Anthropogenic noise, competition for prey resources, habitat degradation, and vessel disturbance are additional concerns; however, there is little evidence available to describe or quantify the impacts of these threats on blue whales (NMFS 2008).

Like other large whales, they are threatened by environmental change (including noise and chemical pollution). Their nearly exclusive dependence upon euphausiids, especially krill (*Euphasia superba*) in the Antarctic, could make blue whales vulnerable to large-scale changes in ocean productivity caused, for example, by climatic change (Reeves et al. 2003).

Within the U.S. the blue whale is listed as endangered throughout its range under the Endangered Species Act of 1973 and is listed as "depleted" throughout its range under the Marine Mammal Protection Act of 1972.

Fin Whale. Fin whales are an oceanic species of both hemispheres, and may be found from the tropics to polar zones. They are sighted near the coast in certain areas where deep water approaches the coast. There are seven reliable sightings and four unreliable sighting reports of fin whales from the GOM. From these data, they are not considered to be abundant in the Gulf. Sighted individuals may be extralimital strays from their western Atlantic population or, less likely, a small, resident, and relict population (Viada 2000).

Fin whales feed on localized concentrations of zooplankton, fishes, and squid. The predominant prey of fin whales varies greatly in different geographic locales, based on what is locally abundant. Fin whales in the North Atlantic eat pelagic crustaceans (mainly euphausiids or krill, including *Meganyctiphanes norvegica* and *Thysanoessa inermis*) and schooling fish such as capelin (*Mallotus villosus*), herring (*Clupea harengus*), and sand lance (*Ammodytes spp*.).

Two estimates of abundance from line-transect surveys are available. An abundance of 2,200 fin whales was estimated from a July to September 1995 sighting survey from Virginia to the mouth of the Gulf of St. Lawrence. In August 1999, a line-transect sighting survey from Georges Bank to the mouth of the Gulf of St. Lawrence estimated an abundance of 2,814 fin whales. This is currently considered the best estimate for the western North Atlantic stock. Although there is little data on population trends, the minimum population estimate reported in NOAA Fisheries Stock Assessment Reports has steadily increased since 1992 (Waring et al. 2006).

Potential threats affecting fin whales include collisions with vessels, entanglement in fishing gear, and habitat degradation from chemical and noise pollution. The total level of human-caused mortality and serious injury is unknown. There are insufficient data to determine the population trend for fin whales (NMFS 2008).

The fin whale has been federally listed as endangered under the ESA since 1970. There is no critical habitat designated for the fin whale.

Humpback Whale. Humpback whales typically inhabit in coastal waters but migrate across oceanic waters from breeding areas in the tropics to feeding areas in polar or sub-polar regions. In winter, humpbacks from the different western Northern Atlantic feeding areas mate and calve primarily in the West Indies, where spatial and genetic mixing among subpopulations occurs. Not all of the stock migrates to the West Indies every winter, however, and significant numbers of animals are found in mid- and high-latitude regions during the winter months. There have recently been a number of wintertime humpback sightings in coastal waters of the southeastern U.S (CBD undated). There are seven reliable sightings and two unreliable sightings reports of generally small, humpback whales from the GOM. The time of the year of the records suggest that these individuals may be extralimital strays during their breeding season or during their migrations, and their small body sizes suggest that they may be inexperienced yearlings on their first return migration (Viada 2000).

Humpback whales feed on localized concentrations of zooplankton, fishes, and squid. Because of the patchy distribution of their prey, humpback whales must target feeding areas where prey abundance is high. Capelin (*Mallotus villosus*) and euphausiids (*Meganyctophanes norvegica*) are preferred food for humpbacks in more northern U.S. and Canadian waters (Whitehead and Glass 1985), while humpbacks south of Cape Cod and Rhode Island feed primarily on euphausiids (Kenney and Winn 1986).

Photographic mark-recapture analyses gave an ocean-basin-wide estimate of 11,570 for 1992/1993, and an additional genotype-based analysis yielded a similar but less precise estimate of 10,400. The estimate of 11,570 is regarded as the best available estimate for the North Atlantic. Overall, North Atlantic humpback numbers are thought to be slowly increasing (Waring et al. 2006).

The most common anthropogenic sources of mortality for humpback whales are entanglement in commercial fishing gear and ship strikes. Between 1975 and 1990, 47 humpback whales were reported entangled in various types of fishing gear in U.S. waters. A study of stranded humpback whales along the mid-Atlantic and southeast U.S. indicated that 30 percent of the whales had major injuries potentially associated with a ship strike and an additional animal showed signs of a past ship strike (Wiley et al. 1995).

Humpback whales have been federally listed as endangered since 1970. There is no critical habitat designated for the humpback whale.

Sei Whale. Sei whales are an oceanic species that are not commonly sighted near the coast. They occur from the tropics to polar zones in both hemispheres, but appear to be more common in mid-latitude temperate zones.

Sei whales feed on localized concentrations of zooplankton, small fishes, and squid. Sei whales typically remain in deeper water (more than 100 meters) and further offshore (CeTap 1982). However, sightings of these species in coastal areas may correspond to changes in prey distribution (Payne et al. 1990).

The total number of sei whales in the U.S. Atlantic EEZ is unknown. However, two abundance estimates are available for portions of the sei whale habitat: from Nova Scotia during the 1970's, and in the U.S. Atlantic EEZ during the springs of 1979-1981. Tag-recapture surveys conducted in the 1970s in Nova Scotia estimated the Nova Scotian stock to number between 1,393 and 2,248 sei whales. Based on census data, they estimated a minimum Nova Scotian population of 870 sei whales. An abundance of 280 sei whales was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia. The estimate is based on data collected during the spring when the greatest proportion of the population off the northeast U.S. coast appeared in the study area. There are no recent abundance estimates for the sei whale (Waring et al. 2006).

Sources of mortality other than direct exploitation include probable vessel strikes (OBIS-SEAMAP 2004), and factors that could potentially limit the persistence and recovery of this species are primarily indirect, and are a reflection of the overall state of the oceans. These include bioaccumulation of toxins, and inter-specific competition for prey items (COSEWIC 2003).

Sei whales have been federally listed since 1970. There is no critical habitat designated for the sei whale.

Sperm Whale. Sperm whales are the largest toothed whale and are distributed from the tropics to polar zones in both hemispheres (NMFS 2008). They are the only large cetacean common occurring in the GOM (NMFS 2002). Sperm whales are found in the waters of the GOM throughout the year, but are most common during the summer months (NMFS 2008). They are deep-diving mammals and inhabit oceanic waters, although they may come close to shore in certain areas where deep water approaches the coast (Viada 2000). While they might be encountered almost anywhere on the high seas, their distribution shows a preference for continental margins, sea mounts, and areas of upwelling where food is abundant (NMFS 2002). Their distribution is dependent on their food source and suitable conditions for breeding, and varies with the sex and age composition of the group (NMFS 2008). Sperm whales are known to feed on cephalopods, demersal fishes, and benthic invertebrates (Viada 2000).

Historical sightings records suggest Gulf-wide distribution, primarily on the continental slope. During GulfCetI and II surveys, however, sperm whales on the slope were sighted almost entirely in the north-central and northeastern Gulf in loose groups of two to eight individuals. Congregations of sperm whales are also common inhabitants of waters over the shelf edge in the vicinity of the Mississippi River delta in water depths of 500 to 2,000 m (1,640 to 6,562 feet). From these consistent sightings it is believed that there is a resident population of sperm whales in the Gulf consisting of adult females, calves, and immature individuals. Seasonal aerial surveys have confirmed that sperm whales are present in the northern Gulf of Mexico in all seasons. Sightings are more common during summer, but may be an artifact of movement patterns of sperm whales associated with reproductive behavior, hydrographic features, or other environmental and seasonal factors (NOAA 2002).

Sperm whales are noted for their ability to make prolonged, deep dives, and are likely the deepest and longest diving mammal. Dive depth may be dependent upon temporal variations in prey abundance. Their principle prey are large squid weighing between 3.5 ounces and 22 pounds (0.1 kg and 10 kg), but they will also eat large demersal and mesopelagic sharks, skates, and fishes. The average dive lasts about 35 minutes and is usually down 1,312 feet (400 m), however dives may last over an hour and reach depths over 3280 feet (1000 m) (NMFS 2008). Long series of monotonous, regularly spaced clicks are associated with feeding and are thought to be produced for echolocation. Sperm whales also utilize unique stereotyped click sequence "codas" to possibly convey information about the age, sex, and reproductive status of the sender (NOAA 2002).

The 2004 abundance estimate for sperm whales in the Atlantic is the sum of the estimates from the two 2004 surveys, 4,804, where the estimate from the northern U.S. Atlantic is 2,607, and from the southern U.S. Atlantic is 2,197. The northern Gulf of Mexico stock is present year-round in the northern part of the Gulf of Mexico, with sightings occurring most frequently in summer. Recent research supports suggestions that this population represents a distinct stock. A recent re-analysis of survey data collected from 1991 to 1994 resulted in a population estimate of 805. The current best estimate of this population, 1,349, is from 1996 and 2001 data that were pooled. There is not sufficient data to determine population trends for this stock (Waring et al. 2006).

Sperm whales have the potential to be harmed by ship strikes and entanglements in fishing gear, although these are not as great of a threat to sperm whales as they are to more coastal cetaceans. Because of their generally more offshore distribution and their benthic feeding habits, sperm whales are less subject to entanglement than are right or humpback whales.

Documented takes of sperm whales primarily involve offshore fisheries such as the offshore lobster pot fishery and pelagic driftnet and longline fisheries. Sperm whales have been taken in the pelagic drift gillnet fishery for swordfish, and could likewise be taken in the shark drift gillnet fishery on occasions when they may occur more nearshore, although this likely does not occur often (NOAA 2002).

Disturbance by anthropogenic noise may prove to be an important habitat issue in some areas of this population's range, notably in areas of oil and gas activities or where shipping activity is high. Another potential source of mortality is from accumulation of stable pollutants (e.g. polycholorobiphenyls (PCBs), chlorinated pesticides (DDT, DDE, etc.), polycyclic aromatic hydrocarbons (PAHs), and heavy metals). Stable pollutants might affect the health or behavior of sperm whales. The potential impact of coastal pollution may be an issue for this species in portions of its habitat, though little is known on this to date (NMFS 2008).

