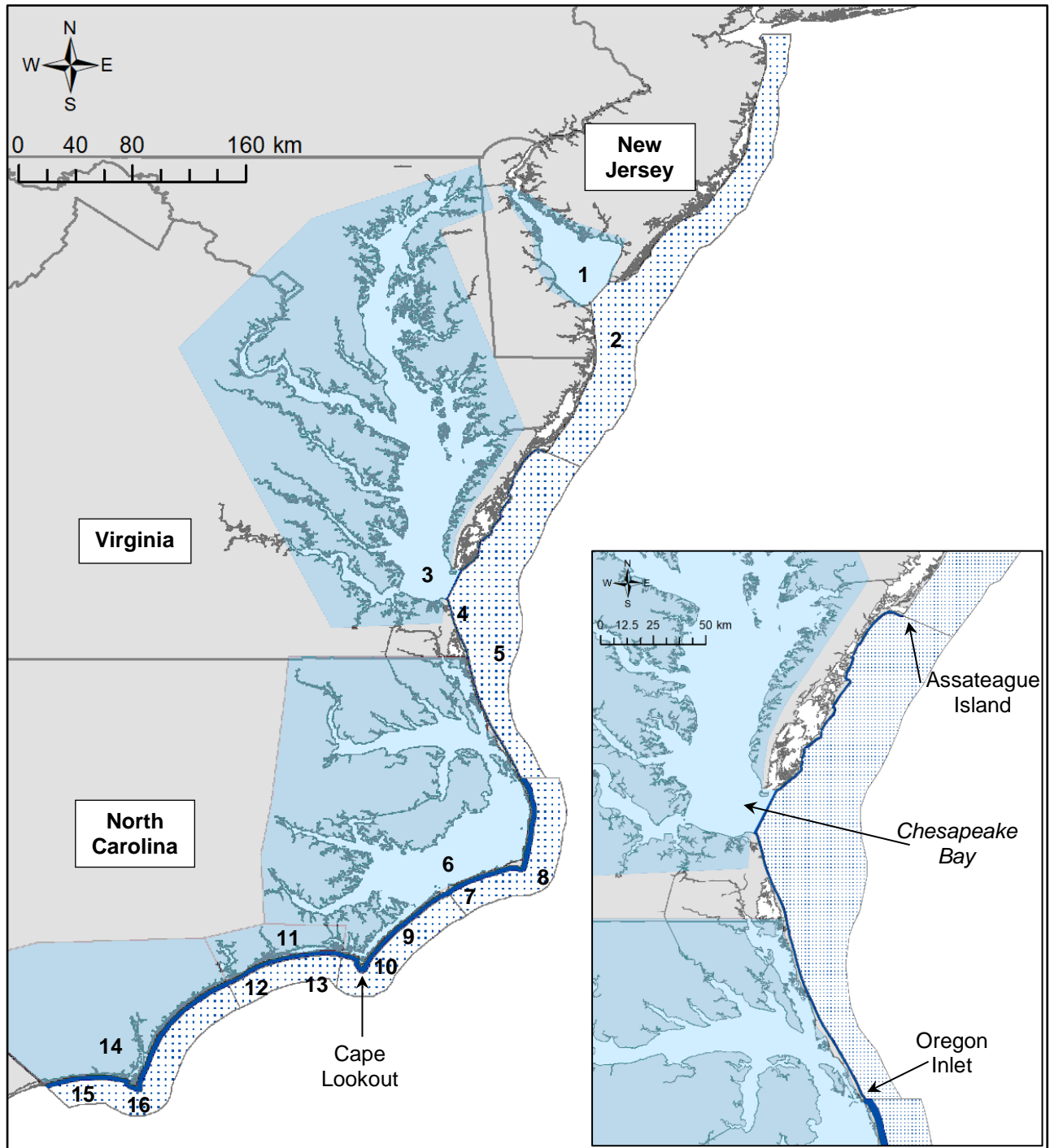


Figure 1. Range of the coastal form of common bottlenose dolphins from North Carolina (NC) to New Jersey (NJ), including estuarine (light blue) and ocean waters (dark and stippled blue). The range is divided into 16 geographic regions (see Table 1) where dolphins are assigned to stock(s) based on bimonthly periods: NM=Northern Migratory, SM=Southern Migratory, NNCES=Northern NC Estuarine System, SNCES=Southern NC Estuarine System (adapted from Lyssikatos and Garrison [2018]). Note in the inset that the regions closest to shore extend out to 3 km south of Oregon Inlet, NC, out to 1 km from Oregon Inlet to Assateague Island, Virginia, and out to the 20-m isobath from Assateague Island to NJ.

