

## CETACEAN SPECIES IN THE GULF OF MEXICO

### DWH NRDA MARINE MAMMAL TECHNICAL WORKING GROUP REPORT

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#### Introduction

The Gulf of Mexico harbors a unique mix of sub-tropical and temperate cetacean species. Twenty-one species of cetaceans routinely occur in the northern Gulf of Mexico (Table 1). Bay, sound and estuary waters are inhabited by common bottlenose dolphins. Continental shelf waters (<200m deep) are primarily inhabited by common bottlenose dolphins and Atlantic spotted dolphins. Twenty species are widely distributed in continental slope and oceanic waters (>200m deep) out to the U.S. Exclusive Economic Zone (EEZ) and beyond. These species includes two large whales<sup>1</sup>, the sperm whale and the Bryde's whale. The sperm whale is listed as endangered under the Endangered Species Act (ESA) and there is a petition to list the Bryde's whale as endangered. Thirty-three stocks of common bottlenose dolphin are listed as strategic under the Marine Mammal Protection Act (MMPA); most of these are stocks found within the Gulf's bays, sounds and estuaries (Table 2).

**Table 1.** Cetacean species that occur in the northern Gulf of Mexico, their ESA/MMPA status and best available abundance estimate with associated coefficient of variation (CV). Abundance estimates for the oceanic species are from a line-transect survey conducted by the National Marine Fisheries Service (NMFS) in 2009 (Waring *et al.* 2013). Extralimital species are not included, *i.e.*, species for which there are only a few records and are considered beyond their normal range. Extralimital cetacean species for the Gulf of Mexico include the North Atlantic right whale, blue whale, fin whale, sei whale, minke whale, humpback whale and Sowerby's beaked whale. There are no pinnipeds (seals, sea lions, walrus) that live in the northern Gulf of Mexico.

Common Name	Scientific Name	Federal ESA/MMPA Status <sup>1</sup>	Abundance Estimate (with CV)
Sperm whale	<i>Physeter macrocephalus</i>	Endangered	763 (CV=0.38)
Bryde's whale	<i>Balaenoptera edeni</i>		33 (CV=1.07)
Dwarf and Pygmy sperm whales	<i>Kogia sima</i> and <i>Kogia breviceps</i>		186 (CV=1.04) <sup>3</sup>
Cuvier's beaked whale	<i>Ziphius cavirostris</i>		74 (CV=1.04)
Blainville's and Gervais' beaked whales	<i>Mesoplodon densirostris</i> <i>Mesoplodon europaeus</i>		149 (CV=0.91) <sup>2</sup>
False killer whale	<i>Pseudorca crassidens</i>		unknown
Pygmy killer whale	<i>Feresa attenuata</i>		152 (CV=1.02)
Melon-headed whale	<i>Peponocephala electra</i>		2,235 (CV=0.75)

<sup>1</sup> 'Large whales' include the baleen whale species and the sperm whale

Common Name	Scientific Name	Federal ESA/MMPA Status <sup>1</sup>	Abundance Estimate (with CV)
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>		2,415 (CV=0.66)
Killer whale	<i>Orcinus orca</i>		28 (CV=1.02)
Risso's dolphin	<i>Grampus griseus</i>		2,442 (CV=0.57)
Atlantic spotted dolphin	<i>Stenella frontalis</i>		unknown
Pantropical spotted dolphin	<i>Stenella attenuata</i>		50,880 (CV=0.27)
Clymene dolphin	<i>Stenella clymene</i>		129 (CV=1.00)
Striped dolphin	<i>Stenella coeruleoalba</i>		1,849 (CV=0.77)
Spinner dolphin	<i>Stenella longirostris</i>		11,441 (CV=0.83)
Common bottlenose dolphin <sup>4</sup>	<i>Tursiops truncatus</i>	see Table 2	see Table 2
Fraser's dolphin	<i>Lagenodelphis hosei</i>		unknown
Rough toothed dolphin	<i>Steno bredanensis</i>		624 (CV=0.99)

1. Denotes ESA listing as either endangered or threatened, or MMPA listing as depleted. All marine mammal stocks are considered protected under the MMPA.
2. This is a joint abundance estimate for the two beaked whale species because they are difficult to differentiate at sea
3. This is a joint abundance estimate for the two *Kogia* species because they are difficult to differentiate at sea

**Table 2.** Stocks of common bottlenose dolphins (*Tursiops truncatus*) in the Gulf of Mexico. Best available abundance estimates derived from Waring *et al.* (2015) and Waring *et al.* (2013). Estimates for most of the bay, sound and estuary stocks are more than 8 years old and are considered outdated.

Stock	MMPA Status	Abundance estimate (with CV)
Oceanic		5,806 (CV=0.39)
Continental Shelf		51,192 (CV=0.10)
Western Coastal	Strategic	20,161 (CV=0.17)
Northern Coastal	Strategic	7,185 (CV=0.21)
Eastern Coastal		12,388 (CV=0.13)
<b><u>Bav. Sound and Estuary Stocks</u></b>		
Laguna Madre	Strategic	Unknown
Nueces Bay, Corpus Christi Bay	Strategic	Unknown
Copano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espirtu Santo Bay	Strategic	Unknown
Matagorda Bay, Tres Palacios Bay, Lavaca Bay	Strategic	Unknown
West Bay	Strategic	Unknown

Stock	MMPA Status	Abundance estimate (with CV)
Galveston Bay, East Bay, Trinity Bay	Strategic	Unknown
Sabine Lake	Strategic	Unknown
Calcasieu Lake	Strategic	Unknown
Vermilion Bay, West Cote Blanche Bay, Atchafalaya Bay	Strategic	Unknown
Terrebonne Bay, Timbalier Bay	Strategic	Unknown
Barataria Bay	Strategic	Unknown
Mississippi River Delta	Strategic	332 (CV=0.93)
Mississippi Sound, Lake Borgne, Bay Boudreau	Strategic	901 (CV=0.63)
Mobile Bay, Bonsecour Bay	Strategic	Unknown
Perdido Bay	Strategic	Unknown
Pensacola Bay, East Bay	Strategic	Unknown
Choctawhatchee Bay	Strategic	179 (CV=0.04)
St. Andrews Bay	Strategic	Unknown
St. Joseph Bay	Strategic	146 (CV=0.18)
St. Vincent Sound, Apalachicola Bay, St. Georges Sound	Strategic	439 (CV=0.14)
Apalachee Bay	Strategic	Unknown
Waccasassa Bay, Withlacoochee Bay, Crystal Bay	Strategic	Unknown
St. Joseph Sound, Clearwater Harbor	Strategic	Unknown
Tampa Bay	Strategic	Unknown
Sarasota Bay, Little Sarasota Bay	Strategic	160
Pine Island Sound, Charlotte Harbor, Gasparilla Sound	Strategic	826 (CV=0.09)
Lemon Bay	Strategic	Unknown
Caloosahatchee River	Strategic	Unknown
Estero Bay	Strategic	Unknown
Chokoloskee Bay, Ten Thousand Islands, Gullivan Bay	Strategic	Unknown
Whitewater Bay	Strategic	Unknown
Florida Keys (Bahia Honda to Key West)	Strategic	Unknown

The following information provides a general description of the physical characteristics, distribution and habitat preferences, and life history characteristics, as available, for each species found in the northern Gulf of Mexico. For many species, little is known about the life history characteristics anywhere in the world and even less so for the populations living in the Gulf of Mexico. Thus, the information herein provides a general description of species and is based primarily on three published sources: The Encyclopedia of Marine Mammals edited by Perrin *et al.* (2009), The Marine Mammals of the Gulf of

Mexico by Würsig *et al.* (2000), the Guide to Marine Mammals and Turtles of the U.S. Atlantic and Gulf of Mexico by Wynne and Schwartz (1999), and NMFS Stock Assessment reports published by Waring *et al.* (2013).

Section one of this document addresses large whales. Section two addresses small whales. Section 3 addresses dolphins. Maps illustrating sightings of all species during NMFS Southeast Fisheries Science Center (SEFSC) cetacean surveys in the Gulf of Mexico follow the species descriptions at the end of the document (Figures 1-14). These maps are taken from Dias and Garrison (2015).

## 1. Large Whales

### 1.1. Sperm Whale (*Physeter macrocephalus*)

The sperm whale is the largest toothed whale species. Adult females can reach 11-12 m in length, while adult males are much larger, measuring 15-16 m in length (Jefferson *et al.* 1993, Whitehead 2009). Gulf of Mexico sperm whales seem smaller than those from other areas (Jochens *et al.* 2008). Sperm whales are brownish gray to black in color. The surface of the body behind the eye tends to be wrinkled. The flippers are relatively short, wide, and paddle-shaped. There is a low rounded dorsal hump and a series of bumps on the dorsal ridge of the tailstock (Whitehead 2009).

Sperm whales are listed as endangered under the ESA. A Final Recovery Plan for sperm whales was published and is in effect (NMFS 2010). Because it is listed as endangered under the ESA, sperm whales in the Gulf of Mexico are listed as strategic under the MMPA

Sperm whales are distributed in deep waters worldwide from the ice-edge to the equator (Whitehead 2009). The sexes differ in habitat usage with females distributed primarily in tropical and warm-temperate waters while adult males have larger ranges and may move from the equator to the ice edge (Whitehead 2009). They are found year round in the northern Gulf of Mexico along the continental slope and in oceanic waters (Figure 1) (Waring *et al.* 2013).

The best available abundance estimate for northern Gulf of Mexico sperm whales is 763 (CV=0.38), derived from an oceanic survey of waters from the 200m isobath to the seaward extent of the U.S. EEZ in 2009 (Waring *et al.* 2013). The minimum population estimate is 560. Under the MMPA, the maximum number of animals, not including natural mortalities that may be removed from a marine mammal stock annually while allowing that stock to reach or maintain its optimum sustainable population is called Potential Biological Removal (PBR). PBR for sperm whales in the Gulf of Mexico is 1.1. There is insufficient information to determine population trends. Total human-caused mortality and serious injury for this stock is not known and information is insufficient to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching zero mortality and serious injury rate (Waring *et al.* 2013). An examination of whaling logbooks from the 18<sup>th</sup> century indicates that sperm whales were hunted in the Gulf of Mexico (Reeves *et al.* 2011). Most takes were of smaller whales found in groups, suggesting the whalers were taking primarily juveniles and females. The authors estimate 1,179 whales (with a standard error (SE) = 224) were killed by the fishery between 1780s-1870s (Reeves *et al.* 2011).

Female sperm whales reach sexual maturity at about age 8-9 years old and they give birth about every 5-7 years; gestation is 14-16 months (Würsig *et al.* 2000, Whitehead 2009). Males are larger and do not start breeding until in their late 20's (Whitehead 2009). The sperm whale consumes a wide variety of deep-water fish and cephalopods, their primary prey being squid. They forage during deep dives that routinely reach a modal depth of 600m and duration of 45 min, though deeper dives to over 1000m occur (Whitehead 2009). They are capable of diving to depths of over 3,200m (10,000 ft) with durations of over 60 min (Würsig *et al.* 2000). After a long, deep dive, sperm whales come to the surface to breathe for approximately 9 min (Whitehead 2009).