The Southeast U.S. Marine Mammal Stranding Network received reports of 16 sperm whales that stranded along the Gulf of Mexico coastline from 1987 to 2001 in areas ranging from Pinellas County, Florida to Matagorda County, Texas. One of these whales had deep, parallel cuts posterior to the dorsal ridge that were believed to be caused by the propeller of a large vessel; this trauma was assumed to be the proximate cause of the stranding (NOAA 2002). In January 2008, a dead female sperm whale washed ashore at Fort De Soto Park, FL. Preliminary necropsy findings indicate the whale was emaciated and suffered from chronic illness. Sperm whales are present year-round in deep water areas of the Gulf of Mexico. Typically, healthy sperm whales are not found near shore. In the past ten years, three other sperm whales stranded themselves on Florida's west coast (FWRI 2008).

The sperm whale was listed as endangered throughout its range on June 2, 1970 under the Endangered Species Conservation Act of 1969 (35 FR 8495) and is also protected under the MMPA of 1972. No critical habitat has been designated for this species.

3.2.3.2 Threatened and Endangered Sea Turtles

All five species of sea turtles that inhabit the GOM are federally listed as threatened or endangered. These species are the loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), hawksbill sea turtle (*Eretmochelys imbricata*), and Kemp's ridley sea turtle (*Lepidochelys kempi*). Four of the five species of sea turtles (loggerhead, green turtle, Kemp's ridley, and hawksbill) occur in the Tampa Bay area. Loggerhead sea turtles are by far the most numerous in this area, but green, hawksbill, and Kemp's ridley turtles also are found (Meylan et al. 2003). **Table 3.2-1** outlines the turtle species that can be found in the vicinity of the project and their status.

Sea turtle life history stages include eggs, hatchling, juvenile, and adult (MMS 2002a). In general, sea turtles nest along the entire GOM coastline; however, nesting activity in the project area is described below. Hatchling sea turtles move offshore in a swimming frenzy immediately after hatching. Post-frenzy hatchling sea turtles move to areas of convergence or to sargassum mats and undergo passive oceanic migrations (Wyneken 2001). Juvenile sea turtles actively recruit to nearshore nursery habitat and move into adult foraging habitat when approaching sexual maturity. At the onset of nesting, adults move between foraging habitats and nesting beaches. Mating habitat depends on species and might occur off nesting beaches or remotely. Females reside near nesting beaches during nesting season (MMS 2002a). Recent research has revealed that Tampa Bay is an important nursery area for young Kemp's ridley sea turtles (TBEP 2006). The bay serves as habitat for several life history stages of sea turtles, including foraging adults, foraging juveniles and subadults, and nesting females. The Gulf waters adjacent to Anna Maria Island, Egmont Key, and all of Pinellas County can be expected to be visited by both reproductive males and females during the mating and nesting season (Meylan et al. 2003).

Loggerheads, greens, and leatherbacks nest regularly on Florida's beaches and hawksbills, and Kemp's ridleys occur throughout GOM coastal waters, bays, and lagoons. These habitats are used as nursery and development areas by juveniles and subadults. Sea turtles come to Florida's nesting and rearing areas

Table 3.2-1. Sea Turtle Occurrence in the Tampa Bay Region

Species	ESA Status	Typical Adult Habitat	Juvenile/Hatchlings Potentially Present?
Family Cheloniidae			
Green sea turtle (*Chelonia mydas*)	T, E*	Shallow coastal waters; seagrass beds	Yes
Loggerhead sea turtle (*Caretta caretta*)	T	Estuarine, coastal, and shelf waters	Yes
Kemp's ridley sea turtle (*Lepidochelys kempi*)	E	Shallow coastal waters; seagrass beds	Yes
Hawksbill sea turtle *(Eretmochelys imbricata)*	E	Shallow coastal waters; coral reefs	Yes
Family Dermochelyidae			
Leatherback sea turtle (*Dermochelys coriacea*)	E	Coastal, shelf, and slope waters	Yes

Source: Meylan et al. 2003

Notes:

E – Federally listed as "endangered" under the ESA of 1973.

T – Federally listed as "threatened" under the ESA of 1973.

* Green sea turtles are listed as threatened throughout their range except in Florida, where breeding populations are listed as endangered.

from feeding grounds scattered throughout the Atlantic (Mahmoudi et al. 2002). Approximately 350 sea turtles nest annually on beaches surrounding Tampa Bay (TBEP 2006). Three sea turtle species nest regularly on Florida's beaches: the loggerhead, the green, and the leatherback (Mahmoudi et al. 2002). Nearly all ocean-facing (Gulf) sandy beaches in the Tampa Bay area are used as nesting habitat by sea turtles. Along Florida's Gulf coast, most nesting occurs from Pinellas to Monroe counties (Mahmoudi et al. 2002). Sea turtle nesting habitat is seriously threatened in Florida and elsewhere by coastal construction (and its attendant artificial lighting), coastal armoring, and an increasing human presence on the beach (Meylan et al. 2003).

Surveys conducted by the FMRI recorded sightings of marine turtles in all sectors of Tampa Bay, with higher densities in the southern part of the bay, particularly in the area around Terra Ceia, just south of the Sunshine Skyway Bridge (Meylan et al. 2003). Based on stranding records, aerial surveys, and incidental captures, the occurrence of sea turtles in the Tampa Bay area suggests that turtles are common inhabitants of the bay. Their great mobility and tendency to remain submerged most of the time contribute to their inconspicuous nature. The following species were observed during the surveys (in decreasing order of abundance): loggerheads, Kemp's ridleys, greens, and hawksbills.

Strandings of dead or injured marine turtles along Florida's coastline are monitored by FMRI as part of the Sea Turtle Stranding and Salvage Network (STSSN). A total of 298 records of dead or injured turtles exist for the inshore waters of the Tampa Bay area for 1980 through 2001. Loggerhead turtles are by far the species most frequently documented. Strandings of loggerheads were most numerous from March through June, with a smaller peak in October and November. Green turtle strandings were documented primarily outside the summer months, with a peak in February and March. Strandings of Kemp's ridleys have occurred in all months, with no obvious seasonal pattern. Dead or injured loggerheads and Kemp's ridleys have been recovered in all sectors of the bay; green turtle strandings have been far more restricted in distribution, with most occurring near the mouth of the bay. All hawksbill strandings have been in the outer bay area (Meylan et al. 2003).

Although they are all now protected by law from harvesting, it is clear from stranding records that numerous mortality factors are still operating. Many are human-related, such as boat collisions, entanglement, and incidental catch. Boat-related injuries (including propeller wounds and possible boat collision injuries), were the most frequently observed carcass anomaly for loggerheads; 16 Kemp's ridleys and 1 hawksbill also showed evidence of boat injuries. Seven cases of entanglement were reported, affecting all species (Meylan et al. 2003).

In 2004, sea turtle strandings in the Tampa Bay region accounted for 13.5 percent of the total offshore strandings and 14.7 percent of the inshore strandings in the entire GOM (see **Table 3.2-2**). A total of 107 sea turtle strandings were verified in the offshore and inshore areas of Tampa Bay, with loggerhead strandings accounting for 70 percent of the total.

Table 3.2-2. Offshore and Inshore Sea Turtle Strandings in Tampa Bay and the Entire GOM Region in 2004

Sea Turtles	Offshore		Inshore	
	Tampa Bay	GOM	Tampa Bay	GOM
Loggerhead	55	322	20	77
Green	13	89	9	103
Leatherback	1	13	0	2
Hawksbill	1	20	0	1
Kemp's ridley	5	94	3	26
Unknown	0	19	0	8
Total	75	557	32	217

Source: STSSN 2004

Note: The Tampa Bay area was characterized by the "zone 5" designation on the STSSN zone map.

There are no designated critical habitats or migratory routes for sea turtles in the GOM. However, NMFS recognizes many coastal areas as preferred habitat (i.e., important habitats for the species within a specific geographic area) for sea turtles. For example, nearshore or inshore areas are preferred habitat for green sea turtles, while bays are preferred habitat for Kemp's ridley sea turtles (MMS 2002a). Sargassum mats are also recognized as preferred habitat for juvenile sea turtles.

Loggerhead Sea Turtle. Loggerhead sea turtles are the most abundant sea turtle in the GOM (Dodd 1988). Loggerheads inhabit the continental shelves and estuaries of temperate and tropical environments of the Atlantic, Pacific, and Indian oceans. In offshore waters, loggerhead turtles have been primarily sighted on the continental shelf, although many sightings of this species have also been made within the deeper waters of the slope at depths of greater than 1,000 m (3,280 feet) (Viada 2000). Loggerheads are carnivorous and, though primarily predators of benthic invertebrates, are facultative feeders over a wide range of food items (Viada 2000). Loggerheads forage along the inshore and coastal waters of the GOM, the Florida Keys, and north all the way to New England (Mahmoudi et al. 2002).

About 14,000 female loggerheads nest in the southeastern United States annually, and this species accounts for approximately 98 percent of the total sea turtle nesting activity in Florida. In 2006, 377 loggerhead nests were found in Manatee, Hillsborough, and Pinellas counties (191, 21, and 165 respectively) (FMRI 2006). Nests are documented annually on the barrier islands off Pinellas and Manatee counties, with Egmont Key providing the most pristine nesting beach remaining (an average of 44 loggerhead nests has been documented on the key annually from 1989 through 2001 (Meylan et al. 2003). Florida's west coast is also a major feeding area for nonnesting loggerheads. Nesting females remain in shallow areas near beaches during the nesting season. They then disperse to feeding grounds throughout the Bahamas, Cuba, Dominican Republic, north along the eastern U.S. coast and south through the Florida Keys and GOM (late April to September). Florida Bay is a developmental habitat for loggerheads originating from southeastern U.S. beaches (Mahmoudi et al. 2002).

It is expected that loggerhead sea turtles would occur within offshore, nearshore, and coastal waters of the project area. The loggerhead is currently listed as a threatened species.

Green Sea Turtle. Green sea turtles are found throughout the GOM, where they inhabit shallow waters (except when migrating) inside reefs, bays, and inlets and tend to be found in areas with marine grass and algae (USFWS 2002c). Green sea turtles are known to make extensive migrations between nesting and feeding habitats (NMFS 2002). Green sea turtles are omnivorous; adults prefer feeding on plants but juveniles and hatchlings are more carnivorous. The adult feeding habitats are beds or pastures of seagrasses and algae in relatively shallow, protected waters; juveniles forage in areas such as coral reefs, emergent rocky bottom, sargassum mats, and in lagoons and bays (Viada 2000). Immature green turtles have been reported along the west coast, in Florida Bay, and in the Cedar Key/Crystal River area, indicating the importance of these areas as developmental habitat. Green turtles prefer shallow, sandy flats covered with seagrasses or seaweeds (Mahmoudi et al. 2002).