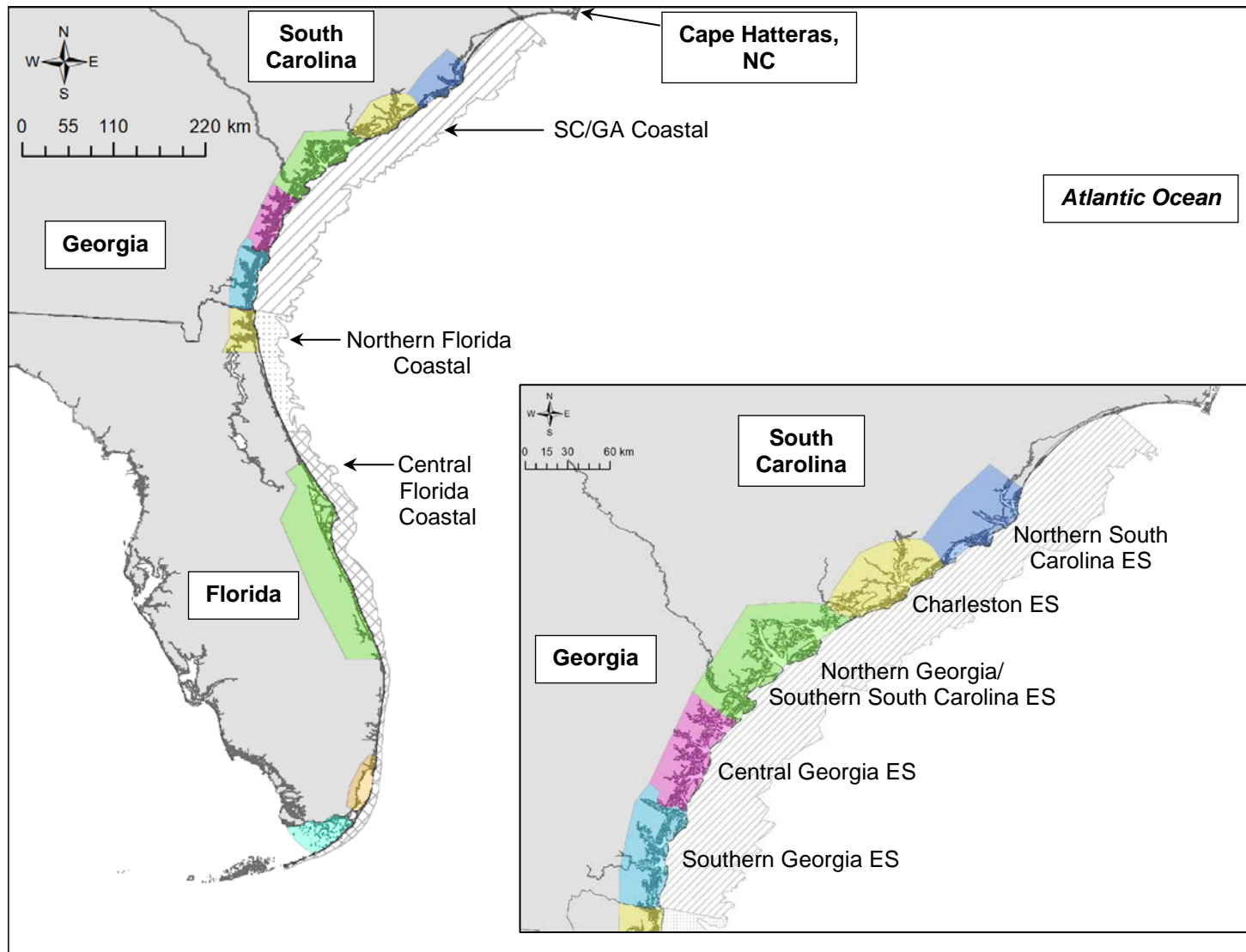


Figure 2. Common bottlenose dolphin stocks in the Atlantic Ocean from South Carolina (SC) to Florida (FL) showing assignment polygons for Bay, Sound, and Estuary (BSE) stocks (colored) and coastal stocks (gray patterns). Inset shows polygons for BSE stocks in SC and Georgia. See Figure 3 colored).