## 1.2. Bryde's Whale (*Balaenoptera edeni*)

Bryde's whales are medium-sized baleen whales that may attain lengths of 15.5 m, although most are smaller (Kato and Perrin 2009). Bryde's whales closely resemble, and are often confused with, sei whales (*Balaenoptera borealis*) but this latter species does not occur in the northern Gulf of Mexico. The feature that most readily distinguishes Bryde's whales from other species, including sei whales, is the presence of three prominent ridges on the rostrum (Kato and Perrin 2009). The rostrum is V-shaped and the dorsal fin is strongly falcate. They are dark gray above and lighter below (Kato and Perrin 2009).

Bryde's whales in the Gulf of Mexico are not listed under the ESA, but are designated as strategic under the MMPA since the average annual human-caused mortality and serious injury exceeds PBR. NMFS was recently petitioned to list this population as endangered under the ESA and a Status Review (<http://www.nmfs.noaa.gov/pr/laws/esa/policies.htm>) is in progress.

Bryde's whales occur throughout tropical and warm temperate waters worldwide. Unlike most other large baleen whales, this species is not thought to make seasonal migratory movements between warmer breeding and calving grounds and cold temperate feeding grounds. In the northern Gulf of Mexico, Bryde's whales are found almost exclusively in the northeastern Gulf between 100-300m isobaths (Figure 2). They appear to rely heavily on the highly productive waters of the De Soto canyon area. They have been seen during spring and summer ship surveys and a winter aerial survey, and strandings are recorded from all seasons (Mullin and Hoggard 2000, Waring *et al.* 2013).

The best available abundance estimate for northern Gulf of Mexico Bryde's whales is 33 individuals (CV=1.07), based on a summer 2009 survey that covered oceanic waters from the 200m isobath offshore to the seaward extent of the U.S. EEZ (Waring *et al.* 2013). The minimum population estimate is 16 and the calculated PBR is 0.16. Annual human-caused mortality and serious injury is not known and there are no documented serious injuries or mortalities of whales from this stock due to commercial fishing. One ship-strike mortality recorded in 2009 resulted in a minimum annual average rate of 0.2 serious injuries or mortalities due to ship strikes during 2006-2010 (Waring *et al.* 2013).

Bryde's whales are generally observed singly or in small groups (2-5 individuals) in the Gulf of Mexico (Maze-Foley and Mullin 2006). Female Bryde's whales in the western North Pacific attain sexual maturity at approximately 11.6-11.8 m length and males reach sexual maturity at 11.0-11.4 m length (Kato and Perrin 2009). Gestation is approximately 11 months and the calving interval is 2 years (Kato and Perrin 2009). Life history information is not available for the Gulf of Mexico population. This species primarily feeds on pelagic schooling fishes, such as pilchard, anchovies, sardines, and herring.

## 2. Small Whales

### 2.1. Pygmy Sperm Whale (*Kogia breviceps*) and Dwarf Sperm Whale (*K. sima*)

There are two species in the genus *Kogia*: the pygmy sperm whale (*Kogia breviceps*) and dwarf sperm whale (*K. sima*). Both are present in the Gulf of Mexico. They are difficult to tell apart at sea and so are often combined into a single group, *Kogia* spp., during surveys and studies and that has been done for this document as well. As their name suggests, these species are closely related to the sperm whale. They are mid-sized toothed whales. Pygmy sperm whales reach a maximum size of about 3.8 m; dwarf sperm whales are smaller reaching a maximum length of 2.7 m (Würsig *et al.* 2000, McAlpine 2009). Adults of both species are bluish-gray to blackish-brown above and lighter below (McAlpine 2009). They have small falcate dorsal fins set about two-thirds of the way back. The dwarf sperm whale has a taller more dolphin-like dorsal fin (Jefferson *et al.* 2008). They have very blunt, stubby heads, no rostrum and the lower jaw is under slung, placing the mouths under the rostrum.

Neither species is listed as endangered or threatened under the ESA, nor as strategic or depleted under the MMPA.

Pygmy and dwarf sperm whales have a worldwide distribution in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans (McAlpine 2009). They are found primarily over the continental shelf edge and slope. Both species are common in the Gulf of Mexico and sightings of *Kogia* spp. in the northern Gulf of Mexico are widely distributed in oceanic waters (Figure 3) (Maze-Foley and Mullin 2006). They have been documented during all seasons (Hansen *et al.* 1996, Mullin and Hoggard 2000, Mullin and Fulling 2004, Mullin *et al.* 2004, Maze-Foley and Mullin 2006).

The best available population estimate for dwarf and pygmy sperm whales together in the northern Gulf of Mexico is 186 (CV=1.04), derived from a summer 2009 oceanic survey that covered waters from the 200m isobath to the offshore extent of the U.S. EEZ. The minimum population estimate for both species combined is 90 and the calculated PBR is 0.9 (Waring *et al.* 2013). There has been zero fishery-related mortality or serious injury reported for dwarf sperm whales from 1998 to 2010. The estimated annual average fishery-related mortality or serious injury to pygmy sperm whales was 0.3 for 2006-2010 in the pelagic longline fishery (Waring *et al.* 2013). Total human-caused mortality and serious injury is not known for either species and data are insufficient to determine if total fishery-related mortality and serious injury is insignificant and approaching a zero mortality rate. Neither species is considered strategic, but, with the difficulties in distinguishing between *Kogia* species, there is concern for the possibility of mortalities exceeding PBR for one species or the other (Waring *et al.* 2013).

There is little information on the life history of the two species, in part because they are found far offshore and are not often encountered. What information that is available indicates group sizes are fairly small (< 10 individuals) with an average of 1.5 to 2 animals (Würsig *et al.* 2000). Male pygmy sperm whales appear to be sexually mature by the time they reach 2.7m, females slightly smaller; dwarf sperm whales at slightly smaller sizes - about 2.1m (McAlpine 2009). Like other cetaceans, a single calf is born. Females may bear a calf every year (Wynne and Schwartz 1999, Würsig *et al.* 2000, Bloodworth and Odell 2008). Both species make prolonged deep dives for feeding and forage primarily for mid and deep-water squid, but also some fish and crustaceans, through suction feeding (Wynne and Schwartz 1999, Bloodworth and Odell 2008, Staudinger *et al.* 2014). Barlow (1999) estimated a median dive time of 10.9 min for *Kogia* sp. in the Gulf of California. A satellite-tagged pygmy sperm whale released off Florida was found to make long nighttime dives (> 8 min). Daytime dives were shorter in duration (Scott *et al.* 2001).

## 2.2. Cuvier's Beaked Whale (*Ziphius cavirostris*)

Cuvier's beaked whales are one of the 22 species in the toothed whale family Ziphiidae. Collectively known as 'beaked whales,' all the members of the group are deep-water species. Cuvier's beaked whales have a robust, cigar-shaped body with a small falcate dorsal fin set about two thirds back; the small flippers fit into a slight depression in the side of the body as with other beaked whales (Heyning and Mead 2009). There is little definition between the head and the body head and the rostrum is very short and poorly defined (Heyning and Mead 2009). Coloration is somewhat variable, but they are generally brownish to gray and have a white forehead and rostrum. Older males are often scarred, leaving whitish lines and marks on the body. Both sexes may exhibit healed cookie cutter shark bites. Average adult size is 6.1m (Heyning and Mead 2009).

The species is not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

Cuvier's beaked whales are distributed in all oceans and seas, though they are absent from the high polar regions (Heyning and Mead 2009). They are found throughout the Gulf of Mexico, on the continental slope and in deep waters off the slope (Figure 4). Sightings are generally in waters > 1,000m deep. Data from both aerial and ship surveys (Hansen *et al.* 1996, Mullin and Hoggard 2000) and strandings indicate they are present in the Gulf of Mexico year round.

The best abundance estimate available for Cuvier's beaked whales in the northern Gulf of Mexico is 74 (CV=1.04), based on a summer 2009 survey covering waters from the 200m isobath to the seaward extent

of the U.S. EEZ (Waring *et al.* 2013). Because it is often difficult to identify beaked whales to species from the ship, some beaked whale sightings are not identified to species. Thus, this estimate is likely negatively biased since the only sightings included were of beaked whales positively identified as Cuvier's beaked whales (Waring *et al.* 2013). The minimum population estimate is 36 Cuvier's beaked whales and PBR is 0.4 (Waring *et al.* 2013). Total human-caused mortality and serious injury is unknown and none has been documented. In 2007, one unidentified beaked whale was released alive without serious injury after entanglement interaction with the pelagic longline fishery (Waring *et al.* 2013).

Group sizes for Cuvier's beaked whales in the Gulf of Mexico are generally < 5 individuals (Maze-Foley and Mullin 2006). Life history parameters are not well known, but they may reach sexual maturity between 7-11 years and have a single calf every 2-3 years (Wynne and Schwartz 1999). Cuvier's beaked whales may live upwards of 35 years (Wynne and Schwartz 1999). As with most beaked whales, Cuvier's beaked whales are an offshore, deep diving species. Baird *et al.* (2006) found that Cuvier's beaked whales in Hawaii dive deeply (maximum of 1,450m) and for long periods (maximum dive duration of 68.7 min) but also spend time at shallow depths. Tyack *et al.* (2006) has also reported deep diving for Cuvier's beaked whales with mean depth of 1,070m and mean duration of 58 min. Little is known of the feeding preferences of Cuvier's beaked whale. They may be mid-water and bottom feeders on squid and deep-water fishes (Heyning and Perrin 2009).

### 2.3. Blainville's and Gervais' Beaked Whales (*Mesoplodon* spp.)

The two species of beaked whales in the genus *Mesoplodon* known to occur in the Gulf of Mexico are Blainville's beaked whale (*M. densirostris*) and Gervais' beaked whale (*M. europaeus*). Beaked whales are small sized whales. Blainville's beaked whales reach approximately 4.7m long and Gervais' beaked whales reach 4.6m and 4.2 - 5.7m for males and females, respectively (Würsig *et al.* 2000). While long, bodies are generally slender. They have a small, triangular to falcate dorsal fin located approximately two-thirds of the way back on the body (Würsig *et al.* 2000). The forehead is flattened and tapers to a slender rostrum. The flippers are short and narrow and fit into shallow depressions in the body (Pitman 2009). Both species are gray to black in color, usually lighter below (Würsig *et al.* 2000). As with other beaked whales, both species can show grayish white lines and splotches on their sides and back. Long, linear scars in males are healed scars from intraspecific fighting with other males (Pitman 2009). Oval splotches come from cookie cutter sharks and possibly squid (Würsig *et al.* 2000).

Neither species is listed as threatened or endangered under the ESA, and the Gulf of Mexico populations are not listed as depleted or strategic under the MMPA.