Green turtles nest in Florida from June to late September on Florida's east coast. Reports of green turtle nesting along the GOM coast are infrequent, and the closest important nesting aggregations are along the Florida east coast (60 to 800 nests are reported each year) (Mahmoudi et al. 2002) and the Yucatan Peninsula (NMFS and USFWS 1991). Nesting has been reported on Anna Maria Island (2002) and Longboat Key North (2003) in Manatee County and Fort DeSoto County Park (1994) and north Pinellas County Beaches (2000) in Pinellas County (FMRI 2006).

It is expected that green sea turtles would occur within offshore and nearshore waters of the project area. The green sea turtle is currently listed as a threatened species internationally and as an endangered species in Florida. No critical habitat has been designated in the GOM.

Leatherback Sea Turtle. Leatherback sea turtles are the most abundant sea turtle on the northern GOM continental slope (Viada 2000). They are the largest, deepest diving, most migratory, widest ranging, and most pelagic sea turtle (USFWS 2002a). Though considered pelagic, leatherbacks would occasionally enter the shallow waters of bays and estuaries. During the GulfCet I and II programs, leatherbacks were sighted frequently during both summer and winter. Leatherback sea turtles feed primarily on gelatinous zooplankton such as jellyfish, siphonophores, and salps, though they could, perhaps secondarily, ingest some algae and vertebrates (Viada 2000).

Leatherback sea turtles undergo extensive migrations from feeding grounds to nesting beaches. Leatherback nesting within the continental United States is limited to eastern Florida (NMFS and USFWS 1992a). Results of MMS-sponsored surveys (i.e., GulfCet I and II) suggest that the region from Mississippi Canyon to De Soto Canyon, especially near the shelf edge, appears to be an important habitat for leatherbacks. Temporal variability in leatherback distribution and abundance suggests that specific areas might be important to this species, either seasonally or for short periods of time (Viada 2000).

Global abundance estimates of breeding female leatherbacks range from 70,000 to 115,000, and the number of nests reported in Florida ranges from 39 to 188 since 1979. Leatherbacks nest in Florida from April through July, but they are observed along Florida's west coast during all months except February and April. Sightings in southwestern Florida have been concentrated between 27 and 166 km from shore (Mahmoudi et al. 2002).

It is likely that leatherback sea turtles would occur within offshore waters of the project area. Leatherbacks are listed as endangered but no critical habitat has been designated in the GOM.

Hawksbill Sea Turtle. Hawksbill sea turtles are small- to medium-sized turtles that occur in tropical to subtropical seas of the Atlantic, Pacific, and Indian oceans (Viada 2000). Although hawksbill sea turtles are the least common sea turtle in the GOM, they have been recorded in waters of all of the states along the GOM (NMFS and USFWS 1993). Hawksbills are primarily coastal and are seldom seen in waters deeper than 20 m (66 feet). Hawksbill sea turtles have been sighted near coral reefs south of Florida (NMFS 2002) and are observed regularly in the Florida Keys (Mahmoudi et al. 2002). Coral reefs are generally recognized as the resident foraging habitat for juveniles and adults. Adult hawksbills feed primarily on sponges and demonstrate a high degree of feeding selectivity on a relatively limited number of sponge species. Juvenile hawksbills show evidence of residency on specific foraging grounds, although some migrations can occur.

Nesting within the continental United States is limited to southeastern Florida and the Florida Keys (Viada 2000). Nesting on GOM beaches is extremely rare (NMFS 2002a). One hawksbill nest was found on Longboat Key, in Manatee County, in 1980 (FMRI 2006). In most locations, nesting occurs between April and November, but varies depending on the area. Hawksbill nesting within the continental United States is limited to southeastern Florida and the Florida Keys.

The global population of hawksbill sea turtles has declined 80 percent over the past 100 years, with only approximately 15,000 females nesting worldwide (USFWS 2002b). It is expected that hawksbill turtles would occur within nearshore waters of the project area. The hawksbill is listed as endangered. No critical habitat has been designated in the GOM.

Kemp's Ridley Sea Turtle. Kemp's ridley sea turtles, the smallest sea turtles, occur mainly on the continental shelf in the GOM. Adults are found in productive coastal and estuarine waters of the GOM. Juvenile and subadults are widely distributed through U.S. coastal waters from Texas to Maine, but the west Florida coast is the area of "maximum abundance" of Kemp's ridleys in the United States. Kemp's ridleys are carnivorous and feed primarily on crabs, though they also feed on a wide variety of other prey items as well (Viada 2000).

Kemp's ridleys travel near the coast and are considered relatively common within all sectors of Tampa Bay (Meylan et al. 2003). Stranding and capture records indicate that Kemp's ridleys were most often encountered in west Florida in the late spring and summer. This temporal pattern is likely due to migration or winter dormancy (Mahmoudi et al. 2002).

The major Kemp's ridley nesting area is near Rancho Nuevo, a stretch of beach in southern Tamaulipas, Mexico. Some scattered nesting has also been reported in other areas of Mexico and Texas, Colombia, Florida, and South Carolina (Viada 2000). Nesting occurs from April into July (NMFS 2002a). Kemp's ridley nests were recorded within Pinellas County on Madeira Beach in 1989 (Meylan et al. 2003), 1994, and twice in 2002 (FMRI 2006).

It is expected that Kemp's ridley turtles would occur within offshore, nearshore, and coastal waters of the project area. The Kemp's ridley is currently listed as an endangered species and is considered the most endangered sea turtle in the world (NMFS and USFWS 1992b). No critical habitat has been designated in the GOM.

Sea Turtle Hearing. Little is known about sea turtle hearing. Past research based on the physiology of the brain indicates that sea turtles are able to hear sounds with frequencies ranging from 0.08 to 2 kiloHertz (kHz), with maximum sensitivity levels reported between 0.1 and 0.8 kHz and 0.3 and 0.4 kHz (Lenhardt 1994, NRC 2003). Preliminary data indicate that green sea turtles are capable of hearing sounds ranging from 0.1 kHz to 0.5 kHz, with a threshold between 107 decibels (dB) and 119 dB at 0.2 kHz, and a threshold between 121 dB and 131 dB at 0.4 kHz (ONR undated). Loggerhead sea turtle hearing ranges from 0.25 kHz to 0.75 kHz with peak sensitivity at 0.25 kHz (Richardson et al. 1995).

3.2.3.3 Threatened and Endangered Bird Species

The USFWS is responsible for coastal and marine bird protection and recovery under the authority of the ESA. The threatened and endangered birds that occur in the northern GOM and inhabit or frequent coastal areas and waters of the inner continental shelf include the piping plover (*Charadrius melodus*), wood stork (*Mycteria americana*), and roseate tern (*Sterna dougallii*). The Southeastern snowy plover (*Charadrius alexandrinus*) and least tern (*Sterna antillarum*) are listed as threatened in the State of Florida.

Piping Plover. Piping plovers are migrant shorebirds that overwinter along the southeastern U.S. and GOM coasts. Piping plovers from all three breeding populations winter along South Atlantic, Gulf Coast, and Caribbean beaches and barrier islands, primarily on intertidal beaches with sand or mud flats with no or very sparse vegetation. Plovers depart for the wintering grounds from mid-July through late October. Breeding and wintering plovers feed on exposed wet sand in wash zones; intertidal ocean beach; wrack lines; washover passes; mud-, sand-, and algal flats; and shorelines of streams, ephemeral ponds, lagoons, and salt marshes by probing for invertebrates at or just below the surface. They use beaches adjacent to foraging areas for roosting and preening (USFWS 2007b). Christmas Bird Count (CBC) census surveys during the 2006 to 2007 season recorded only three individuals within the St. Petersburg survey area, and none within the Alafia Banks Sanctuary, the Tampa survey area, and the Bradenton survey area (Audubon Society 2007). As discussed in **Section 3.2.2.3**, critical habitat has been designated for the piping plover.

Wood Stork. Wood storks are the only storks that regularly inhabit North America. These wading birds are year-round residents of Florida and Georgia, though sightings occur within the other Gulf coastal states. Wood storks frequent freshwater and brackish coastal wetland habitats. This endangered species nests at a single site in Tampa Bay, the Dot-Dash colony at the mouth of the Braden River. During the 1994 through 2001 census, numbers varied from about 40 to 160 pairs annually, with the high in 2000. In 1994 the colony was abandoned following disturbance by jet skiers, and numbers were reduced in 1995 (Paul and Paul 2003). CBC census surveys during the 2006 to 2007 season recorded 110 individuals within the St. Petersburg survey area, 83 individuals within the Alafia Banks Sanctuary, 30 individuals within the Tampa survey area, and 208 individuals within the Bradenton survey area (Audubon Society 2007). The wood stork is currently listed as endangered. No critical habitat has been designated for wood storks in the GOM.

Roseate Tern. Roseate terns are seabirds that that commonly venture into oceanic waters; however, their western Atlantic population is known to approach only the far southeastern Gulf to breed in scattered colonies along the Florida Keys (Viada 2000). They are currently listed as threatened in Florida. Roseate terns were not recorded within the project area during CBC census surveys conducted during the 2006 to 2007 season (Audubon Society 2007).

Southeastern Snowy Plover. Southeastern snowy plovers are shorebirds that nest within GOM coastal habitats such as dry sandy beaches and flats. They are obligate inhabitants of barrier beaches, particularly near passes and intertidal sand flats. As beach-nesters, southeastern snowy plovers are highly vulnerable to human disturbance and raccoon predation. With a maximum of three pairs of birds found annually (1994 through 2001) on the beaches of Tampa Bay (especially Ft. DeSoto and Shell Key), and no more than 10 or so estimated for the entire region, this species is on the brink of local extinction (Paul and Paul 2003). Snowy plovers were not recorded within the project area during CBC census surveys conducted during the 2006 to 2007 season (Audubon Society 2007).

Least Tern. Least terns nest in numerous sites along Florida's coast. About 350 pairs were recently censused in Tampa Bay colonies, but colonies move frequently and are hard to locate. Colonies at the Skyway Sandbar, Isla, and Tierra Verde have been lost to development or chronic human disturbance, while the Shell Key colony failed 1988 through 2001 due to raccoon predation (Paul and Paul 2003).