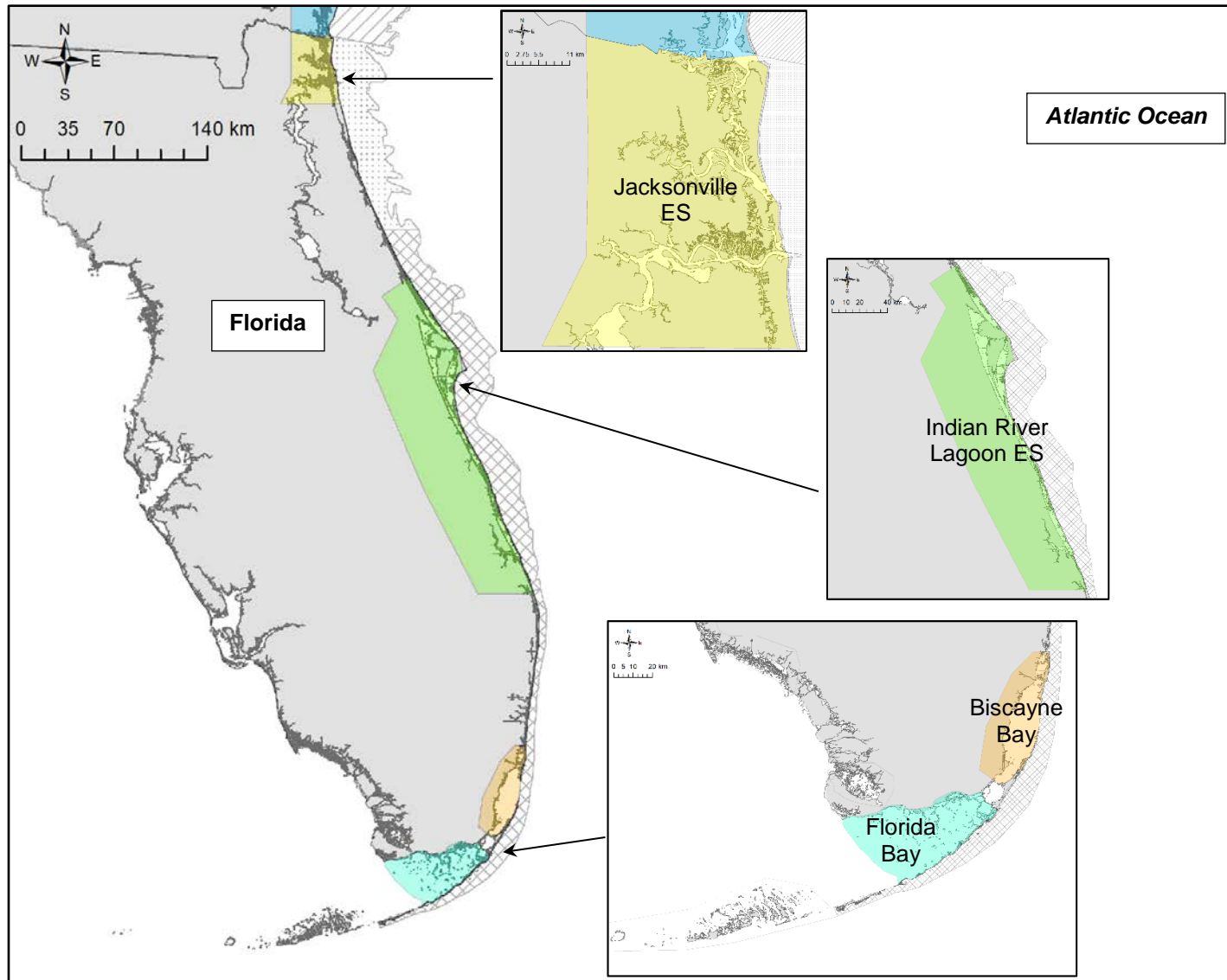


Figure 3. Closer views of Bay, Sound, and Estuary stocks (colored) of common bottlenose dolphins along the Atlantic coast of Florida. Parts of the coast do not have a formally designated stock in their Estuarine Systems (ES). Coastal migratory stocks (gray patterns) are also shown; see Figure 2 for names.

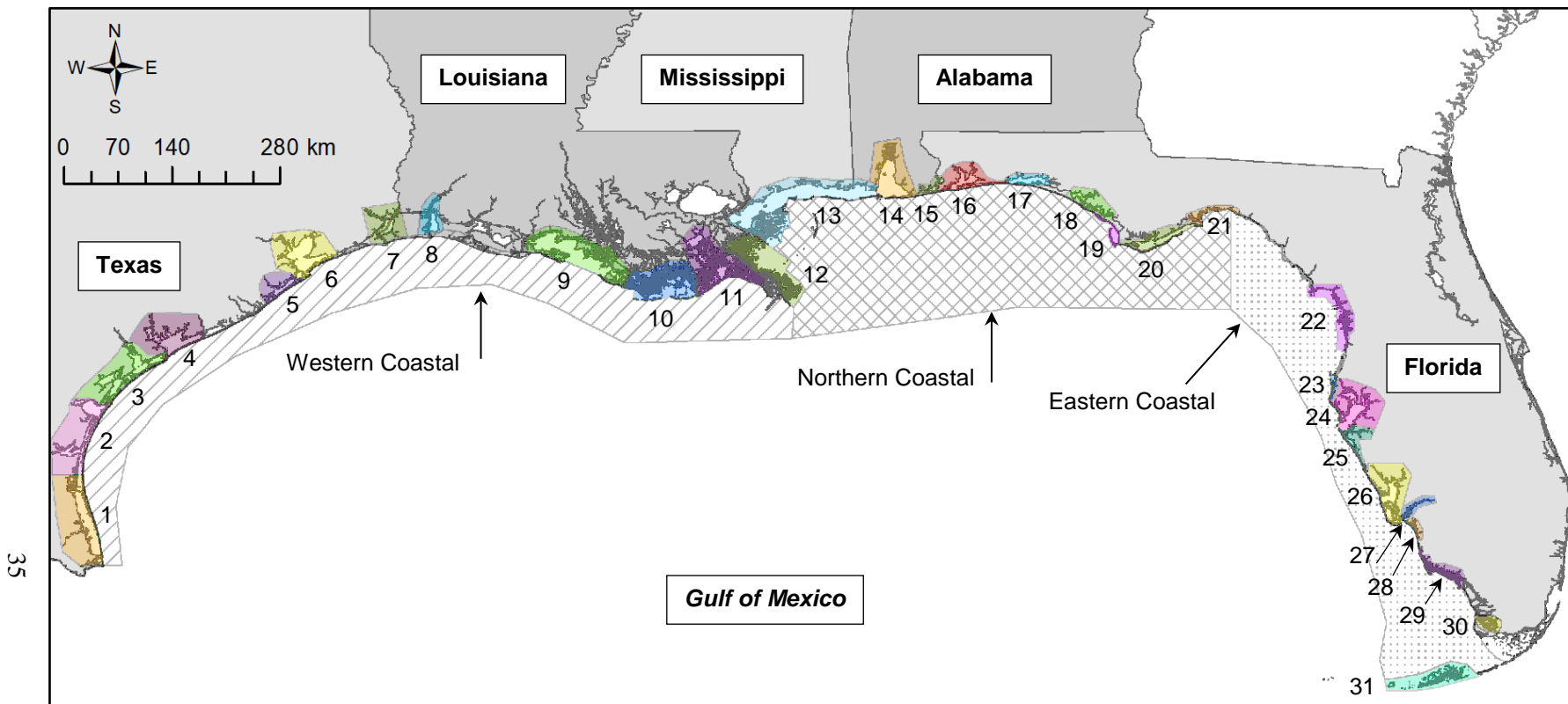


Figure 4. Bay, Sound, and Estuary (BSE) and coastal stocks of common bottlenose dolphins in the Gulf of Mexico. Assignment polygons for BSE stocks are numbered 1–31 and correspond to stocks names in Table 3. Boundaries for the three coastal stocks are displayed in gray pattern. See Figures 5–11 for more detailed views and BSE stock names; figures are arranged from west (Texas) to east (Florida).