As a group, beaked whales are deep-water species. They are found worldwide in continental slope and oceanic waters, with the exception of the Arctic and Antarctic. Some species are restricted to oceanic waters > 2,000m, while others are found over continental slopes (200-2,000m) (Pitman 2009). Blainville's beaked whales are found worldwide in tropical and warm temperate waters while Gervais' beaked whales are only known from tropical to warm temperate waters of the Atlantic Ocean, including the Gulf of Mexico (Würsig *et al.* 2000). Identification of beaked whale sightings to species is challenging at sea and therefore most sightings of beaked whales are only identified as '*Mesoplodon* sp'. or 'unidentified Ziphiidae' (the name of the family they belong to). As a group beaked whales have been observed throughout the northern Gulf of Mexico in waters deeper than 200m (Figure 4). In cases where identification to species was possible, Blainville's beaked whales have been recorded over the continental slope south of western Louisiana and on the Florida escarpment in the eastern Gulf. Stranded Blainville's beaked whales have been recovered in Texas, Louisiana, Mississippi and the panhandle of Florida (Würsig *et al.* 2000) further supporting a Gulf-wide distribution. Strandings of Gervais' beaked whales are more common than the other species and are recorded from central Florida, Texas and the northeastern Gulf (Würsig *et al.* 2000).

The total number of Blainville's or Gervais' beaked whales in the northern Gulf of Mexico is unknown and the best available abundance estimate is for *Mesoplodon* sp., which is a combined estimate for Blainville's and Gervais' beaked whales. The estimate of abundance for the two species combined in the northern Gulf of Mexico is 149 (CV=0.91), based on a summer 2009 oceanic survey covering waters from the 200m isobath to the seaward extent of the U.S. EEZ. The minimum population estimate for the two species combined in the northern Gulf of Mexico is 77 and PBR for is 0.8 (Waring *et al.* 2013). Data are insufficient data to determine the population trends due to uncertainty in at-sea species identification. Total human-caused mortality and serious injury is unknown, though none has been documented. However, in 2007, one unidentified beaked whale was released alive without serious injury after entanglement interaction with the pelagic longline fishery (Waring *et al.* 2013).

Beaked whales are thought to be the longest and deepest diving mammals. Because they are found so far offshore and are deep divers, life history information for these species is sparse. A 9 year-old female Blainville's beaked whale had just become sexually mature (Pitman 2009). Observed group sizes range from single individuals to small groups of 3-7 individuals (Würsig *et al.* 2000). As a group, beaked whales have reduced dentition- females generally have no teeth and males a single tooth in each lower jaw. Such a reduction in teeth in cetaceans is interpreted as an adaptation for feeding on squid (Pitman 2009). Accordingly, what little is known about prey preferences indicates the diet for both species in the Gulf of Mexico is comprised primarily of deep water squids and some fishes. Baird *et al.* (2006) reported on the diving behavior of four Blainville's beaked whales (*M. densirostris*) off the coast of Hawaii. These whales foraged in deep ocean areas (690-3,000m) with a maximum dive to 1,408m. Average dive times ranged from 48- 68 min (Baird *et al.* 2006).

#### 2.4. False Killer Whale (*Pseudorca crassidens*)

False killer whales are among the larger members of the dolphin family Delphinidae and belong to a group of small whales called the blackfish, which also includes the pygmy killer whale, killer whale, melon-headed whale and the 2 pilot whale species. They are mostly dark gray to black in color, with some white on chin and chest/belly (Würsig *et al.* 2000). They have a narrow, rounded head, small falcate dorsal fin, and flippers that distinctively bulge on the leading edge (Baird 2009a). Adult false killer whale males average approximately 5.5m in length and females average 4.8 to 5m in length (Würsig *et al.* 2000, Baird 2009a).

The species is not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

False killer whales occur throughout tropical and warm temperate waters worldwide. They are largely pelagic, but may occur nearshore and in shallow waters around oceanic islands (Baird 2009a). Sightings in the Gulf of Mexico occur in oceanic waters (>200m depth), primarily in the central and eastern part of the northern Gulf of Mexico (Figure 5) (Mullin and Fulling 2004, Maze-Foley and Mullin 2006). All survey sightings have been in spring or summer (Hansen *et al.* 1996, Mullin and Hoggard 2000, Mullin and Fulling 2004), though survey effort in other seasons is much lower.

The abundance of false killer whales in the Gulf of Mexico is poorly known. Sightings are rare. The most recent estimate is 10 years old from summer and spring surveys in 2003 and 2004, respectively, and is 777 (CV=0.56) (Waring *et al.* 2013). Because the estimate is >8 years old it cannot be used for stock assessments. Therefore, the population size and PBR are considered undetermined. There were no sightings during a 2009 oceanic survey. There were no reported fishery-related mortalities or serious injuries during 1998-2010. Total human-caused mortality and serious injury is unknown, but none has been reported (Waring *et al.* 2013).

This species is also quite social are very social and are most often observed in groups of 10s - 100 individuals (Baird 2009a). In the Gulf of Mexico group sizes of 12-63 have been reported (Würsig *et al.* 2000). Not much is known about the diving behavior of false killer whales other than a recorded dive to



over 230m by one tagged animal (Baird 2009a). Both males and females are thought to reach sexual maturity between 8 and 14 years (Wynne and Schwartz 1999). A calving interval of 7 years was estimated for one population (Baird 2009a); Wynne and Schwartz (1999) suggest a calving interval of 3-4 years. False killer whales appear long-lived with males living a maximum estimated 57 years and females 62 years (Baird 2009a). False killer whales have a diverse diet that includes a variety of squid and fish; one tagged animal dive to depths over 230m (Baird 2009a). There is evidence of false killer whales attacking other marine mammals, including a humpback calf and sperm whales (Würsig *et al.* 2000, Baird 2009a).

### **2.5. Pygmy Killer Whale (*Feresa attenuata*)**

Pygmy killer whales have round, blunt heads and lack the characteristic dolphin beak. They have somewhat more robust bodies than the false killer whale, have a falcate dorsal fin located at the midpoint of the back and have long flippers with rounded tips (Donahue and Perryman 2009). They are mostly dark gray to black in color with lighter gray to white on the belly and lips often edged in white. Average length for both sexes is 2.1-2.3m (Würsig *et al.* 2000), with females generally slightly smaller than males as with most delphinids.

The species is not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

Pygmy killer whales occur in deep tropical, subtropical and warm temperate waters worldwide. In the northern Gulf of Mexico, they occur in oceanic waters off the continental shelf in all seasons (Figure 5) (Mullin *et al.* 1994, Hansen *et al.* 1996, Mullin and Hoggard 2000, Mullin and Fulling 2004).

Currently, the best available population estimate for pygmy killer whales in the northern Gulf of Mexico is 152 (CV=1.02), derived from a summer 2009 survey that covered waters from the 200m isobath to the offshore extent of the U.S. EEZ (Waring *et al.* 2013). The minimum population estimate is 75 and the calculated PBR is 0.8 (Waring *et al.* 2013). There has been no fishery-related mortality or serious injury reported for this stock from 1998 to 2010.

Pygmy killer whales in the northern Gulf of Mexico are generally observed in groups of 6-30 animals (Würsig *et al.* 2000). Little is known about their life history and feeding behaviors, though they are thought to feed primarily on squid and fish (Würsig *et al.* 2000). Remains of cephalopods and small fish have been found in stomachs of stranded and incidentally caught individuals. They may be one of the species of small whales that attack and sometimes eat smaller dolphins caught in the tuna purse-seine fishery (Donahue and Perryman 2009).

### **2.6. Melon-Headed Whale (*Peponocephala electra*)**

Another member of the group of small whales known as blackfish, the melon-headed whale is predominantly gray with a darker gray to black dorsal cape that dips down the sides, nose, and a distinct dark eye patch (Perryman 2009). They may have white lips and lighter coloration on the throat region (Würsig *et al.* 2000). Flippers are long, slender and pointed. This species is similar in size to the pygmy killer whale and the two can be difficult to distinguish at sea (Perryman 2009). Average maximum length for males is 2.5 m and for females is 2.4 m (Würsig *et al.* 2000). There is some sexual dimorphism, with males slightly more robust than females and with generally larger flippers and dorsal fins (Perryman 2009).

The species is not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

Melon-headed whales are distributed worldwide in tropical and subtropical waters. They generally occur offshore in deep oceanic waters (Perryman 2009). Melon-headed whales in the northern Gulf of Mexico

are generally sighted in water depths >800m and west of Mobile Bay, Alabama (Figure 5) (Mullin *et al.* 1994, Mullin and Fulling 2004, Maze-Foley and Mullin 2006). Sightings occurred during in all seasons in the northern Gulf of Mexico (Hansen *et al.* 1996, Mullin and Hoggard 2000).

The best available population estimate for melon-headed whales in the northern Gulf of Mexico is 2,235 (CV=0.75), derived from a summer 2009 survey that covered waters from the 200m isobath to the offshore extent of the U.S. EEZ (Würsig *et al.* 2013). The minimum population estimate is 1,274 and the calculated PBR is 13 (Waring *et al.* 2013). There has been no fishery-related mortality or serious injury reported for this stock from 1998 to 2010. Total human-caused mortality and serious injury is not known, although none has been reported.

Melon-headed whales are often seen in large groups with mean groups size is about 200 (Perryman 2009), but as many as 400 have been sighted in the northern Gulf of Mexico (Würsig *et al.* 2000). The species is often seen in mixed-species groups with Fraser's dolphins in some parts of the world (Perryman 2009, Wade and Gerrodette 1993). Little is known of the life history of this species. Gestation is thought to be 12 months (Würsig *et al.* 2000). Females reach sexual maturity at approximately 11.5 years of age and males at about 15 years (Perryman 2009). Melon-headed whales are thought to feed primarily on squid, along with some fish and shrimp (Perryman 2009).

### **2.7. Short-Finned Pilot Whale (*Globicephala macrorhynchus*)**

There are two recognized species of pilot whales, but only the short-finned pilot whale, *Globicephala macrorhynchus*, is found in the Gulf of Mexico. Pilot whales appear black or dark gray with a lighter coloration on the chin and belly (Würsig *et al.* 2000). They have a rather robust body with a thick tailstock, in contrast to the melon-headed whale, which has a more slender tailstock. They have a bulbous head with a prominent melon and there is no obvious beak (Olson 2009). The flippers are long, thin and pointed while the dorsal fin is low but broad, curved and located forward of the center of the back. This species exhibits strong sexual dimorphism with adult males reaching an average length of 6m and they are larger than females; the broad-based dorsal fin of a male is larger than that of a female (Olson 2009).

The species is not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

Short-finned pilot whales occur worldwide in tropical to warm-temperate waters in continental shelf and slope waters. Sightings of short-finned pilot whales in the northern Gulf of Mexico are primarily on the continental slope (200-2,000m depth) west of 89°W, though sightings in deeper oceanic waters have been made (Figure 6) (Mullin and Fulling 2004, Maze-Foley and Mullin 2006). Short-finned pilot whales are seen throughout the year (Hansen *et al.* 1996, Mullin and Hoggard 2000).

The best available abundance estimate for northern Gulf of Mexico short-finned pilot whales is 2,415 (CV=0.66), based on a summer 2009 survey of waters from the 200m isobath to the seaward extent of the U.S. EEZ (Waring *et al.* 2013). The minimum population estimate is 1,456 and the calculated PBR is 15 (Waring *et al.* 2013). There has been no documented fishery-related mortality or serious injury of short-finned pilot whales in the Gulf of Mexico between 1998 and 2010. However, during 2006 there was one short-finned pilot whale released alive with no serious injury after an entanglement interaction with the pelagic longline fishery (Waring *et al.* 2013) and interactions with this fishery in the western North Atlantic are not uncommon. Total human-caused mortality and serious injury is unknown, but assumed to be below PBR (Waring *et al.* 2013).