3.2.3.4 Threatened and Endangered Fish Species

Under the authority of the ESA, USFWS and NMFS are responsible for the protection and recovery of endangered and threatened fish species. In accordance with the ESA, "endangered" species are defined as any species in danger of extinction throughout all or a significant portion of its range; "threatened" species are defined as any species likely to become endangered within the foreseeable future.

Smalltooth Sawfish. The only federally listed fish species that occurs in the project area is the U.S. population of the smalltooth sawfish (*Pristis pectinata*) (endangered). Smalltooth sawfish are tropical marine and estuarine fish that are typically found in shallow waters associated with the muddy or sandy bottoms of inshore bars, mangroves, and seagrass beds (68 FR 15676). Smalltooth sawfish occurrences have been reported in both the Pacific and Atlantic oceans, but the U.S. population is found only in the Atlantic. Historically, the U.S. population was common throughout the GOM from Texas to Florida, and along the east coast from Florida to Cape Hatteras. The current range of this species has contracted to peninsular Florida, where they only occur with any regularity in the Everglades region at the extreme southern tip of the state. No accurate estimates of abundance trends over time are available for smalltooth sawfish, but available records and anecdotal evidence indicate that although this species was once common throughout its historic range, it has declined dramatically in U.S. waters over the past century (NMFS 2006d). These declines are largely attributed to habitat modification and loss, as well as to overutilization for commercial, recreational, scientific, or educational purposes (68 FR 15676). NMFS listed the U.S. population of the smalltooth sawfish as an endangered species on April 1, 2003 (68 FR 15674–15680). There is no critical habitat currently designated for sawtooth sawfish.

3.2.4 Benthic Resources

Benthic—or bottom—communities consist of both substrate (habitat) and organisms that occupy that substrate. Benthic habitats are characterized by physical or structural features, such as topography, substrate type, sediment grain size, and water depth, and by the presence of emergent biogenic structures (i.e., structures formed by plants or animals), such as coral reefs, oyster reefs, and tube assemblages (GMFMC 2004).

In general, the benthic habitat on the west Florida Shelf is predominantly carbonate sediments, with low-relief hard bottom, coralline algal nodules and pavement, and unconsolidated shell rubble. Sediments are composed of quartz-shell sand (i.e., greater than 50 percent quartz), shell-quartz sand (i.e., less than 50 percent quartz), shell sand, and algal sand. The west Florida shelf provides a large area of scattered hard substrates, some emergent, but most covered by a thin veneer of sand. Hard substrates are colonized by a variety of hardy, tropical reef biota, such as algae, sponges, stony corals, hydroids, octocorals, anemones, and bryozoans intermingled with sand bottoms (GMFMC 1998).

The offshore hard-bottom communities of the West Florida shelf can be grouped into various assemblages based on similarities and dissimilarities. The assemblages that would occur in the Project area include Inner and Middle Shelf Live Bottom Assemblage II identified in water depths of 75 m (246 feet) to 25 m (82 feet) and the Inner Shelf Live Bottom Assemblage I identified in water depths of 27 m (89 feet) to 20 m (66 feet) (GMFMC 2004).

The Inner and Middle Shelf Live Bottom Assemblage II consists of algae, sea squirts, bryozoans, hard corals, small sea fans, hydrozoans, and several sponges. This assemblage is characterized by a higher number of sponges than the Inner Shelf Live Bottom Assemblage I. The Inner Shelf Live Bottom I consists of patches of algae, ascidians, large sea fans, hydrozoans, and sponges. This assemblage generally has larger organisms and a higher biomass per unit area than the Inner and Middle Shelf Live Bottom I (GMFMC 2004).

The nearshore benthic habitat (from depths of 18 m [60 ft] to shore) on the west Florida shelf is characterized by spotty sediment covering large expanses of limestone, with rock ledges and sinkholes. Rocky bottom is colonized by sponges, soft corals, true corals, and anemones. These provide commercially important fish and shellfish habitat (GMFMC 2004).

Approximately 80 percent of Tampa Bay is covered by sand or mud bottom, including hard-packed sand and shell. These sediments support a large variety of organisms, including parchment worms, clams, sea squirts, and conchs. In 1993, more than 500 types of macroinvertebrates were identified baywide, with an average density of 10,000 organisms per square meter (SWFWMD 1999).

Hard-bottom habitats also occur in Tampa Bay. Sessile invertebrates such as corals, barnacles, sponges, and algae colonize natural outcroppings of rock or limestone—or man-made bridge pilings or reefs in these habitats. More than 850 acres of hard-bottom communities were identified in the shallow areas of Tampa Bay in 1994. It is likely that additional hard-bottom communities are associated with deeper areas of the Tampa Bay ship channel where rock has been exposed due to dredging (Savercool and Lewis 1994). Three distinct hard-bottom habitats that were identified by aerial photographs in shallow areas include native limestone outcroppings, artificial habitat such as concrete bridge rubble, and living oyster reefs. Similar organisms with slight variations occur within each habitat type. Hard corals and macroalgae (*Sargassum filipendulum* and *Caulerpa mexicana*) only occurred in the native limestone. However, the native limestone was the only habitat type that did not support amphipods. Oysters only occurred in the oyster reef habitat (Savercool and Lewis 1994). Long-term trends and current hard-bottom coverage in Tampa Bay are not available. However, eight artificial reefs have been established in Tampa Bay to expand natural hard-bottom and enhance fishing (SWFWMD 1999).

Seagrasses (vascular plant) and macroalgae (nonvascular plant) are important primary producers in the marine environments. They also provide nursery grounds to important recreational and commercial fish species and habitat for many larval and adult invertebrates. Five species of seagrass are common to the GOM. These include turtle grass (*Thalassia testudinium*), shoal grass (*Halodule wrightii*), manatee grass (*Syringodium filiforme*), star grass (*Halophila engelmanni*), and paddle grass (*Halophila decipens*). Widgeon grass (*Ruppia maritima*) is also common, but not considered a true seagrass. It is a freshwater species that is capable of living in a saline environment but also occurs in the GOM. Macroalgae species of *Caulerpa*, *Udotea*, *Penicillus*, and *Sargassum* are also common to this area of the GOM (GMFMC 1998).

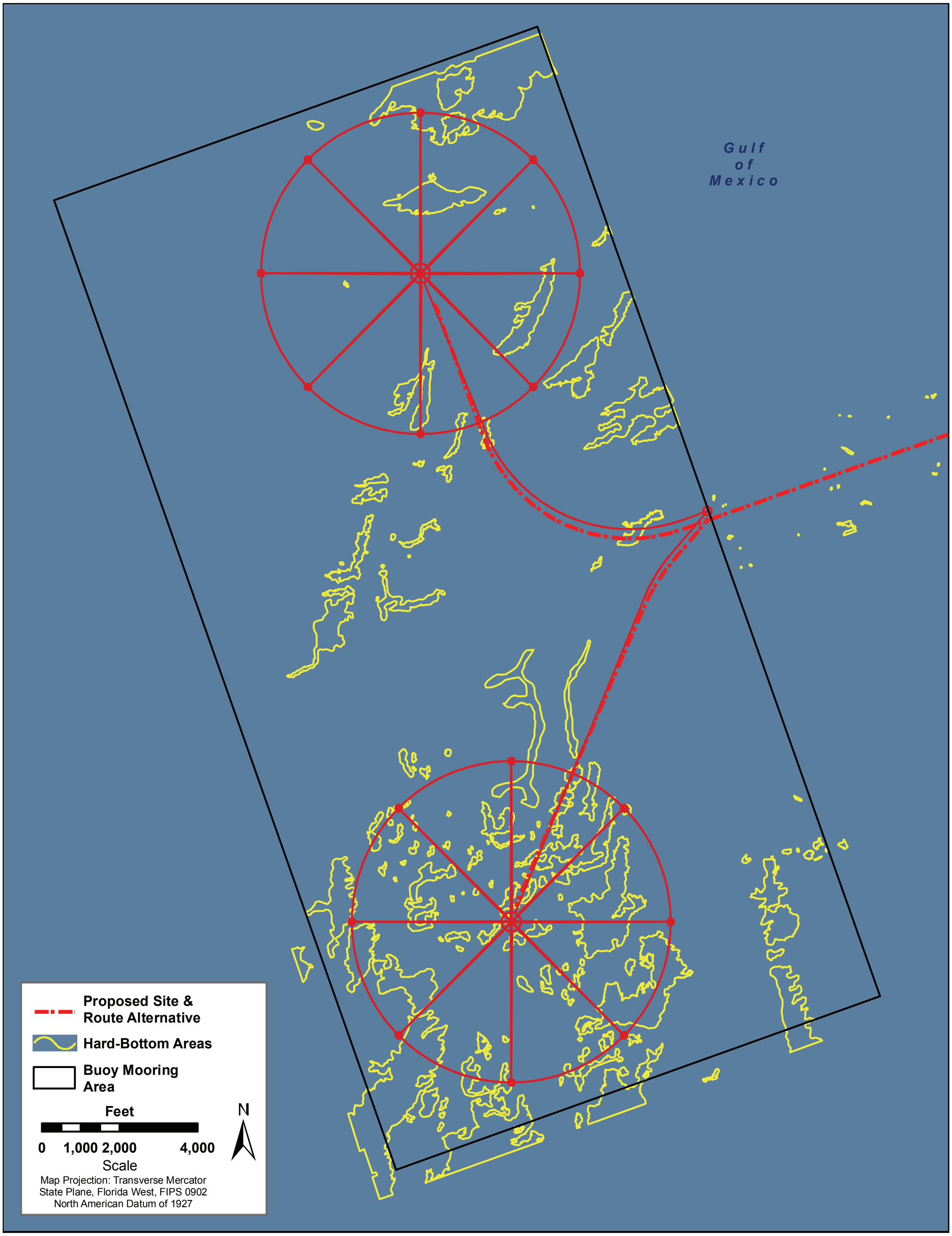
Benthic Community Survey. The Applicant performed a benthic survey along a 7,772-m-by-3,658-m (25,500-foot-by-12,000-foot) site at the proposed buoy system array footprint and a 914-m (3,000-foot) corridor along the original pipeline corridor, from August through December 2006. After meeting with FDEP, the Applicant decided to develop an alternative route that would avoid crossing the Terra Ceia AP and meets the engineering requirements of the proposed project. In September and October 2007, a survey was conducted of the rerouted portion of the pipeline, which includes the portion of the pipeline that starts at the mouth of the Tampa Bay (the inshore portion). The offshore portion (outside of Tampa Bay) of the proposed pipeline route was surveyed during the 2006 benthic survey. Side-scan sonar, photodocumentation (video and still photographic data), and diver surveys were used to identify marine benthic communities within the Project area. Surveyed habitats were classified into six different habitat types, presented in **Table 3.2-3**. Approximately 33 percent of the proposed Route Alternative were hard/ live-bottom habitat. Five of these six habitat types were identified in the survey, soft substrate/sand; Types A, B, and D; and seagrass. Approximately 5 percent was Type A habitat, 18 percent was Type B habitat, and 9 percent was Type D habitat. **Figures 3.2-3, 3.2-4,** and **3.2-5** present the hard-bottom areas in the proposed Port Site and Pipeline Route Alternative. Organisms that were characteristic to the hard-bottom habitat in the survey are presented in **Table 3.2-4** (Port Dolphin 2007d). Biota were not characterized for the soft bottom/sand habitat.