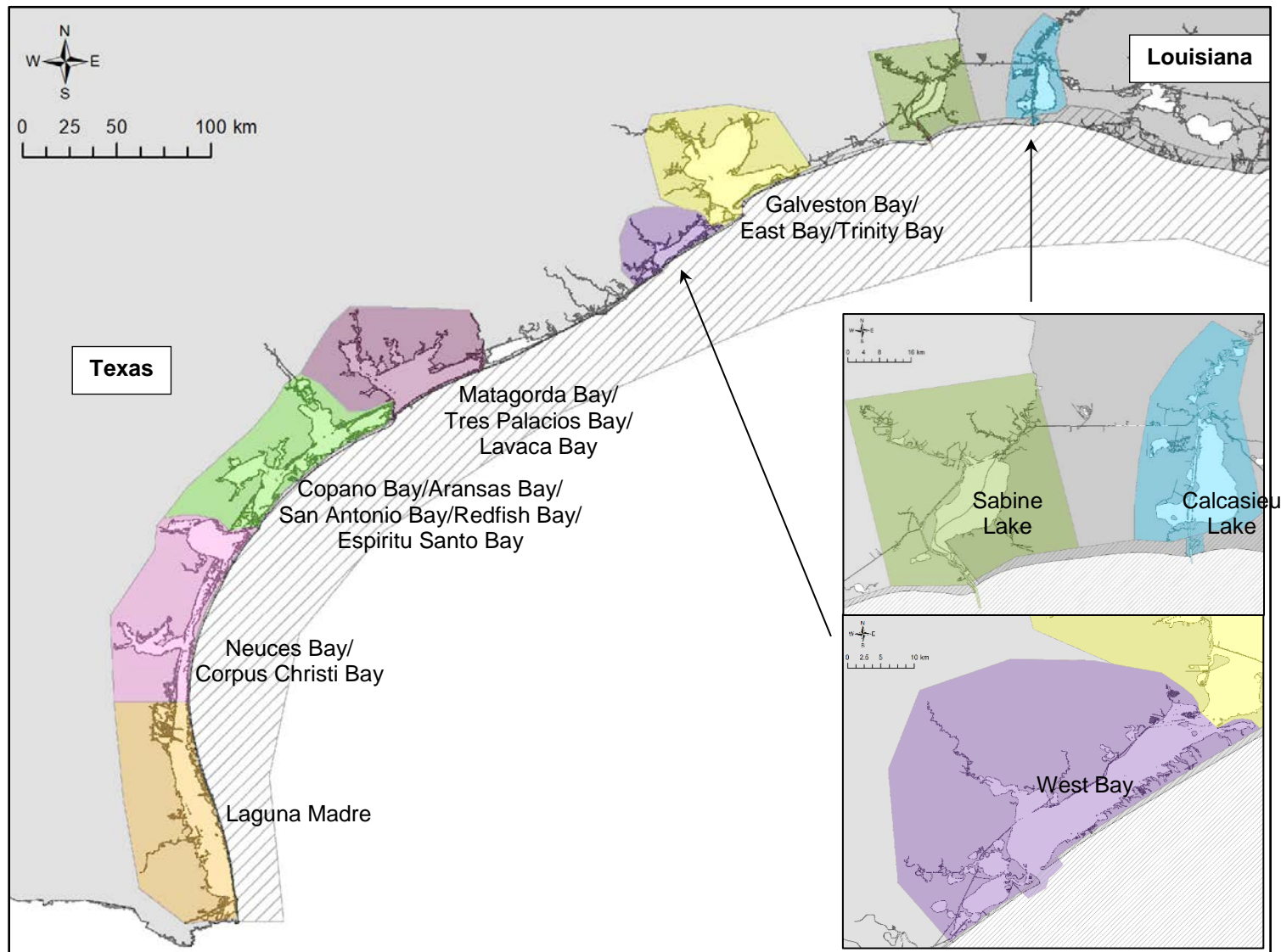


Figure 5. Common bottlenose dolphin stocks from southern Texas to near the Texas/Louisiana border showing assignment polygons for Bay, Sound, and Estuary stocks (colored). The top inset map shows Sabine Lake and Calcasieu Lake, both of which extend into coastal waters within the borders of the jetties. The bottom inset map shows the West Bay Stock that extends into coastal waters 1 km from shore and 3 km to the north and south of the inlet/pass.