Pilot whales are very social and may travel in groups of several to hundreds of animals (Wynne and Schwartz 1999, Würsig *et al.* 2000) although groups average about 25 in the Gulf of Mexico (Maze-Foley and Mullin 2006). They appear to live in relatively stable, female-based groups (Würsig *et al.* 2000) similar to killer whales and sperm whales. They are thought to reach sexual maturity between 6-16 years (Wynne and Schwartz 1999, Olson 2009) and have a calving interval of about 3 years (Wynne and

Schwartz 1999, Würsig *et al.* 2000). Wynne and Schwarz (1999) suggest short-finned pilot whales may live 50-70 years. Pilot whales are relatively deep divers and feed primarily on squid and also fish (Olson 2009, Würsig *et al.* 2000).

## **2.8. Killer Whale (*Orcinus orca*)**

Killer whales are the largest member of the dolphin family Delphinidae, attaining maximum body lengths of 9m for males and 7.7m for females (Ford 2009). Males develop larger appendages than females including the pectoral fins, tail flukes, and dorsal fin, which may reach 1.8m in males (Ford 2009). Killer whales are generally black dorsally and white ventrally with a conspicuous elliptically shaped white patch behind the eye. Variation in the shape and color of the post-ocular patch, saddle patch, and the size and shape of the dorsal fin often allows for the identification of individuals (Ford 2009).

Killer whales are not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

Killer whales are found in all oceans, though they are most commonly found in coastal and temperate waters of high productivity (Ford 2009). In the northern Gulf of Mexico, they are most often encountered in oceanic waters of the north-central Gulf 500m or deeper (Figure 7) (O'Sullivan and Mullin 1997). They are rarely seen in shelf waters of the Gulf (Waring *et al.* 2013). They have been recorded from May to November in the northern Gulf of Mexico (Waring *et al.* 2013).

The best available population estimate for killer whales in the northern Gulf of Mexico is 28 (CV=1.02), from a summer 2009 oceanic survey that included waters from the 200m isobath offshore to the seaward extent of the U.S. EEZ; the minimum population size is 14 and PBR is 0.1 (Waring *et al.* 2013). There was no reported fishery-related mortality or serious injury to this stock from 1998 to 2010. Total human-caused mortality and serious injury is unknown, but none has been documented.

Killer whales are very social and the basic social unit is based on matrilineal relationship and linked by maternal descent. A typical matriline is composed of a female, her sons and daughters, and the offspring of her daughters (Ford 2009). Mating may be polygynous, with males mating with females from a different pod (Würsig *et al.* 2000). Killer whales are long lived with lifespans for females likely greater than 50 years and as high as 80 years (Ford 2009). Males typically live to about 30 years of age, but 50-60 year old males are recorded (Ford 2009). Females become sexually mature at around 8 to 14 years of age, males between 10-15 years of age (Wynne and Schwartz 1999, Würsig *et al.* 2000, Ford 2009). Females give birth to a single calf every 3-8 years (Wynne and Schwartz 1999, Würsig *et al.* 2000, Ford 2009). The diet of killer whales is highly variable and populations can be quite specialized in their prey choice. In the Northeast Pacific, some populations are fish eaters while other populations eat primarily other marine mammals. Killer whales in the Gulf of Mexico are known to hunt and eat other marine mammals (Pitman *et al.* 2003). Whether they also eat fish in the Gulf of Mexico is unknown.

## **3. Dolphins**

### **3.1. Risso's Dolphin (*Grampus griseus*)**

Risso's dolphins are large dolphins, with adults of both sexes reaching up to 3.8-4m in length (Würsig *et al.* 2000, Baird 2009b). Risso's dolphins are unusual in their color pattern. They are generally dark gray on the back with whitish bellies. But as they age, the face, head, and back in front of the dorsal fin fade to a much lighter gray and they accumulate many scars which are also light colored resulting in older adults that are much whiter in appearance than younger individuals (Würsig *et al.* 2000). They are the fifth largest member of the dolphin family Delphinidae (Baird 2009b), with stocky, robust bodies tapering to a

relatively narrow tailstock with a relatively small dorsal fin. They have a blunt head without a pronounced beak.

Risso's dolphins are not listed as threatened or endangered under the ESA and the Gulf of Mexico populations is not listed as depleted or strategic under the MMPA.

Risso's dolphins are distributed worldwide in offshore tropical and warm-temperate waters. They are found throughout the oceanic waters of the northern Gulf of Mexico (Figure 8), but concentrate along the continental slope (Baumgartner 1997, Maze-Foley and Mullin 2006). They are seen during all seasons (Hansen *et al.* 1996, Mullin and Hoggard 2000).

The best available abundance estimate for northern Gulf of Mexico Risso's dolphins is 2,442 (CV=0.57), based on a summer 2009 survey of oceanic waters from the 200m isobath to the seaward extent of the U.S. EEZ (Waring *et al.* 2013). The minimum population estimate is 1,563 and PBR is 16 (Waring *et al.* 2013). Estimated annual average mortality and serious injury for this stock is 2.0 dolphins during 2007 to 2011. This is based on observed serious injury and mortality in the pelagic longline fishery in 2008 and 2011. Total fishery-related mortality and serious injury is not less than ten percent of PBR for this stock, so cannot be considered insignificant and approaching a zero mortality rate.

Risso's dolphins typically travel in groups of <40 individuals in the Gulf of Mexico (Maze-Foley and Mullin 2006). There is limited information on the life history of this species. They are thought to be sexually mature at 2.6-3m length (Wynne and Schwartz 1999), which may be in the range of 8-10 years old for females and 10-12 years old for males (Baird 2009b). Gestation is 13-14 months and calving intervals are about 2.4 years (Baird 2009b). They may live from 17-40 years (Wynne and Schwartz 1999, Würsig *et al.* 2000, Baird 2009b). They feed almost exclusively on squid, likely at night (Baird 2009b).

### **3.2. Atlantic Spotted Dolphin (*Stenella frontalis*)**

Atlantic spotted dolphins are a relatively small, stocky dolphin. They reach a maximum length of approximately 2.4m, though most are closer to 2.1m (Würsig *et al.* 2000). In the western North Atlantic there are two different morphotypes of Atlantic spotted dolphins, a larger, more heavily spotted form found over the continental shelf and a smaller, less spotted form that inhabits deeper oceanic waters off the shelf and waters around oceanic islands. Only the more heavily spotted form has been found in the Gulf of Mexico (Viricel and Rosel 2014). Most are born without spots, with spots starting to develop by the first year.

Atlantic spotted dolphins are not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

This species is endemic to the Atlantic Ocean and is distributed in tropical and warm temperate waters between approximately 50° N to about 25° S (Perrin 2009a). Atlantic spotted dolphins are seen year round in the Gulf of Mexico, where they occur primarily over the continental shelf (10-200m deep) to slope (<500m deep) waters (Figure 9) (Hansen *et al.* 1996, Mullin and Hoggard 2000, Fulling *et al.* 2003, Mullin and Fulling 2004, Maze-Foley and Mullin 2006).

Population size is currently unknown in the Gulf of Mexico, as survey data are greater than eight years old. A minimum population estimate and PBR are, therefore, also unknown and undetermined, respectively. Total annual human-caused mortality and serious injury are unknown for this stock (Waring *et al.* 2013). They may, however, be taken in the Gulf of Mexico shrimp trawl fishery (Soldevilla *et al.* 2015)

Atlantic spotted dolphins have a maximum age of about 23 years with age at sexual maturity estimated at 8-15 years for females (Perrin 2009a). Average calving interval may range from 1-5 years with an average of about 3 years (Perrin 2009a). They have a single calf after a gestation period of 12 months (Wynne and Schwartz 1999). Group sizes in the Gulf of Mexico averaged 18-23 animals (Würsig *et al.*

2000). They consume a variety of prey including small-to-large epipelagic and mesopelagic fishes and squid (Perrin 2009a).

### 3.3. Pantropical Spotted Dolphin (*Stenella attenuata*)

Pantropical spotted dolphins are characterized by a slender body with a long, clearly defined beak, and a tall, slender dorsal fin. As with the Atlantic spotted dolphin, newborns do not have spots and spotting begins to develop in older juveniles. The flippers are small, curved and pointed. It is a small dolphin, with adults reaching 1.6-2.6m long (Wynne and Schwartz 1999, Perrin 2009b).

This species is not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

The pantropical spotted dolphin is distributed worldwide in tropical and some sub-tropical oceans (Perrin 2009b). They are seen year round throughout the northern Gulf of Mexico, where they occur in oceanic waters off the continental shelf (Figure 10) (Mullin and Fulling 2004; Maze-Foley and Mullin 2006; Hansen *et al.* 1996, Mullin and Hoggard 2000).

The best currently available population estimate for pantropical spotted dolphins in the northern Gulf of Mexico is 50,880 (CV=0.27) from a summer 2009 oceanic survey that included oceanic waters from the 200m isobath offshore to the seaward extent of the U.S. EEZ; the minimum population estimate is 40,699 and PBR is 407 (Waring *et al.* 2013). The estimated average annual fishery-related mortality and serious injury for this stock during 2006-2010 was 3.2, based on an estimated take of 16 pantropical spotted dolphins in the pelagic longline fishery in 2009 (Waring *et al.* 2013). Total human-caused mortality and serious injury of this stock is unknown (Waring *et al.* 2013).

In the Pacific Ocean, pantropical spotted dolphins often occur in large multi-species groups, particularly with spinner dolphins (Perrin 2009b) but this has not been observed in the Gulf of Mexico (Maze-Foley and Mullin 2006). It is a relatively gregarious species with group sizes averaging 70 dolphins but reaching over 600 in the Gulf of Mexico (Maze-Foley and Mullin 2006). They are acrobatic swimmers. Life history parameters have been well studied in Pacific populations: sexual maturity is reached at 9-15 years with females maturing earlier than males; the calving interval is about 2-3 years (Perrin 2009b). Prey preferences include epipelagic fishes, squids and crustaceans (Perrin 2009b).

### 3.4. Clymene Dolphin (*Stenella clymene*)

The Clymene dolphin is a relatively small dolphin (1.8m) (Würsig *et al.* 2000) but stocky, with a moderately long beak. They have a 'tripartite' color pattern- dark gray to black on top, lighter gray sides and a white belly and a strong, dark stripe running between the front of the flipper and the eye. They have dark, pointed flippers. The dorsal fin is tall and slightly falcate (Wynne and Schwartz 1999, Würsig *et al.* 2000).

Clymene dolphins are not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

This species is endemic to the Atlantic Ocean, never having been recorded anywhere else in the world and is found in offshore, oceanic tropical to warm-temperate waters (Fertl *et al.* 2003). Clymene dolphin sightings in the northern Gulf of Mexico occur over deeper waters off the continental shelf (>500m), primarily west of the Mississippi River (Figure 11) (Maze-Foley and Mullin 2006). They have been seen during winter, spring, and summer aerial surveys (Hansen *et al.* 1996, Mullin and Hoggard 2000).