Table 3.2-3. Habitat Types Identified in the Benthic Survey

Habitat Type		Description
Hard/Live Bottom	Type A	20 percent to 100 percent cover by attached epibenthic biota or hard bottom with greater than or equal to 0.25 m (0.8 feet) in relief, inclusive of sand components integral to these habitats. EFH, Habitat Area of Particular Concern
	Type B	5 percent to 20 percent cover by attached epibenthic biota or hard bottom with less than .25 m (0.8 feet) in relief, inclusive of sand components integral to these habitats. EFH, Habitat Area of Particular Concern
	Type C	Breakwater spoil area. EFH, Habitat Area of Particular Concern
	Type D	Sand (soft substrate/sedimentary habitat) in proximity to reef/hard-bottom resources, a sandy veneer over hard substrate with less than 5 percent epibenthic coverage. EFH
Soft Substrate/Sand		Soft substrate/sedimentary habitats not associated with hard-bottom ecotones
Seagrass		Areas that contained turtle grass, manatee grass, and shoal grass, as determined by dive surveys

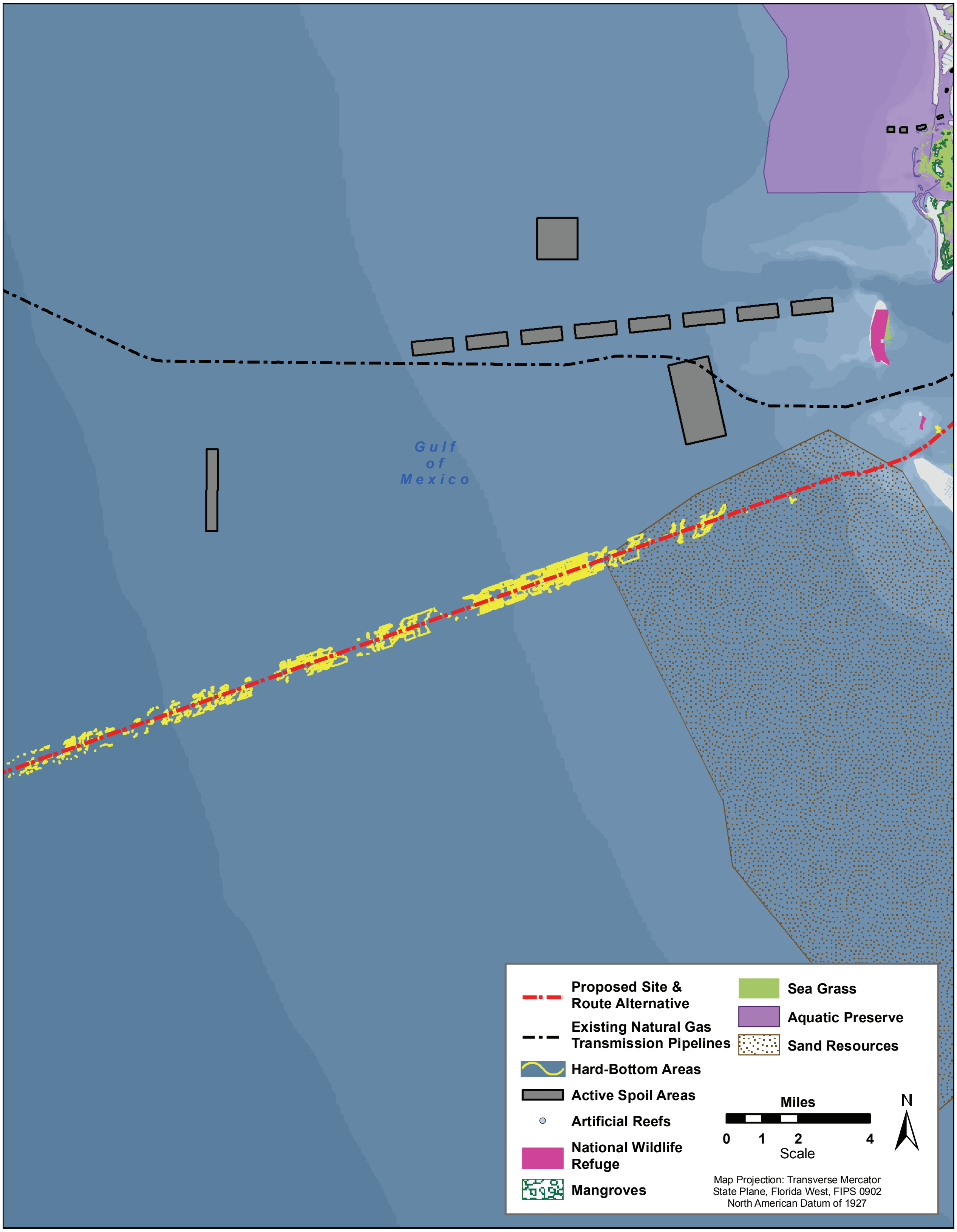
Source: Port Dolphin 2007d

Survey results indicate that the majority of hard-bottom areas were located offshore in water depths of 12 to 15 m (40 to 50 feet) and water depths from 21 to 27 m (70 to 90 feet). The relief ranged from 0 to 2.0 m (0 to 6.5 feet) and was generally oriented northeast to southwest. In depths of 12 to 15 m (40 to 50 feet), communities were dominated by macroalgae (accounting for 34 to 68 percent of benthic cover). Therefore, habitats within this depth range were classified as Type A, although nonalgal coverage composes less than 6 percent of the total benthic cover. The Applicant based their habitat characterization in the survey area on structural relief and nonalgal benthic biotic coverage. In deeper waters > 30.5 m (> 100 feet) macroalgal abundance was less pronounced and emergent substrate was uncommon to rare (Port Dolphin 2007d). Smaller sporadic patches of paddle grass were observed in deeper offshore areas of the proposed Site and Pipeline Route. These were not quantified (Port Dolphin 2007d).



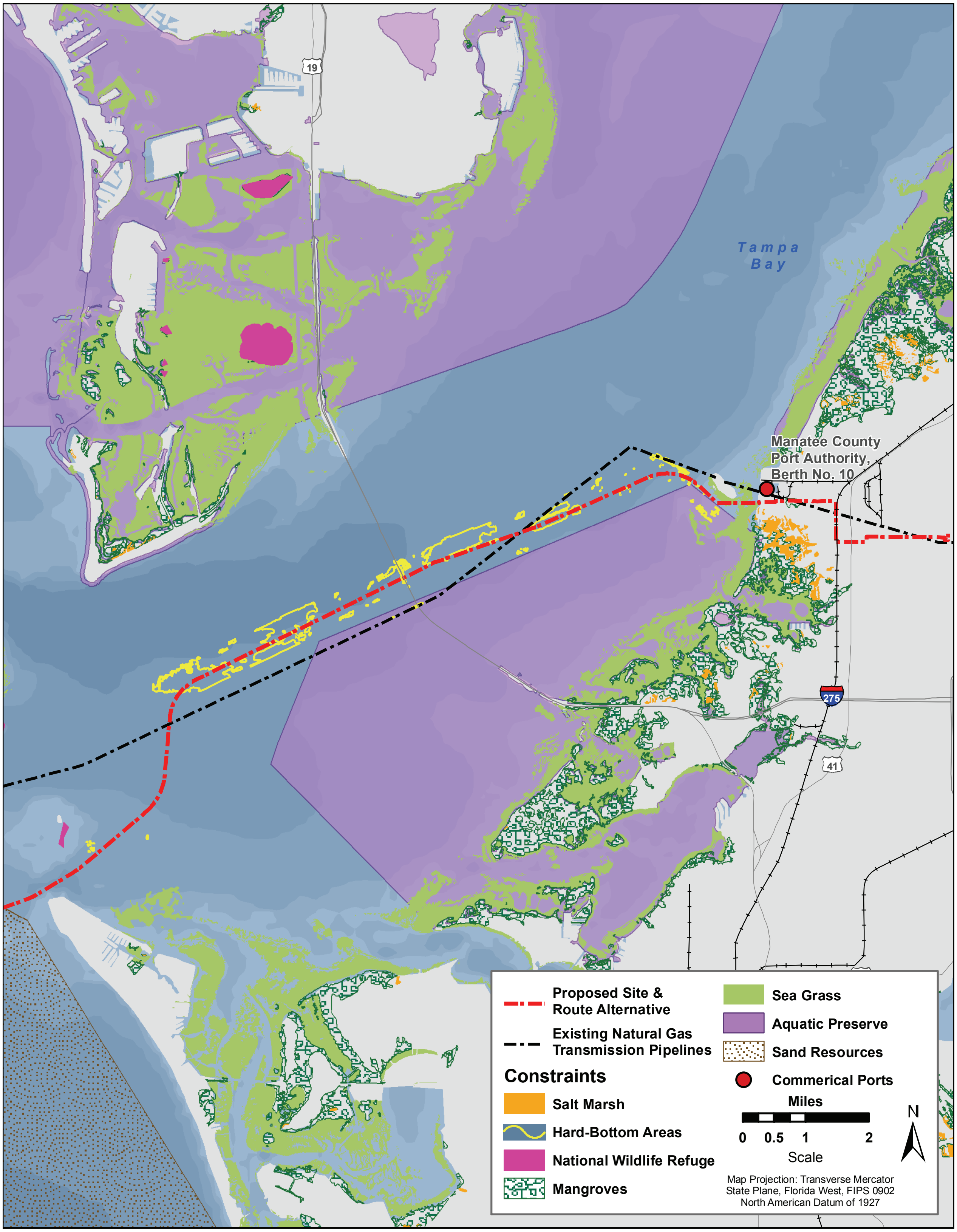
Source of Project Area & Hard Bottom Areas: ConShelf 2007