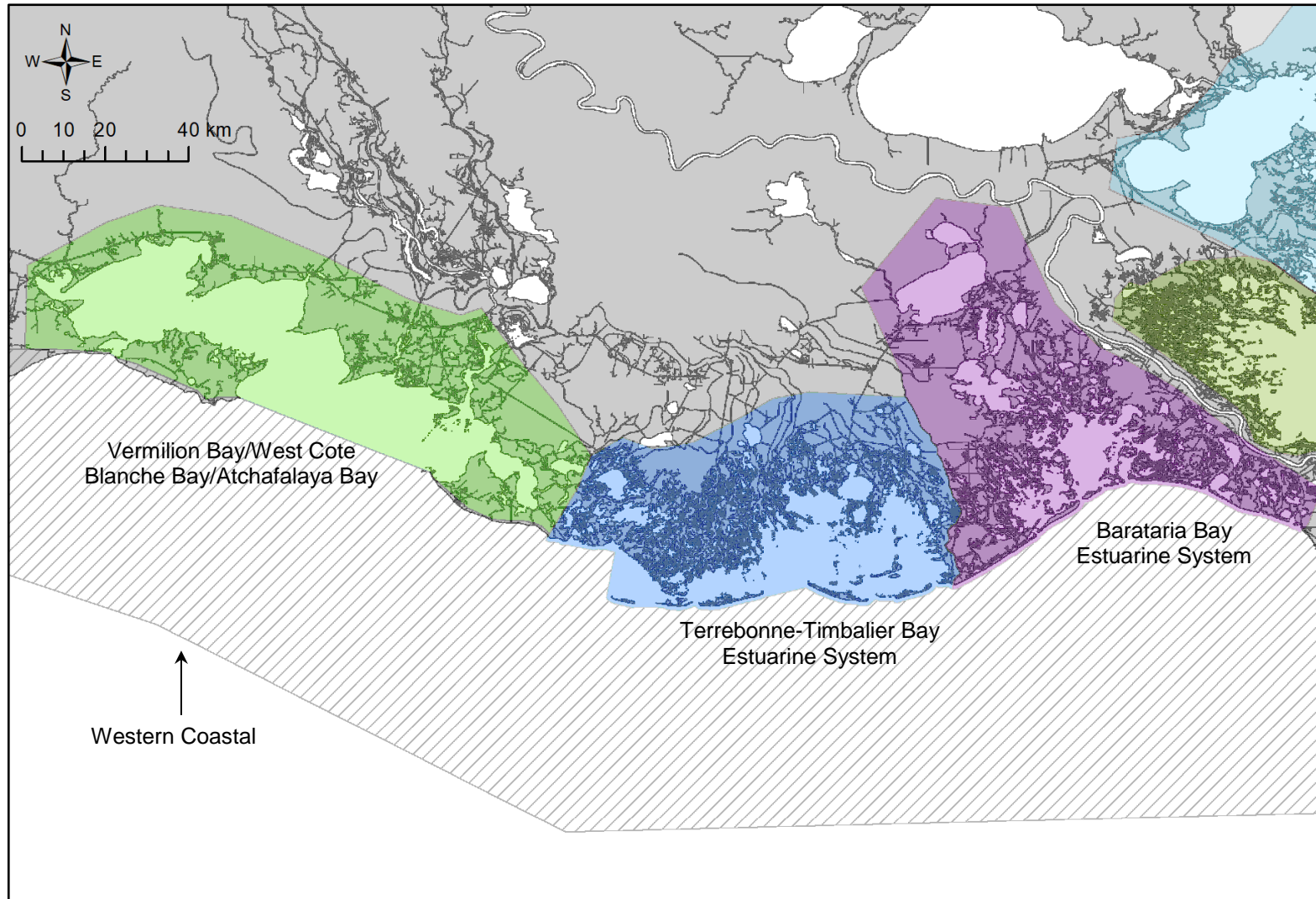


Figure 6. Common bottlenose dolphin stocks in Louisiana west of the mouth of the Mississippi River showing assignment polygons for Bay, Sound, and Estuary stocks (colored). Note that Terrebonne-Timbalier Bay and Barataria Bay Estuarine System stocks extend into coastal waters out to 1 km from shore.