The best currently available population estimate for Clymene dolphins in the northern Gulf of Mexico is 129 (CV=1.00) from a summer 2009 oceanic survey that included waters from the 200m isobath offshore

to the seaward extent of the U.S. EEZ; the minimum population estimate is 64 and PBR is 0.6 (Waring *et al.* 2013). There was no reported fishery-related mortality or serious injury to this stock from 1998 to 2010. Total human-caused mortality and serious injury is unknown, but none is documented (Waring *et al.* 2013).

Little is known of the behavior and life history of this species because it was only described as a species in 1981. Group size is generally of moderate size, with group size in the Gulf of Mexico averaging 90 individuals (Maze-Foley and Mullin 2006). They are active bow riders and acrobatic, though not as acrobatic as spinner dolphins. Clymene dolphins eat small mesopelagic (mid-water) fishes and squid and appear to be night feeders (Würsig *et al.* 2000, Jefferson 2009a).

### **3.5. Striped Dolphin (*Stenella coeruleoalba*)**

The striped dolphin is a medium-sized dolphin reaching, on average, 2.4m in length (Würsig *et al.* 2000). They are slender, though more robust than spinner and pantropical spotted dolphins (Würsig *et al.* 2000). Most notable is their color pattern. They are dark gray on the back, but much lighter gray on the sides and have a white belly. They have a strong, black stripe that stretches from the eye, along their side to the anus and another black strip from the eye to the flipper. They have a tall, dark, thin, strongly curved dorsal fin and a dark beak of moderate length.

The striped dolphin is not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

Striped dolphins are distributed worldwide in warm-temperate to tropical waters. They are a deep-water species, usually found beyond the continental shelf, over the continental slope out to oceanic waters. Striped dolphins are seen year round in the northern Gulf of Mexico, where they occur in oceanic waters >200m (Figure 12) (Mullin and Fulling 2004, Maze-Foley and Mullin 2006, Hansen *et al.* 1996, Mullin and Hoggard 2000).

The best currently available population estimate for striped dolphins in the northern Gulf of Mexico is 1,849 (CV=0.77) from a summer 2009 oceanic survey that included waters from the 200m isobath offshore to the seaward extent of the U.S. EEZ. The minimum population estimate is 1,041 and the PBR is 10 (Waring *et al.* 2013). There has been no reported fishery-related mortality or serious injury to this stock from 1998 to 2010 and total human-caused mortality and serious injury is unknown.

Striped dolphins are quite gregarious, often seen in groups of >100 individual and these groups are thought to often be segregated by age and sex (Würsig *et al.* 2000). Sexual maturity is thought to be reached between 5-15 years of age (Wynne and Schwartz 1999, Würsig *et al.* 2000, Archer 2009). They bear a calf approximately every 3 years (Wynne and Schwartz 1999, Würsig *et al.* 2000). They appear to feed on small mesopelagic fishes and squids (Würsig *et al.* 2000) and may be diving to depths of 200-700m (Archer 2009). In some areas, stomach contents contain large numbers of mid-water species of myctophids (lantern fish), while in other areas, such as the Northeast Atlantic, stomachs have been found to contain anchovies and cod.

### **3.6. Spinner Dolphin (*Stenella longirostris*)**

Spinner dolphins are relatively small, slender dolphins reaching, on average, 1.8m, with males slightly larger than females (Würsig *et al.* 2000). They are most recognizable by their very long, slender beaks, which are black above and lighter below. They also have long, pointed flippers and a tall, erect, triangular shaped dorsal fin. Similar to the Clymene dolphin, they have a tripartite color pattern - dark gray on the back, lighter gray sides and a whitish belly. A dark stripe stretches from the eye to the flipper.

The spinner dolphin is not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

Spinner dolphins occur in offshore tropical to warm-temperate waters. In the northern Gulf of Mexico they occur in oceanic waters, typically east of the Mississippi River and have been seen during all seasons (Figure 12) (Hansen *et al.* 1996, Mullin and Hoggard 2000).

The best currently available population estimate for spinner dolphins in the northern Gulf of Mexico is 11,441 (CV=0.83) from a summer 2009 oceanic survey that included waters from the 200m isobath offshore to the seaward extent of the U.S. EEZ; the minimum population estimate is 6,221 and PBR is 62 (Waring *et al.* 2013). There has been no reported fishery-related mortality or serious injury to this stock from 1998 to 2010 and total human-caused mortality and serious injury is unknown (Waring *et al.* 2013).

Spinner dolphins are quite gregarious and while group size averages about 30 in the Gulf of Mexico, groups as large as 800 have been sighted (Maze-Foley and Mullin 2006). The species is named for its behavior of leaping out of the water and spinning along the long axis of the body, completing as many as six full rotations before returning to the water (Würsig *et al.* 2000). Most information on reproductive parameters for this species comes from Pacific Ocean populations. Sexual maturity is reached in the range of 4-12 years of age (Wynne and Schwartz 1999, Perrin 2009c). A single calf is born every 2-3 years (Wynne and Schwartz 1999, Würsig *et al.* 2000, Perrin 2009c). Spinner dolphins feed on mesopelagic fish and squid, diving to depths of 600m or deeper (Perrin 2009c), primarily at night (Würsig *et al.* 2000).

### 3.7. Common Bottlenose Dolphin (*Tursiops truncatus*)

Common bottlenose dolphins are a fairly large and robust dolphin, averaging 1.9-3.8m in length with a large amount of size variation across populations. In the Gulf of Mexico, most measure 2.7m or less (Würsig *et al.* 2000). They are characterized by a stocky, thick beak that is clearly distinct from the melon (Würsig *et al.* 2000). The dorsal fin is tall and falcate, with a broad base (Wynne and Schwartz 1999). Their overall color is highly variable, but is generally a variant of steel gray on the back and sides with a lighter belly, and a dorsal cape.

While common bottlenose dolphins are not listed as threatened or endangered under the ESA, several population stocks in the Gulf of Mexico are listed as strategic under the MMPA (Table 2).

Common bottlenose dolphins are found worldwide in temperate, subtropical and tropical waters. In addition to this broad geographic distribution, they are found in deep, oceanic waters, nearshore coastal waters and estuarine waters. Two morphologically and genetically distinct morphotypes of bottlenose dolphins - the offshore and coastal forms - inhabit waters along the U.S. Atlantic and Gulf of Mexico coasts (Mead and Potter 1995, Rosel *et al.* 2009, Vollmer and Rosel 2013). Common bottlenose dolphins are found throughout the Gulf of Mexico although few have been recorded beyond the upper continental slope in the northern Gulf of Mexico (Figure 13) (Maze-Foley and Mullin 2006). The offshore form inhabits oceanic, continental slope waters while the coastal form is found over the continental shelf and in coastal and estuarine waters. Thirty-seven stocks of common bottlenose dolphins have been delimited in the northern Gulf of Mexico (Table 2). These include 32 bay, sound, and estuary stocks in the inshore waters, three coastal stocks (western, northern, and eastern) in coastal waters out to the 20m isobath, the northern Gulf of Mexico Continental Shelf Stock in waters from 20 to 200m depth, and the northern Gulf of Mexico Oceanic Stock in waters offshore of the 200m isobath (Waring *et al.* 2013).

Best available abundance estimates for all stocks are listed in Table 2. Estimates are unknown for most of the estuarine stocks. The Gulf of Mexico Oceanic Stock is the only Gulf of Mexico bottlenose dolphin stock with known and reported commercial fishery-related mortality and serious injury, with a mean annual mortality of 3.1 for 2007-2011, in the pelagic longline fishery. This level of take is less than 10 percent of PBR, so is considered insignificant and approaching zero mortality and serious injury rate (Waring *et al.* 2013). The Western and Northern coastal stocks and the Texas and Florida bay, sound and estuary stocks are also impacted by the commercial shrimp otter trawl fishery, with the Coastal stocks' bycatch levels possibly exceeding 10% of PBR (Soldevilla *et al.* 2015). The Eastern Coastal and Continental Shelf stocks are at lower risk from this fishery (Soldevilla *et al.* 2015). Total human-caused

mortality and serious injury is unknown for all of the other stocks. The Northern and Western coastal stocks are considered strategic due to an ongoing northern Gulf of Mexico Unusual Mortality Event (UME) that began in February 2010 (Litz *et al.* 2014). The Gulf of Mexico bay, sound, and estuary stocks are also listed as strategic due to unknown, but likely small, stock sizes and potential impacts of the ongoing UME affecting stocks along the coasts of Louisiana, Mississippi, Alabama, and western Florida (Waring *et al.* 2013).

Life history parameters may vary by region, but generally females reach sexual maturity between 5 and 13 years of age and males between 9 to 14 years of age (Wells and Scott 2009). Calving interval ranges from 3-6 years (Wells and Scott 2009). A 57 year-old female and 48 year-old male have been recorded (Wells and Scott 2009). Prey preferences for this species are highly variable and dependent on the habitat they live in. The coastal form is known to eat primarily fish (sciacnids, mugilids, scombrids) and some shrimp while the offshore form eats fish and squid (Wynne and Schwartz 1999, Würsig *et al.* 2000, Wells and Scott 2009).

### 3.8. Fraser's Dolphin (*Lagenodelphis hosei*)

Fraser's dolphins are robust dolphins with a stubby, but obvious, beak. Adults range in size from 1.9-2.7m (Wynne and Schwartz 1999, Dolar 2009). Fraser's dolphins in the Atlantic Ocean may grow to be larger than those in the Pacific (Dolar 2009). They have a small, triangular dorsal fin, small flukes and flippers. They are generally dark gray above with slightly lighter gray sides and a white, sometimes pinkish, belly (Würsig *et al.* 2000). The dorsal fin, flippers and tail arc dark. Adult males have a broad, dark band stretching along their sides from the just above the mouth to underneath the tailstock. Females tend to have a lighter band. Both sexes have a dark stripe running from the flipper to just behind the mouth. Coloration varies with age, sex and geography.

Fraser's dolphins are not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

Fraser's dolphins are distributed worldwide in tropical and subtropical waters, preferring deep, oceanic waters beyond the continental shelf. Fraser's dolphins in the northern Gulf of Mexico are found in oceanic waters (Figure 11). They have been seen in all seasons (Hansen *et al.* 1996, Mullin and Hoggard 2000).

The best currently available population estimate for Fraser's dolphins in the northern Gulf of Mexico is unknown, as none were seen during a summer 2009 oceanic survey that included waters from the 200m isobath offshore to the seaward extent of the U.S. EEZ (Waring *et al.* 2013). Small numbers of Fraser's dolphins likely inhabit the northern Gulf of Mexico, as they have been consistently seen every few years since the early 1900s (Waring *et al.* 2013). The minimum population size is unknown and the PBR is undetermined. There was no reported fishery-related mortality or serious injury to this stock from 1998 to 2010 (Waring *et al.* 2013).