Figure 3.2-3. Hard-Bottom Habitats at the Proposed Buoy Site



1 Source of Project Areas & Hard Bottom Areas: ConShelf 2007

2 **Figure 3.2-4. Hard-Bottom Habitats Along the Proposed Route**



Source of Project Area & Hard Bottom Areas: ConShelf 2007

Figure 3.2-5. Hard-Bottom Habitats at the Nearshore Route

Table 3.2-4. Species Characteristic of Hard-bottom Habitat

Scientific Name	Common Name
Cnidaria	
Cladocora arbuscula	Tube coral
Dichocoenia stokesii	Elliptical star coral
Oculina robusta	Robust ivory tree coral
Scolymia cubensis	Artichoke coral
Siderastrea sidereal	Massive starlet coral
Siderastrea radians	Lesser starlet coral
Solenastrea bournoni	Smooth star coral
Solenastrea hyades	Knobby star coral
Stephanocoenia intercepta	Blushing star coral
Pseudopterogorgia sp.	Sea plumes
Pterogorgia sp.	Sea whip
Carijoa riisei	White telesto
Leptogorgia sp.	Sea whip
Caryophylliidae	Unidentified cup corals
Zoanthidae	Unidentified zoanthids
Hydroida	Unidentified hydroids
Porifera	
Axinella sp.	Finger sponge
Cinachyra sp.	Orange ball sponge
Halicondria sp.	Unknown
Callyspongia sp.	Vase sponge
Cliona sp.	Yellow boring sponge
Spirastrella sp.	Encrusting sponge
Geodia sp.	Leathery barrel sponge
Placospongia sp.	Unknown
Pseudaxinella sp.	Unknown
Tethya crypta	None
Speciospongia sp.	Loggerhead sponge
Porifera	Unidentified sponges
Urochordata	
Ascidacea	Unidentified tunicates
Bryozoa	
Bryozoa	Unidentified bryozoans
Algae	
Caulerpa sertuloides	Green algae
Caulerpa sp.	Green algae
Halimeda sp.	Calcified green algae
Codium sp.	Green algae
Valonia sp.	Green algae
Macroalgae	Unidentified algae

Source: Port Dolphin 2007d

The Southern Route Alternative was similar to the proposed Route Alternative. Approximately 37 percent was hard/live-bottom habitat. The primary difference was that there was less Type B habitat and more Type D habitat in the Southern Route Alternative. Approximately 4 percent was Type A habitat, 5 percent was Type B habitat, and 28 percent was Type D habitat. Survey results in Tampa Bay were similar for both the revised inshore pipeline route (proposed Pipeline Route) and the original inshore pipeline route (Pipeline Alternative). Soft bottom/sand was the dominant habitat type within Tampa Bay for both routes. Small areas of sporadic hard bottom were scattered throughout the bay for both routes. Hard-bottom communities included octocorals, sponges, hydroids, bryozoans, and various other invertebrates. Fields of one species of tunicate was observed in Tampa Bay, but not offshore. It is not known whether this species is native or nonnative.

Artificial substrate in the proposed Site and Pipeline Route were areas of dredge spoil (colonized primarily by sponges, tunicates, macroalgae, and some octocorals) and an artificial reef created as mitigation for hard/live bottom for impacts associated with installation of the Gulfstream Pipeline. These were both classified as Habitat Type A (Port Dolphin 2007b). Artificial substrate, such as mitigation reefs, bridge rubble, miscellaneous debris, and an unidentified "dome" structure (possibly oceanographic equipment), was also observed in the Pipeline Alternative. Bridge rubble was colonized by octocorals, sponges, macroalgae, and other various invertebrates in the Pipeline Alternative (Port Dolphin 2007d).

Only the area around the HDD exit of the inshore portion of the proposed Pipeline Route was surveyed for seagrasses. No seagrasses were observed (Port Dolphin 2007b). Approximately 1 percent of the area surveyed for the inshore portion of the Alternative Route (195 acres) was seagrass habitat identified off Port Manatee. This area overlaps soft substrate/sand habitat. The benthic survey confirmed that turtle grass, manatee, shoal grass, widgeon grass, and star grass were present along the inshore portion of the Pipeline Alternative in depths less than 2.1 m (7 feet) and concentrated in shallow waters around Manbirdtee Island, south of Port Manatee.

3.2.5 Nonthreatened and Nonendangered Marine Mammals

Under the authority of the MMPA of 1972 (16 U.S.C. 1361 et seq.), the Secretary of Commerce is responsible for the protection of all marine mammals except walruses, polar bears, sea otters, manatees, and dugongs, which are the responsibility of the Secretary of the Interior. These responsibilities have been delegated to NMFS and the USFWS, respectively, and include providing overview and advice to regulatory agencies on all Federal actions that might affect these species.

The MMPA prohibits the "take" of marine mammals, with certain exceptions, in waters under U.S. jurisdiction and by U.S. citizens on the high seas. Under Section 3 of the MMPA, "take" is defined as "harass, hunt, capture, kill, or attempt to harass, hunt, capture or kill any marine mammal." "Harassment" is defined as any act of pursuit, torment, or annoyance that has the potential to injure marine mammal stock in the wild; or has the potential to disturb marine mammal stock in the wild by disrupting behavioral patterns, including migration, breathing, nursing, breeding, feeding, or sheltering. In cases where U.S. citizens are engaged in activities, other than fishing, that result in "unavoidable" incidental take of marine mammals, the Secretary of Commerce can issue a "small take authorization." The authorization can be issued after notice and opportunity for public comment if the Secretary of Commerce finds minor impacts.

A list of the marine mammal species present in the GOM and their likelihood of occurrence are found in **Table 3.2-5**. Federally listed marine mammal species are discussed in detail in **Section 3.2.3.1.** Two nonlisted mysticete whales and 20 nonlisted odontocete whales and dolphins are known to occur in the GOM (Viada 2000). Bottlenose dolphins are observed in the bay throughout the year. Other species of dolphins and an occasional whale are sometimes observed in nearby GOM waters and might infrequently strand on Gulf beaches, but they are not commonly found within the bay.

1 **Table 3.2-5. Marine Mammals Occurring in the GOM and Tampa Bay Area**

Common Name	Scientific Name	Federal ESA Status	Likelihood of Occurrence
Order Sirenia (dugongs, manatees, and sea cows)			
Florida manatee	*Trichechus manatus latirostris*	Endangered	rare-common*
Order Cetacea (whales, dolphins, and porpoises), Suborder Mysticeti (baleen whales)			
Northern right whale	*Eubalaena glacialis*	Endangered	rare
Blue whale	*Balaenoptera musculus*	Endangered	rare
Fin whale	*Balaenoptera physalus*	Endangered	rare
Humpback whale	*Megaptera novaeangliae*	Endangered	rare
Sei whale	*Balaenoptera borealis*	Endangered	rare
Bryde's whale	*Balaenoptera edeni*	--	common
Minke whale	*Balaenoptera acutorostrata*	--	occasional
Order Cetacea, Suborder Odontoceti (toothed whales)			
Sperm whale	*Physeter macrocephalus*	Endangered	common
Pygmy sperm whale	*Kogia breviceps*	--	occasional
Dwarf sperm whale	*K. simus*	--	occasional
Sowerby's beaked whale	*M. bidens*	--	occasional
Blainville's beaked whale	*M. densirostris*	--	occasional
Gervais' beaked whale	*M. europaeus*	--	occasional
Cuvier's beaked whale	*Ziphius cavirostris*	--	occasional
Atlantic spotted dolphin	*Stenella frontalis*	--	common
Bottlenose dolphin	*Tursiops truncates*	--	common
Clymene dolphin	*Stenella clymene*	--	occasional
False killer whale	*Pseudorca crassidens*	--	occasional
Fraser's dolphin	*Lagenodelphis hosei*	--	occasional
Killer whale	*Orcinus orca*	--	occasional
Melon-headed whale	*Peponocephala electra*	--	occasional
Pantropical spotted dolphin	*Stenella attenuata*	--	occasional
Pygmy killer whale	*Feresa attenuata*	--	occasional
Short-finned pilot whale	*Globicephala macrorhynchus*	--	occasional
Risso's dolphin	*Grampus griseus*	--	occasional
Rough-toothed dolphin	*Steno bredanensis*	--	occasional
Spinner dolphin	*Stenella longirostris*	--	occasional
Striped dolphin	*Stenella coeruleoalba*	--	occasional

Source: Viada 2000

Notes:

* Occurrence is rare greater than 1 mile from the coast and common within 1 mile of the coast.

-- Species does not have a Federal ESA status.

3.2.5.1 Mysticete Species

Bryde's whale. The Bryde's whale is the most commonly observed baleen whale in the GOM, with 12 confirmed live sightings and 12 verified strandings (Würsig et al. 2000). All Bryde's whale sightings made during recent surveys in the GOM were from the continental shelf edge in the vicinity of De Soto Canyon and along the 100-m isobath in the north-central Gulf. These data suggest that the GOM could represent at least a portion of the range of a dispersed, resident population of Bryde's whale. Unlike other baleen whales, it does not have a well-defined breeding season in most areas and thus calving can occur throughout the year. Bryde's whales feed on both fish and invertebrates (Viada 2000).

Minke whale. The minke whale is the smallest baleen whale and is widely distributed from tropical to polar habitats. Minke whales can be found in oceanic regions but appear to prefer coastal waters and waters of the continental shelf. Their diet consists of invertebrates and fish. There are 10 reliable records and 2 questionable records of minke whales in the GOM. All of these are stranding records from winter or spring. These records suggest that minke whales might migrate into GOM waters in small numbers during the winter or, more likely, that sighted individuals represent strays from low-latitude breeding grounds in the western North Atlantic (Viada 2000).

3.2.5.2 Odontocete Species

Pygmy and dwarf sperm whales. The pygmy sperm whale and its congener, the dwarf sperm whale, are known from deep waters in tropical to warm temperate zones. They appear to be most common on the continental slope and along the shelf edge. Little is known of their natural history. Data collected from stomach contents of stranded individuals suggest that these species feed on cephalopods, fish, and crustaceans in deep water. Pygmy and dwarf sperm whales have been sighted throughout the GOM across a wide range of depths and bottom topographies, though they are more commonly associated with water mass fronts along the continental shelf edge break and upper slope (Viada 2000).