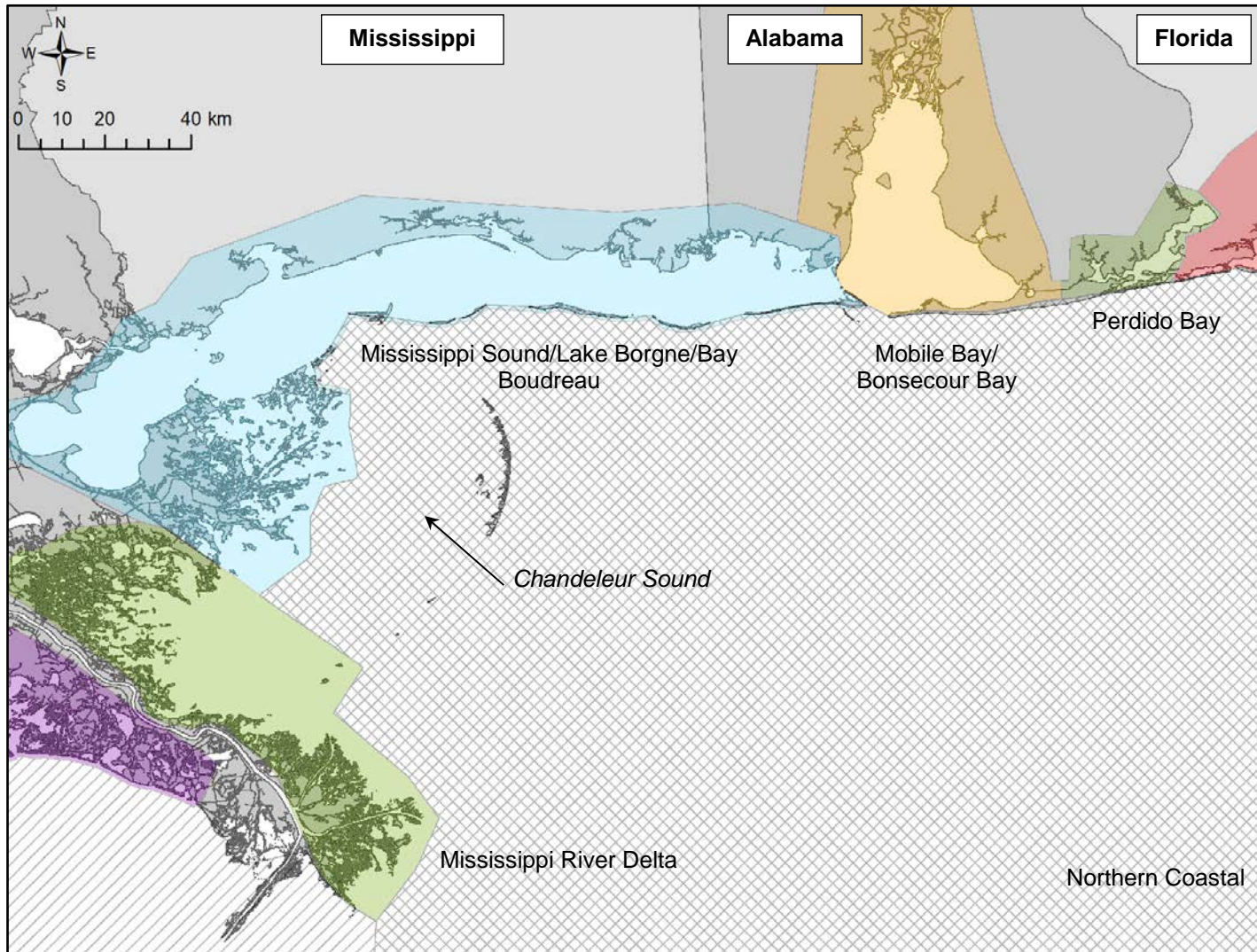


Figure 7. Common bottlenose dolphin stocks in Louisiana east of the mouth of the Mississippi River towards Perdido Bay at the Alabama/Florida border showing assignment polygons for Bay, Sound, and Estuary stocks (colored). Note that the Mississippi Sound/Lake Borgne/Bay Boudreau Stock extends into coastal waters out to 1 km from shore along the barrier islands and east of barrier islands within Chandeleur Sound.

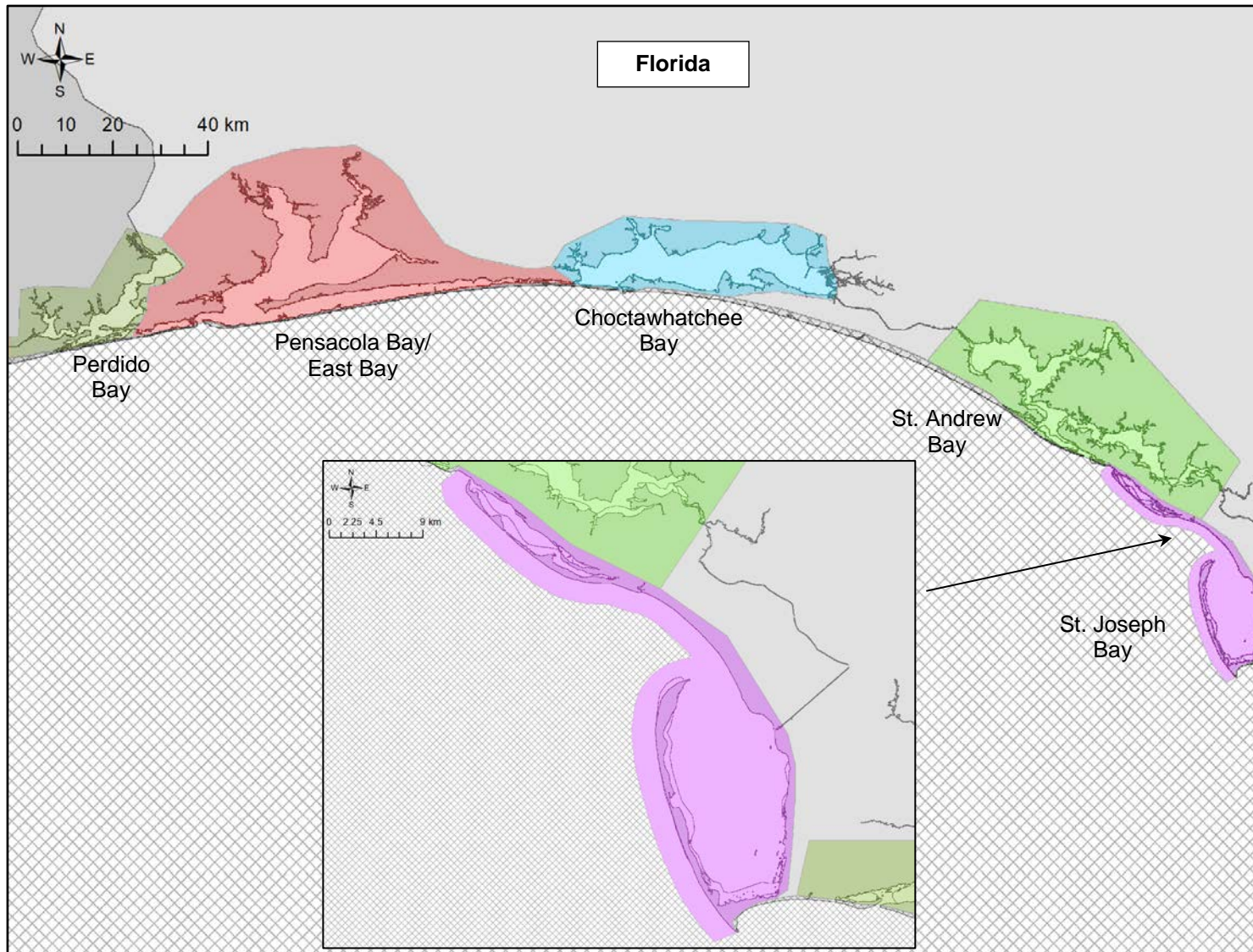


Figure 8. Common bottlenose dolphin stocks from the Alabama/Florida border to St. Joseph Bay showing assignment polygons for Bay, Sound, and Estuary stocks (colored). The inset shows that the St. Joseph Bay Stock extends into coastal waters 2 km from shore.