Fraser's dolphins are often seen in large groups of 10s to 100s (Würsig *et al.* 2000). Average group size in the northern Gulf of Mexico, based on three sightings, was 65 (Maze-Foley and Mullin 2006). Little is known of their reproductive biology. Off Japan, the age of sexual maturity appears to be 7-10 years for males and 5-8 years for females (Dolar 2009). The calving interval is approximately 2 years (Dolar 2009). The oldest known individuals were 17-19 years old (Dolar 2009). They prey primarily on mesopelagic fish, cephalopods, and some crustaceans (Dolar 2009). In the eastern tropical Pacific, it is thought they feed at two different depths, one at depths no less than 250m and the second at depths no less than 500m, based on stomach content analyses (Dolar 2009).



### 3.9. Rough-Toothed Dolphin (*Steno bredanensis*)

Rough-toothed dolphins are medium-sized dolphins of 2.3-2.7m in length (Wynne and Schwartz 1999, Würsig *et al.* 2000, Jefferson 2009b). They have a robust, somewhat chunky body. They are distinctive in appearance, with a smooth sloping forehead and long beak, tall dorsal fin, and large flippers (Würsig *et al.* 2000). They are generally dark in coloration, with a white belly and dark gray to black back. The lower jaw and chin are white. Rough-toothed dolphins often have white-yellow blotches or spots on their sides, some of which may be scars from cookie-cutter sharks or squid (Jefferson 2009b).

Rough-toothed dolphins are not listed as threatened or endangered under the ESA and the Gulf of Mexico population is not listed as depleted or strategic under the MMPA.

Rough-toothed dolphins are found worldwide in tropical to warm-temperate waters. They are generally a deep, oceanic species but have been recorded in continental shelf and coastal waters in some areas (Jefferson 2009b). Rough-toothed dolphins have been seen in all seasons in the northern Gulf of Mexico, where they occur primarily in oceanic, but occasionally in continental shelf waters (Figure 14) (Hansen *et al.* 1996, Mullin and Hoggard 2000, Fulling *et al.* 2003, Mullin and Fulling 2004, Maze-Foley and Mullin 2006).

The best currently available population estimate for rough-toothed dolphins in the northern Gulf of Mexico is 624 (CV=0.99) from a summer 2009 oceanic survey that included waters from the 200m isobath offshore to the seaward extent of the U.S. EEZ (Waring *et al.* 2013). The minimum population estimate is 311 and PBR is 3.1 (Waring *et al.* 2013). There has been no reported fishery-related mortality or serious injury to this stock from 1992 to 2010 and total human-caused mortality and serious injury is unknown (Waring *et al.* 2013).

Group size averages 14 dolphins in the Gulf of Mexico (Maze-Foley and Mullin 2006). Little life history information is available. Data from rough-toothed dolphins in Japan suggest males reach sexual maturity at about 14 years of age and females at about 10 (Jefferson 2009b). The maximum recorded age was 32-36 years (Jefferson 2009b). They feed on a variety of deep-water octopus, squid and fish and some physiological studies indicate their bodies are adaptations associated with deep diving (Jefferson 2009b). Dives as long as 15 min have been recorded (Jefferson 2009b).

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Sightings, by species, of cetaceans in the northern Gulf of Mexico recorded during NMFS SEFSC ship-based marine mammal surveys. Maps come from Dias and Garrison (2015).

Figure 1.

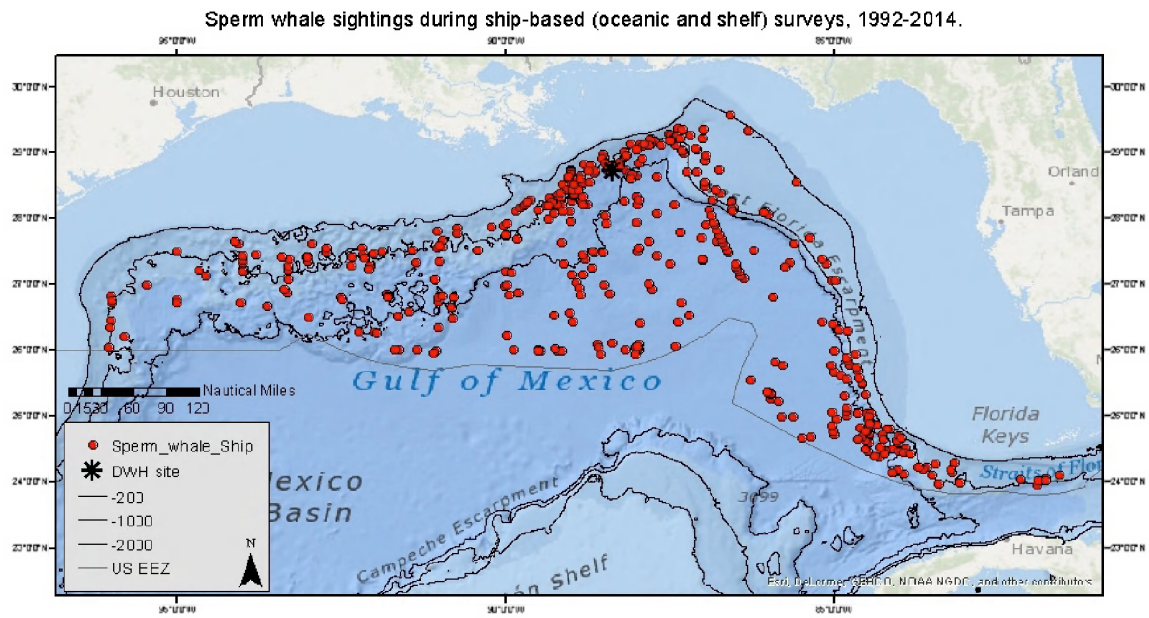


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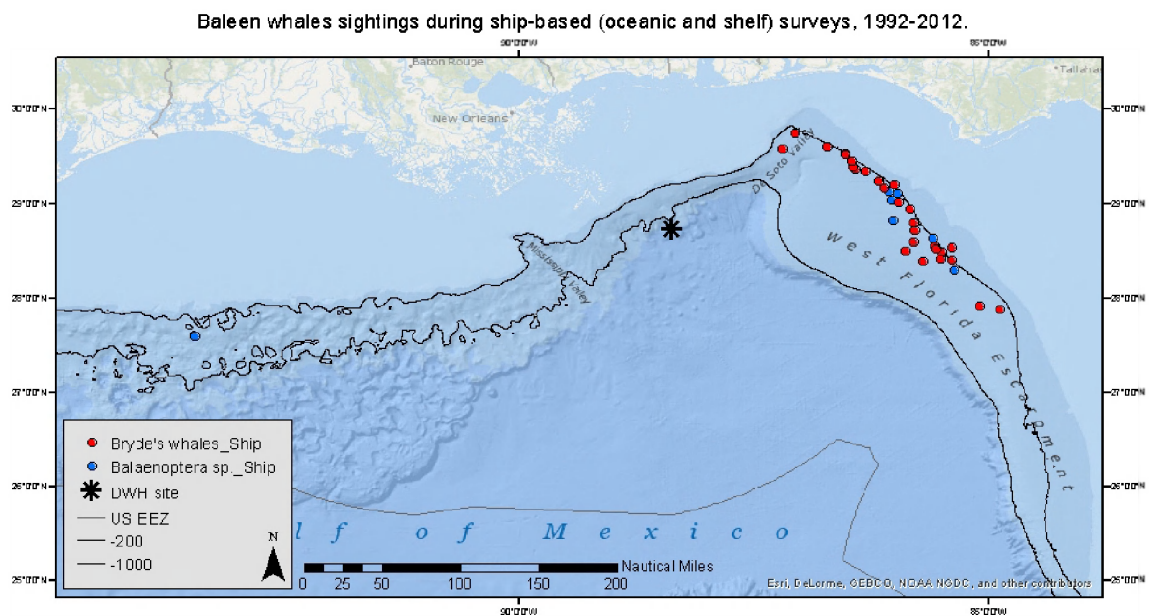


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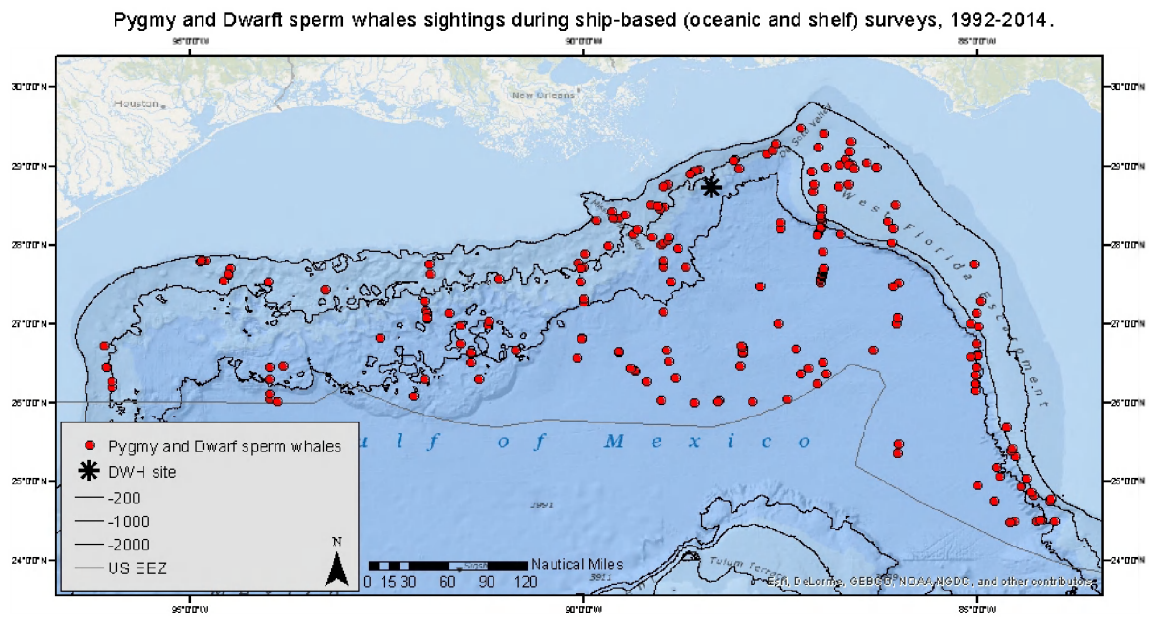