Beaked whales. Two genera and four species of beaked whales are known to occur in the GOM. These include three species in the genus Mesoplodon (Sowerby's beaked whale [*M. bidens*], Blainville's beaked whale [*M. densirostris*], and Gervais' beaked whale [*M. europaeus*]) and Cuvier's beaked whale (Ziphius cavirostris). Generally, beaked whales appear to prefer deep water, though little is known of their respective life histories. Stomach content analyses suggest that these whales feed primarily on deepwater cephalopods, although they would also take fish and some benthic invertebrates. In the GOM, beaked whales have been sighted at depths between approximately 700 and 2,000 m (2,297 and 6,562 feet). Cuvier's beaked whale is probably the most common beaked whale in the GOM (Viada 2000).

Atlantic spotted dolphin. The Atlantic spotted dolphin is endemic to the Atlantic within tropical to temperate waters. The Atlantic spotted dolphin is the only other species of cetacean (other than the bottlenose dolphin) that commonly occurs on the continental shelf of the GOM (Viada 2000). Atlantic spotted dolphins usually occur 8 to 20 km (5 to 12 mi) offshore but move in closer to shore in the spring and summer (Würsig et al. 2000, Mullin and Fulling 2003, Fulling et al. 2003). Current GOM surveys sighted the Atlantic spotted dolphin primarily on the continental shelf and shelf edge at depths less than 250 m (820 feet), although some individuals were sighted along the slope at depths of up to 600 m (1,969 feet). They feed on a wide variety of fish and cephalopods (Viada 2000).

Bottlenose dolphin. The bottlenose dolphin is a common inhabitant of both continental shelf and slope. The bottlenose dolphin is the most common cetacean in the GOM. They are opportunistic feeders of a wide array of prey items. Current data suggest genetically discrete, inshore and offshore stocks, or populations of bottlenose dolphins. Bottlenose dolphins in the GOM are commonly sighted at depths less than approximately 1,200 m (3,937 feet) (Viada 2000).

Clymene dolphin. The Clymene dolphin is endemic to the Atlantic, and found only in tropical and subtropical waters. This species appears to feed on fish and squid. They are not considered to be rare in the GOM, though current sightings have been made almost exclusively to the west of the Mississippi River at depths of 600 m (1,969 feet) to 3,000 m (9,843 feet) (Viada 2000).

False killer whale. The false killer whale is found in tropical to warm temperate zones in deep offshore waters. It feeds primarily on fish and cephalopods, although it has been known to feed on cetaceans. In the GOM, most sightings of false killer whales have occurred along the continental slope, although some were sighted over the OCS as well (Viada 2000).

Fraser's dolphin. The Fraser's dolphin has a pantropical distribution in oceanic waters and nearshore in areas where deep water approaches the coast. Fraser's dolphins feed on fish, cephalopods, and crustaceans. In the GOM, sightings of Fraser's dolphins have occurred in the western part at depths of around 1,000 m (3,280 feet) (Viada 2000).

Killer whale. The killer whale is probably the most cosmopolitan of all cetaceans and can be found in almost any marine region in all oceans. Generally, they appear to prefer nearshore, cold temperate to subpolar zones. Killer whales feed on marine mammals, marine birds, fish, sea turtles, and cephalopods. In the GOM, most sightings of killer whales have been along the continental slope, within a broad area of the north-central Gulf (Viada 2000).

Melon-headed whale. The melon-headed whale is a deepwater, pantropical species. It is known to feed on cephalopods and fish. In the GOM, the melon-headed whale has been sighted in continental slope waters, west of the Mississippi River (Viada 2000).

Pantropical spotted dolphin. The pantropical spotted dolphin is a tropical species known from the Atlantic, Pacific, and Indian oceans. It is known to feed on epipelagic fish and squid. The pantropical spotted dolphin is the most common and abundant cetacean on the slope and especially outer slope waters of the GOM at depths greater than 1,200 m (3,937 feet) (Viada 2000).

Pygmy killer whale. The pygmy killer whale is apparently widely distributed in tropical waters, though little is known of its biology. Its diet includes cephalopods and fish, though reports of attacks on other delphinids are reported. The pygmy killer whale does not appear to be commonly found in the GOM. Sightings of this species in the GOM have been at depths of 500 to 1,000 m (1,640 to 3,280 feet) (Viada 2000).

Short-finned pilot whale. The short-finned pilot whale is found in warm temperate to tropical waters of the world. Short-finned pilot whales feed primarily on squid and fish. In the GOM, it is most commonly sighted along the mid- to upper-slope at depths of 250 to 2,000 m (820 to 6,562 feet) and often in areas of steep bottom topography (Viada 2000).

Risso's dolphin. The Risso's dolphin is a pantropical species that inhabits deep oceanic and continental slope waters. Risso's dolphins feed primarily on cephalopods and secondarily crustaceans. In the GOM, it occurs at depths of 150 to 2,000 m (492 to 6,562 feet), especially in areas along the upper continental slope. It is considered common in these areas of the GOM (Viada 2000).

Rough-toothed dolphin. The rough-toothed dolphin is a circumtropical and subtropical species. This species feeds on cephalopods and fish. In the GOM, they are sighted almost exclusively west of the Mississippi at depths of 900 to 2,000 m (2,953 to 6,562 feet), and occur year-round (Viada 2000).

Spinner dolphin. The spinner dolphin is a pantropical species. They commonly associate with pantropical spotted dolphins. Spinner dolphins appear to feed on fish and squid. In the Gulf, most sightings of spinner dolphins have been east of the Mississippi at depths of 500 to 1,800 m (1,640 to 5,906 feet) (Viada 2000).

Striped dolphin. The striped dolphin is primarily a tropical species, though it can also range into temperate seas. Striped dolphins are known to feed on squid and fish. In the GOM, they are found at depths of 600 to 2,000 m (1,969 to 6,562 feet) (Viada 2000).

3.2.5.3 Marine Mammal Hearing

Relatively little is known about marine mammal hearing. Studies indicate that marine mammal hearing characteristics vary at the individual, sex and age class, population, and species level. Most studies involve very small sample sizes (often only a single individual) and cannot provide insight on intraspecific variations in hearing capabilities. In general, marine mammals are segregated into functional hearing categories based on normal auditory capabilities. Of the cetaceans, mysticetes are thought to be most sensitive to low-frequency sounds (0.01 to 5.0 kHz), while odontocetes have relatively good hearing across a broader range of mid- to high-frequency sounds (4.0 to 100 kHz) (Southall 2004).

Hearing capabilities have not been tested in many marine mammals (e.g., baleen whales). In these cases, information on hearing is based on the frequencies of sounds produced, behavioral observations, anatomical evidence, and extrapolations from what is known about other marine mammal hearing. Marine mammal hearing varies among species; however, as a group, marine mammal hearing ranges from 0.01 to 200 kHz. Broad generalizations can be made about groups of marine mammals. For example, most toothed whales (odontocetes) hear well in ultrasonic ranges, with functional hearing from 0.15 kHz to 180 kHz. Some toothed whales are able to hear frequencies as high as 200 kHz (NRC 2003). Models indicate that baleen whales (mysticetes) have lower frequency hearing, with functional hearing from 0.007 kHz to 22 kHz (Southall 2007). Hearing sensitivities for marine mammals in the GOM study areas are presented in **Table 3.2-6**.

Marine mammals rely heavily on the use of underwater sounds to communicate and gain information about their environment. Marine mammal responses to noise vary widely depending on the species, the context and duration of exposure, the properties of the stimuli (e.g., low-frequency versus high-frequency, continuous versus pulsive), the time of day or year, the reproductive state of the animal, the activity of the animal at the time of exposure, and the experience or prior exposure of the animal (NRC 2003, Richardson et al. 1995). Responses also vary widely among conspecifics. For example, humpback whales have shown negative responses to vessels at distances of at least 0.3 to 0.5 NM, but they have also been shown little or no reaction at closer distances (Richardson et al. 1995). Baleen species such as humpback, minke, and fin whales have also demonstrated various degrees of habituation to frequent vessel traffic, with initial negative reactions shifting toward indifferent, disinterested, or even positive reactions (Watkins 1986).

Specific knowledge about the effects of man-made noise on marine mammals is limited, but noise exposure can result in a range of impacts including masking, disturbance, temporary or permanent hearing loss, disorientation, stress, and other nonauditory effects. Masking is the obscuring of sounds of interest by other sounds, often at similar frequencies. Marine mammals are highly dependent on sound and their ability to recognize sound signals amid noise is important in communication, predator and prey detection, and, in the case of toothed whales, echolocation. Masking effects of man-made noise are more likely to be caused by continuous sounds rather than intermittent or pulsive ones, and masking effects are expected to be less severe when sounds are transient in nature (LGL and JASCO 2005). Even in the absence of

Table 3.2-6. Reported Hearing Sensitivities, Vocalizations, and Transmissions of Marine Mammals that Occur in the Study Areas

Common Name	Scientific Name	Frequency Range (kHz)	Dominant Frequencies (kHz)
Baleen whales (Suborder Mysticeti)			
Bryde's whale	*Balaenoptera edeni* • hearing sensitivity • vocalizations	 NA 0.07–0.900	 NA 0.152–0.174 for moans
Humpback whale	*Megaptera novaeangliae* • hearing sensitivity • vocalizations	 NA 0.03–8.2	 0.4–3.6 [a] 0.025–4
Minke whale	*Balaenoptera acuturostrata* • hearing sensitivity • vocalizations	 NA 0.06–20	 NA 0.06–14.0 for moans, 0.85 for ratchets, and < 12 @ 151 dB* for clicks
North Atlantic right whale	*Eubalaena glacialis* • hearing sensitivity • vocalizations	 NA < 0.4	 0.01–0.015 [b] NA
Toothed Whales (Suborder Odontoceti)			
Sperm whale	*Physeter macrocephalus* • hearing sensitivity • vocalizations	 NA 0.1–30	 NA 2–4, 10–16 @ 160–180 dB*
Bottlenose dolphin	*Tursiops truncatus* • hearing sensitivity • vocalizations • echolocation	 0.04–150[c] 0.3–24 110–130@ 218–228 dB*	 15–110 3.5–14.5 NA
Common dolphin	*Delphinus delphis* • hearing sensitivity • vocalizations • echolocation	 NA NA 23–67	 NA < 0.5–18 NA
Atlantic spotted dolphin	*Stenella frontalis* • vocalizations • echolocation	 0.1–19.8 NA	 6.7–17.9 40–50, 110–130 @ 210 dB*
Pantropical spotted dolphin	*Stenella attenuata* • vocalizations • echolocation	 3.1–21.4 NA	 6.7–7.8 NA
Manatees (Family Trichechidae)			
Florida Manatee	*Trichechus manatus latirostris* • hearing sensitivity • vocalizations	 0.4–46[c] 2.5–5.6	 6–20 [c] 5.6

Sources: Nowacek et al. 2003, Gerstein et al. 1999, Brill et al. 2001, NPS 2003, NRC 2003, USN 2001, Au and Herzing 2003, Herzing 1996, Richardson et al. 1995

Notes:

[a] Based on disturbance data.