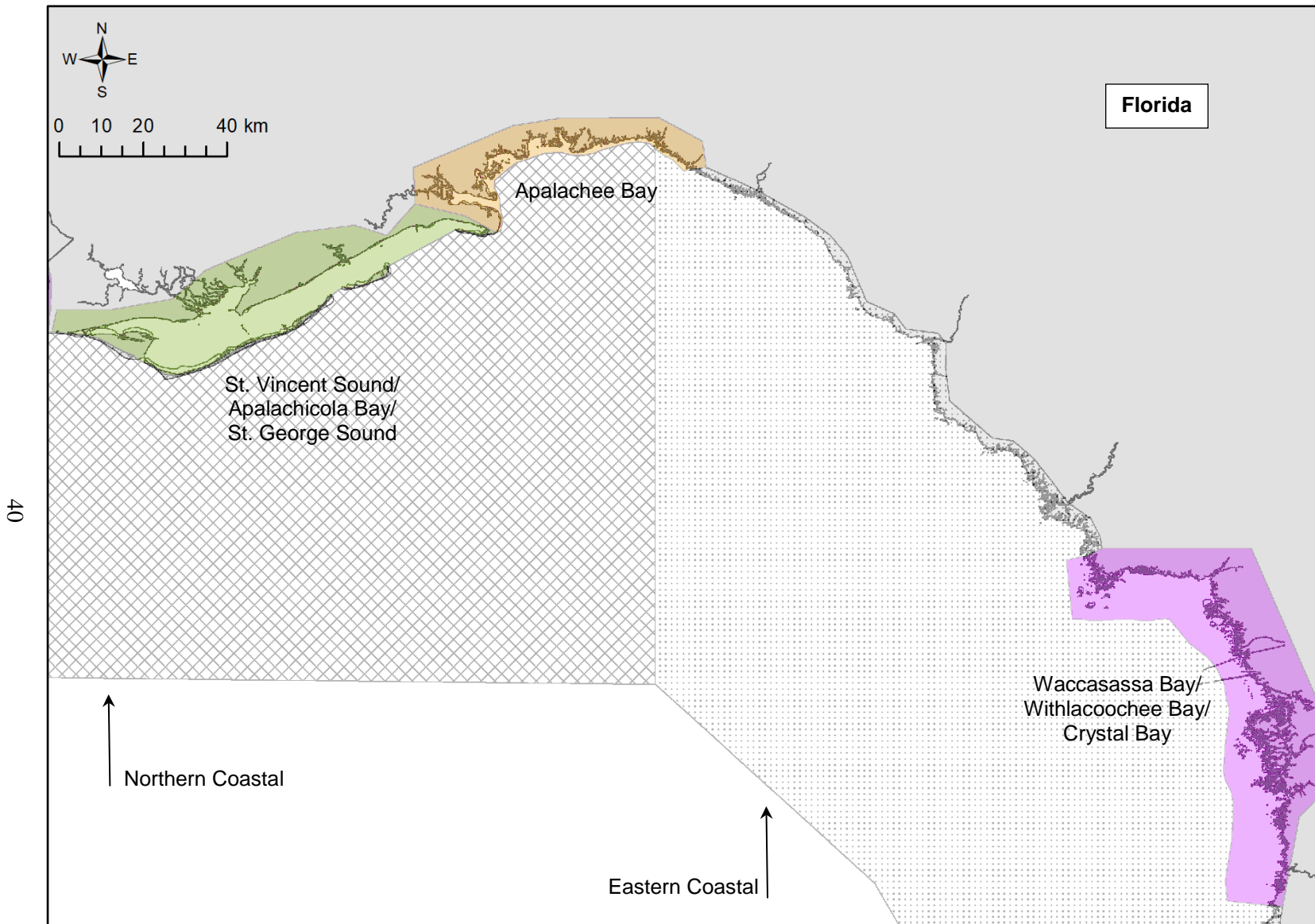


Figure 9. Common bottlenose dolphin stocks along the northwest coast of Florida showing assignment polygons for Bay, Sound, and Estuary stocks (colored).