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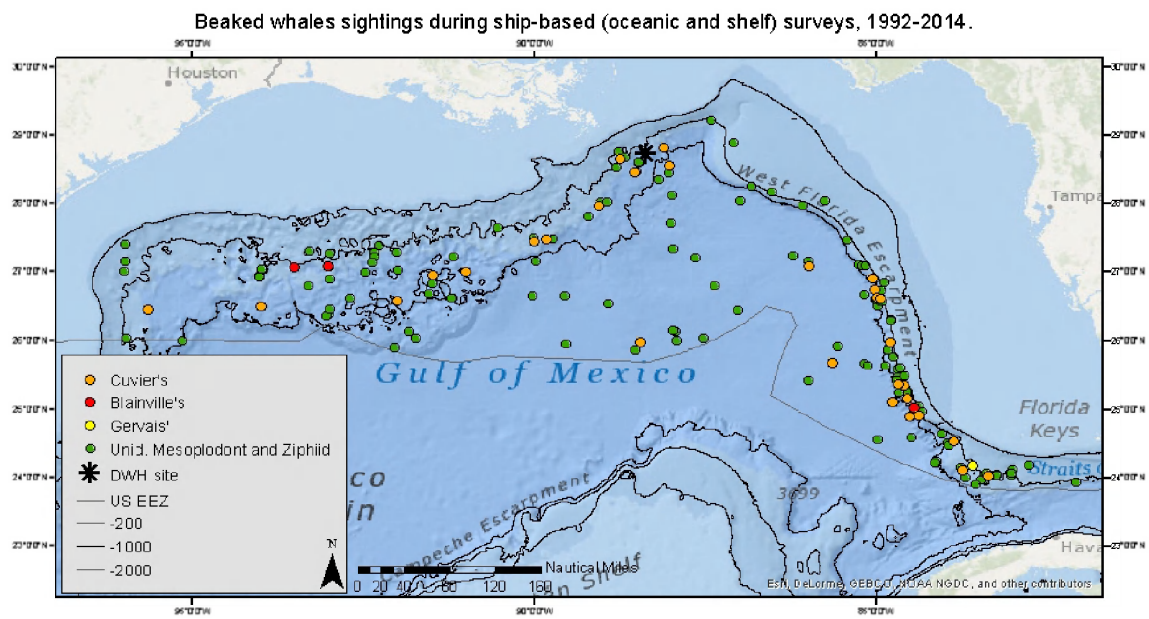


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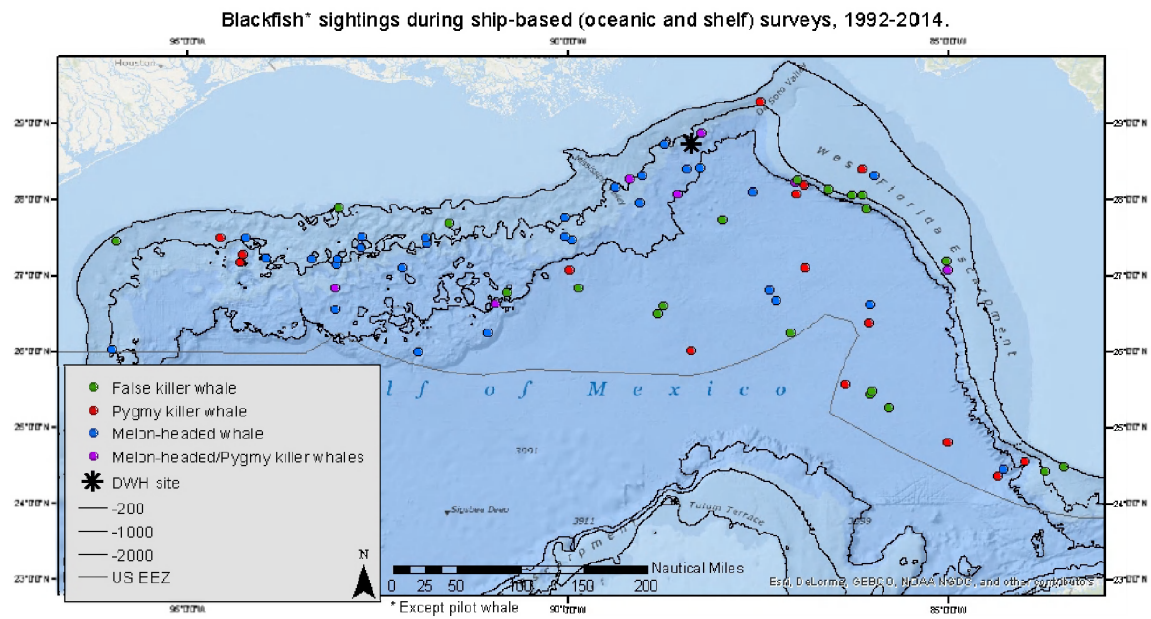


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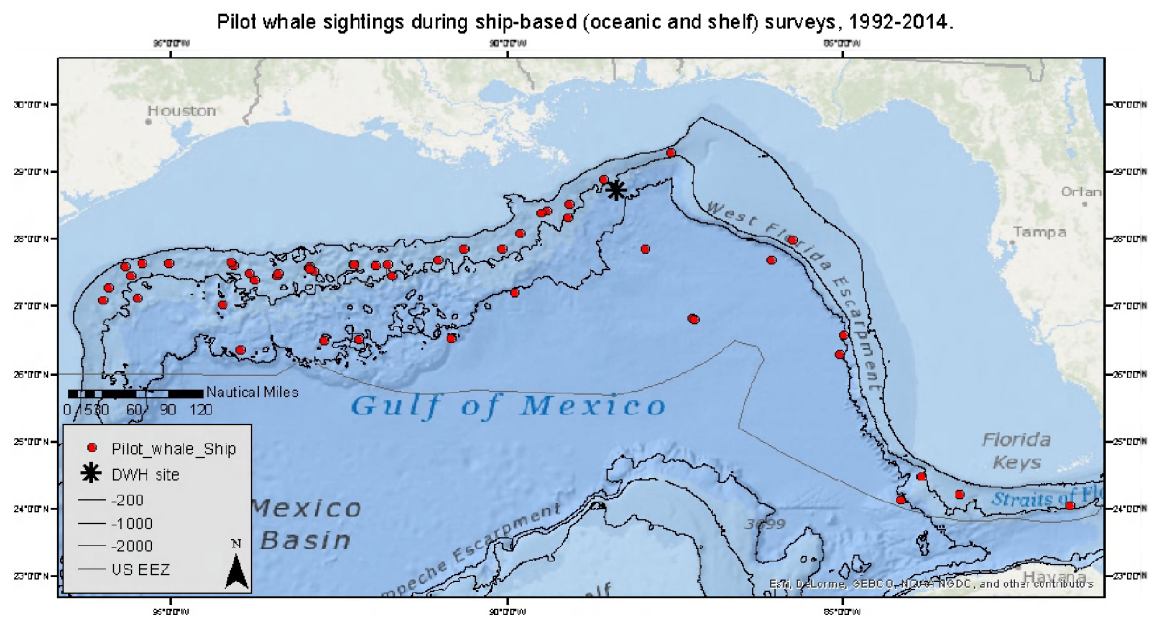


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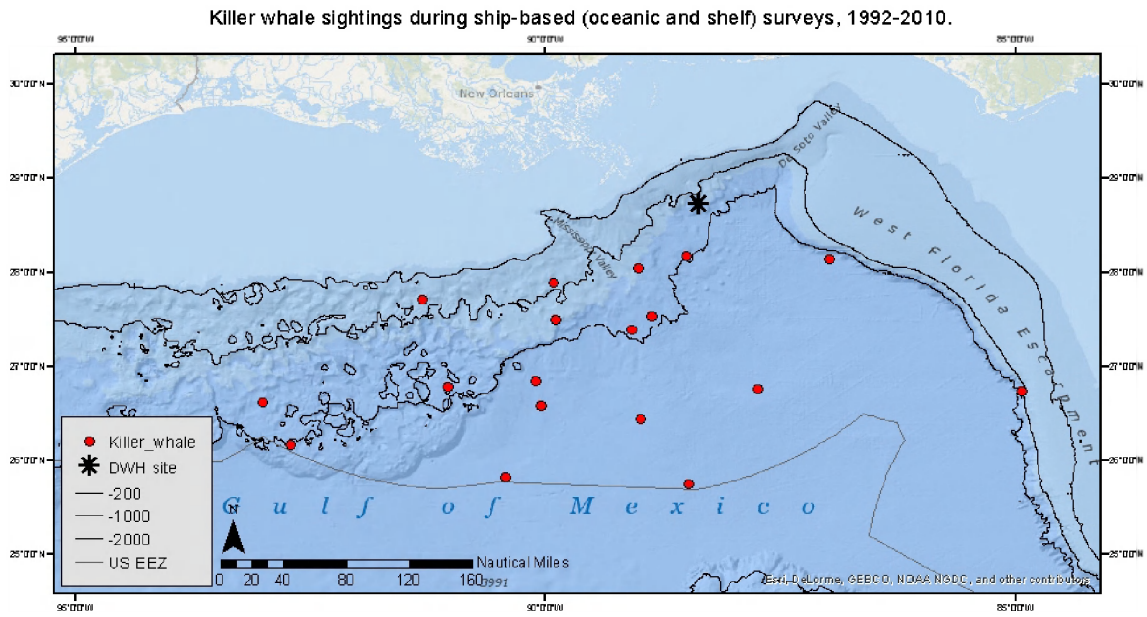


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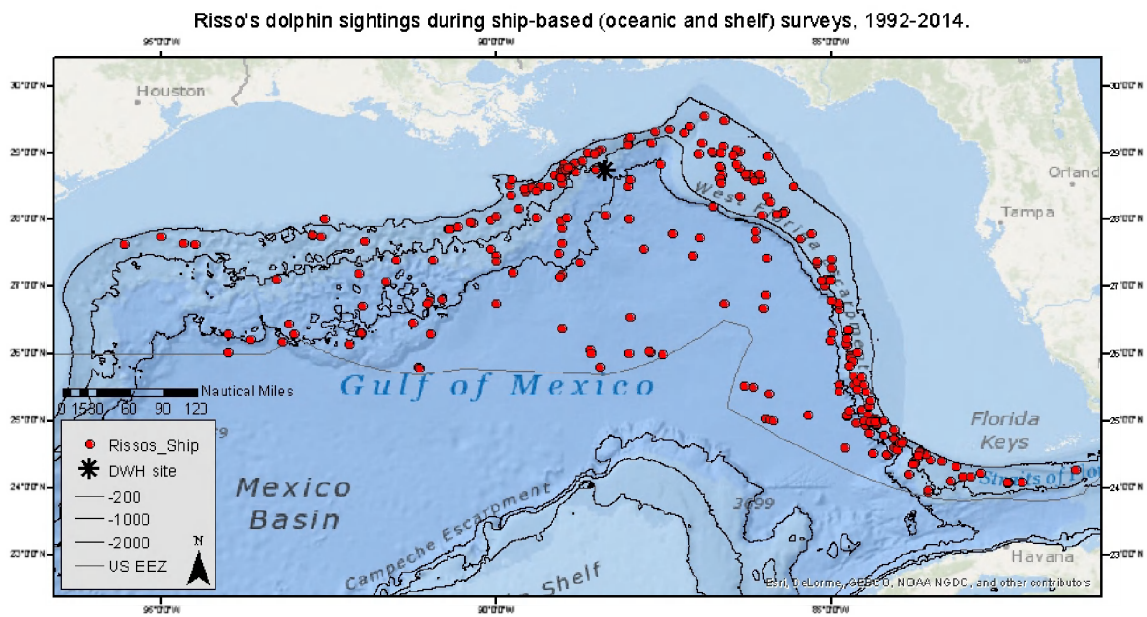




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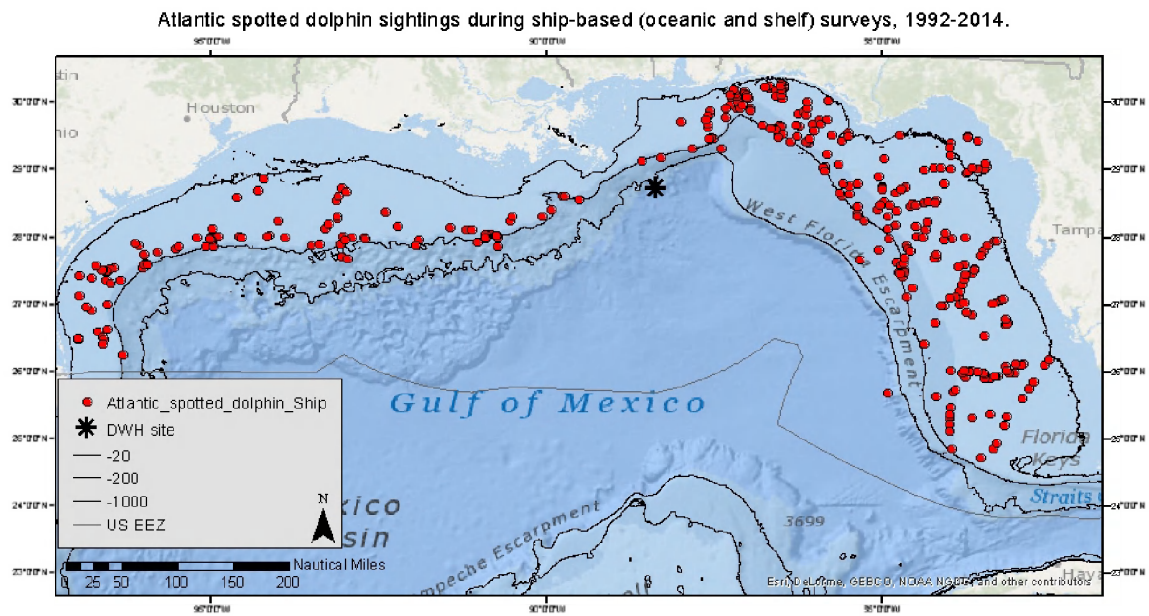


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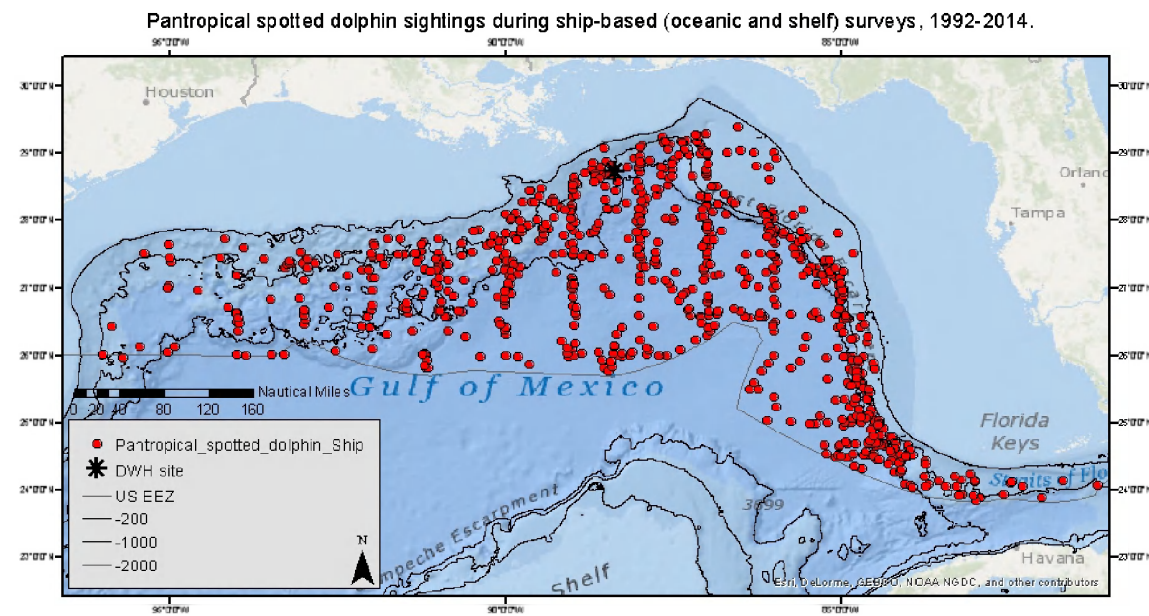


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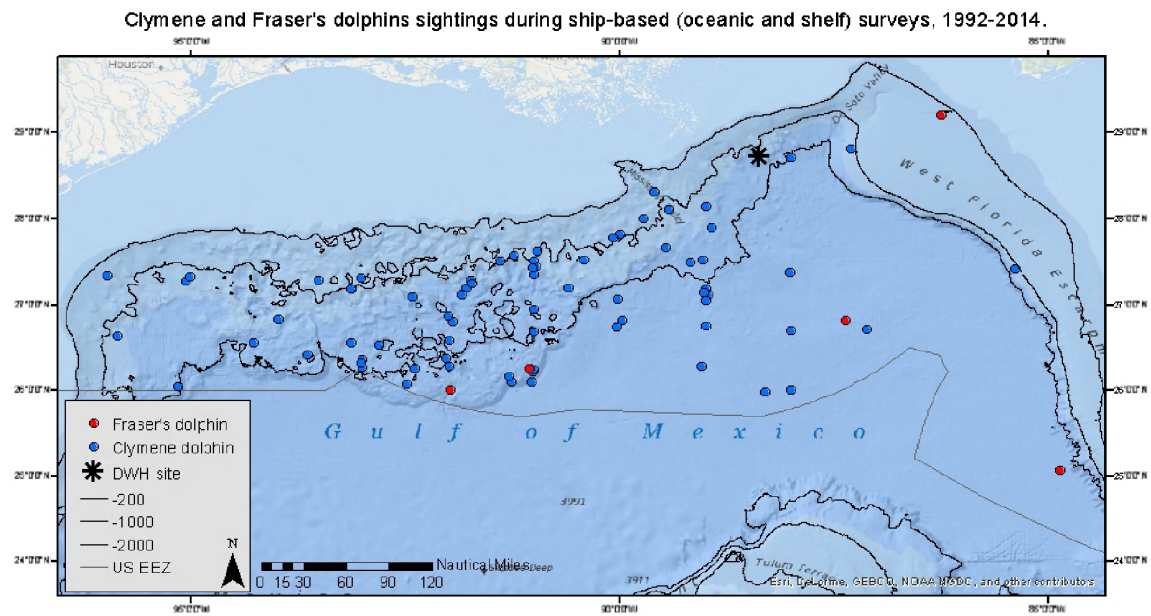


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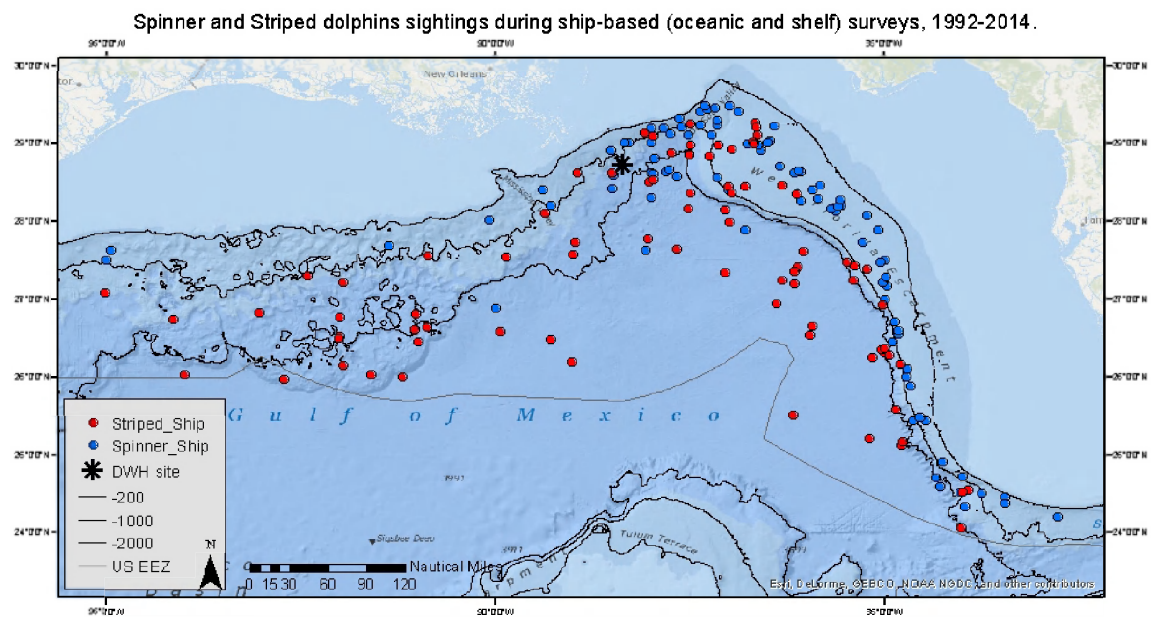


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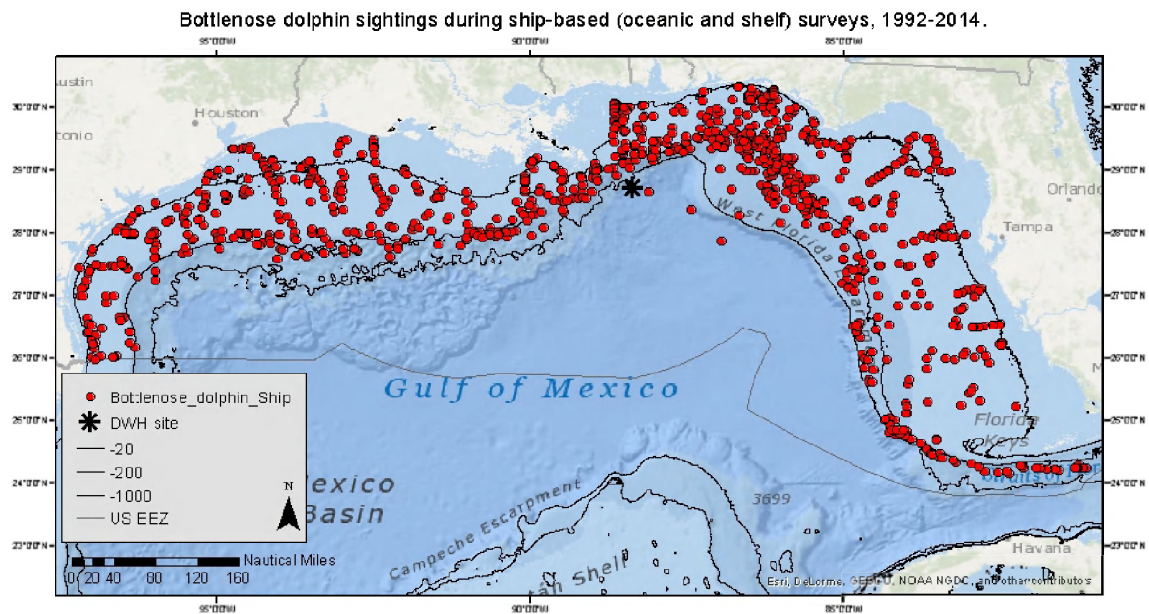


Figure 14.