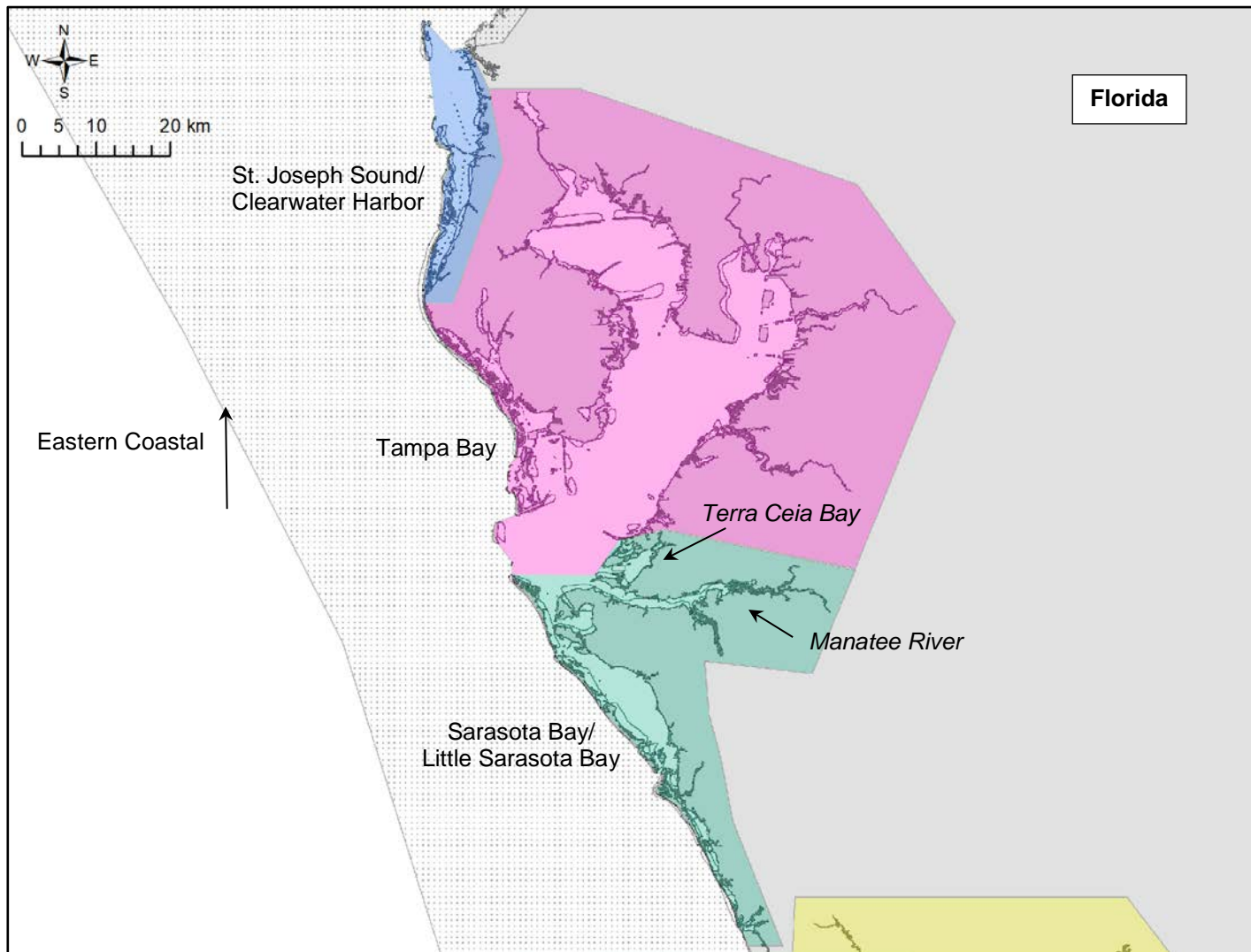


Figure 10. Common bottlenose dolphin stocks in western Florida showing assignment polygons for Bay, Sound, and Estuary stocks (colored).

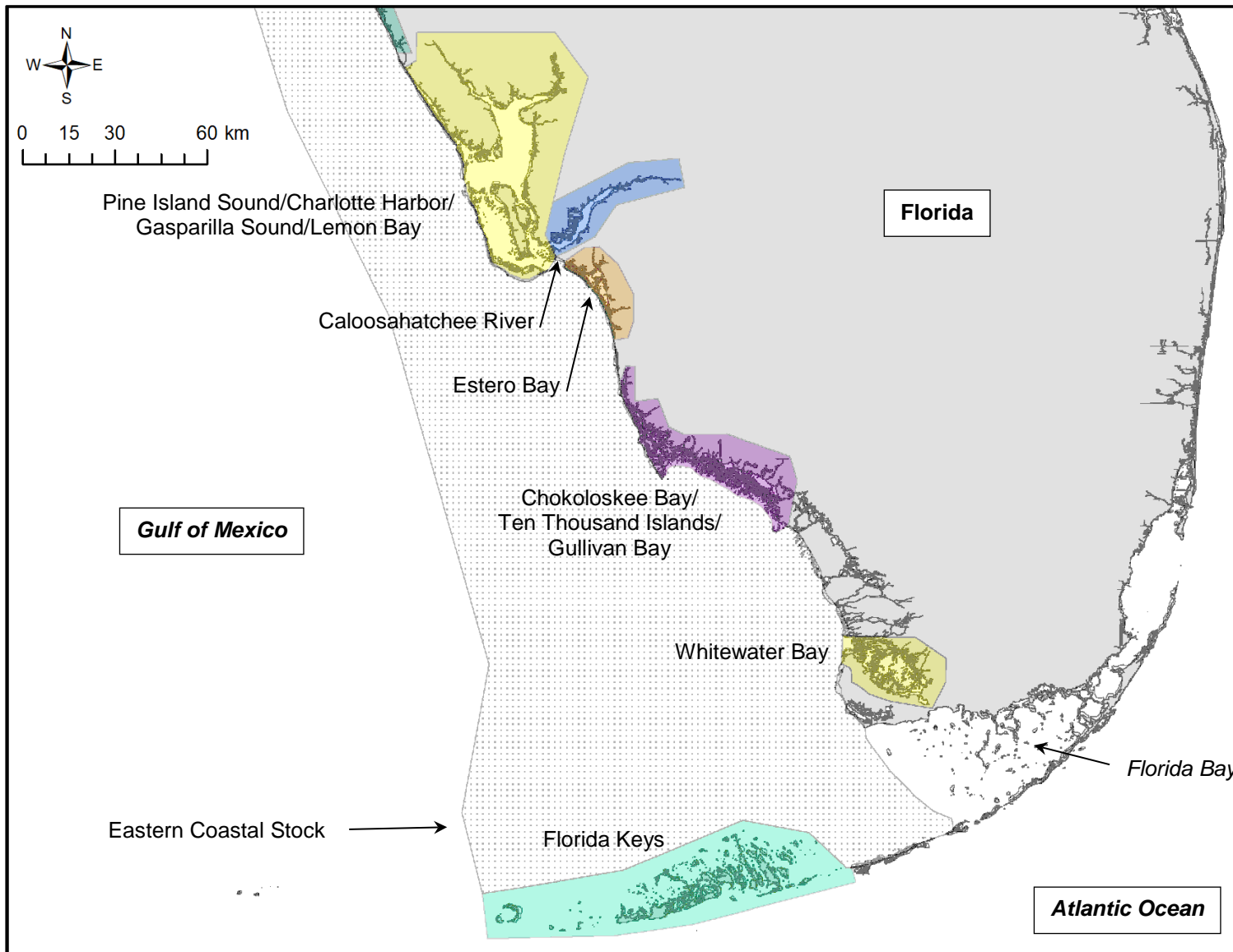


Figure 11. Common bottlenose dolphin stocks along the southwestern coast of Florida showing assignment polygons for Bay, Sound, and Estuary stocks (colored).