[b] Predicted hearing sensitivity.

[c] Tested hearing sensitivity.

NA = Not Available

* dB re 1µPa

man-made sounds, the sea is noisy and ambient background noise can interfere with the ability of marine mammals to detect sound signals even when they are above its absolute hearing threshold. Ambient background noise includes natural contributions from wind, waves, precipitation, and other animals, as well as sounds from distant human activities such as shipping or oil exploration and production (Richardson et al. 1995). Ambient noise is highly variable over continental shelves, and this inevitably results in a high degree of variability in the range at which marine mammals can detect man-made sounds.

Disturbance is one of the main concerns of the potential impacts of man-made noise on marine mammals, but for many species and situations, there is no detailed information about reactions to noise. Behavioral reactions of marine mammals to sound are difficult to predict because they are dependent on a variety of factors. Preliminary research suggests that most small- and medium-sized toothed whales are unlikely to be displaced when exposed to prolonged or repeated underwater sound unless the overall received sound level exceeds 140 dB re 1µPa at 1m. Baleen whales are probably more sensitive to low-frequency sounds and have been shown to react to sound levels of 120 dB re 1µPa at 1m. Toothed whales also appear to exhibit a greater variety of reactions to man-made sound than baleen whales. While toothed whale reactions vary from approaching the vessel to strong avoidance, baleen whale reactions range from neutral to strong avoidance (Richardson et al. 1995).

Continuous sound exposure and loud sounds can temporarily or permanently affect the auditory sensitivity of animals by causing an upward shift in auditory threshold. This effect is known as either a temporary threshold shift (TTS) or permanent threshold shift (PTS). The duration of the TTS varies depending on the nature of the stimulus, but by definition, there is generally recovery of full hearing over time (Hastings and Popper 2005).

A TTS is the mildest form of hearing impairment and occurs when exposure to a strong sound results in a nonpermanent elevation in hearing threshold making it harder for an animal to hear sounds. TTS can last from minutes or hours to days and the magnitude of the TTS depends, upon other factors, on the level and duration of noise exposure. For sound exposures at or somewhat above the TTS level, hearing sensitivity usually recovers rapidly after exposure to the noise ends (Richardson et al. 1995). Only a few data on sound levels and durations necessary to elicit mild TTSs have been obtained for marine mammals. Although TTS studies on humans and terrestrial mammals provide insight on understanding the principles of TTS, it is unclear to what extent these data can be extrapolated to marine mammals (LGL and JASCO 2005).

The primary factors thought to cause a PTS are sound impulse duration, peak amplitude, and rise time. However, no data are available on noise levels that might induce PTS in marine mammals. Damage to a marine mammal's hearing apparatus could theoretically occur if an animal is exposed to sound impulses that have very high peak pressures, especially if they have very short rise times. Also, very prolonged exposure to a noise strong enough to elicit a TTS, or shorter-term exposure to noise levels well above the TTS level, could cause hearing impairment in marine mammals. For sound exposure at or somewhat above the TTS level, hearing sensitivity presumably recovers rapidly after exposure to the noise ends, and the received sound level from a single noise exposure must be far above the TTS level for there to be any risk of PTS. It has been suggested that PTSs caused by prolonged exposure to continuous man-made noise is not likely to occur in marine mammals for sounds with source levels less than 200 dB re 1µPa at 1m (Richardson et al. 1995).

Nonauditory physical effects can also occur in marine mammals exposed to very strong underwater sound. Possible types of nonauditory physiological effects or injuries that, in theory, might occur include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage. It is possible that some marine mammal species (e.g., beaked whales) are especially susceptible to injury or stranding when exposed to strongly pulsed sounds, particularly at higher frequencies.

The potential impacts of noise on marine mammals can be based on specific zones of influence: (1) the zone of audibility (within which the animal can hear the sound), (2) the zone of responsiveness (within which the animal reacts to the sound), (3) a zone of masking (within which the noise levels can interfere with other sounds and signals), and (4) the zone of hearing loss or discomfort (within which the animal's physical auditory structures are temporarily or permanently damaged). Because underwater noise sometimes propagates for long distances, the radius of audibility can be large for a strong noise. Marine mammals usually do not respond overtly to audible but weak man-made sounds, so the zone of "responsiveness" is usually much smaller than the zone of audibility. Potential effects of noise on marine mammals include masking, behavioral disturbance, hearing impairment in the form of PTSs or temporary TTSs, and nonauditory physiological effects (Richardson et al. 1995). Noise can also elicit behavioral responses such as cessation of feeding, resting, or social interaction; onset of alertness or avoidance; or attraction to the noise source. Behavioral responses vary widely both within and among species, and many marine mammals habituate easily to underwater noise (Watkins 1986). Alternatively, noise can be detectable but have no effect on an animal's behavior, hearing, or physiology.

To minimize adverse noise impacts on marine mammals, NMFS has established criteria to determine what constitutes an acoustic "take" under the ESA or MMPA, and to provide guidance on which sound levels correspond to Level A and Level B harassment. The Level A Criterion is currently 180 dB re 1 µPa at 1m. The Level B Criterion is 160 dB re 1µPa at 1m for impulse/intermittent noise and 120 dB re 1 µPa at 1m for continuous noise (70 FR 18871–1875).

3.2.6 Nonthreatened and Nonendangered Coastal and Marine Birds

The waters and adjacent coastal areas of the northern GOM are inhabited by a diverse assemblage of resident and migratory birds (Clapp et al. 1982). There are four groups of coastal and marine birds that inhabit these areas: seabirds, shorebirds, marsh and wading birds, and waterfowl (MMS 2001). Most of the migrant birds overwinter in tropical Central America and South America, breed in eastern North America, and directly cross the GOM (trans-Gulf migration) or move north or south by traversing the GOM coast or the Florida Peninsula (MMS 2002b). Examples of birds occurring in the Tampa Bay region are presented in **Table 3.2-7,** but discussion is limited to those species that might occur within coastal margins and nearshore and offshore waters in the vicinity of Tampa Bay. Federally listed coastal and marine bird species are discussed in **Section 3.2.3.4.**

Three colonies in Tampa Bay: Alafia Bank in Hillsborough Bay at the mouth of the Alafia River, Washburn Sanctuary in Terra Ceia AP, and Tarpon Key in Boca Ciega Bay are among the most diverse colonies in the United States.

The Tampa Bay system is home to 28 species of colonial waterbirds and allies, annually totaling about 30,000 to 45,000 breeding pairs and their young, or nearly 200,000 individuals. As many as half of these species breed in Hillsborough Bay, and Audubon of Florida manages some 15 critically important natural or man-made islands in the Tampa Bay system. Beach-nesting species such as terns, plovers, and black skimmers warrant special attention as their habitat is increasingly limited by coastal development, as do species such as the white ibis which are especially vulnerable to losses of freshwater wetlands that provide food for their young (TBEP 2006).

Many rare or coastal species nesting in Tampa Bay experienced sustained population increases between 1994 and 2001, including reddish egret (*Egretta rufescens*); roseate spoonbill (*Platalea ajaja*); American oystercatcher (*Haematopus palliatus*); and caspian (*Hydroprogne caspia*), royal (*Thalasseus maximus*) and sandwich (*Thalasseus sandvicensis*) terns. El Niño rains created extremely advantageous foraging conditions in 1998, and breeding populations of some species, such as white ibis (*Eudocimus albus*), almost tripled before returning to pre-1998 conditions in 1999 (TBEP 2006).

Table 3.2-7. Coastal and Marine Birds Breeding in the Tampa Bay Area

Category	Common Name	Scientific Name	Number of Nesting Pairs*
Seabirds	Black skimmer	*Rhynchops niger*	600 to 700 pairs
	Brown pelican	*Pelicanus occidentalis*	1,000 pairs
	Double-crested cormorant	*Phalacrocorax auritus*	fewer than 400 pairs
	Laughing gull	*Larus atricilla*	10,000 to 15,000 pairs
	Caspian tern	*Sterna caspia*	90 pairs
	Gull-billed tern	*Gelochelidon nilotica*	0 to 10 pairs
	Least tern	*Sterna antillarum*	100 to 150 pairs
	Roseate tern	*Sterna dougalii*	NC
	Royal tern	*Sterna maxima*	3,700 pairs
	Sandwich tern	*Sterna sandvicensis*	750 pairs
Shorebirds	American oystercatcher	*Haematopus palliatus*	minimum of 125 pairs
	Piping plover	*Charadrius melodus*	NC
	Southeastern snowy plover	*Charadrius alexandrinus*	maximum of 3 pairs
	Wilson's plover	*Charadrius wilsonia*	100 pairs
Marsh/ Wading Birds	Anhinga	*Anhinga anhinga*	200 to 300 pairs
	Cattle egret	*Bubulcus ibis*	5,000 pairs
	Great egret	*Ardea alba*	500 to 800 pairs
	Reddish egret	*Egretta rufescens*	60 to 75 pairs
	Snowy egret	*Egretta thula*	800 to 1,000 pairs
	Black-crowned night heron	*Nycticorax nycticorax*	200 to 250 pairs
	Great blue heron	*Ardea herodias*	NC
	Green heron	*Butorides virescens*	NC
	Yellow-crowned night heron	*Nyctanassa violacea*	90 to 190 pairs
	Little blue heron	*Egretta caerulea*	300 pairs
	Tricolored heron	*Egretta tricolor*	500 to 700 pairs
	Glossy ibis	*Plegadis falcinellus*	400 to 600 pairs
	White ibis	*Eudocimus albus*	6,000 to 11,000 pairs
	Wood Stork	*Mycteria americana*	40 to 160 pairs
	Roseate spoonbill	*Ajaia ajaja*	110 to 180 pairs
	Wouldet	*Catoptrophorus semipalmatus*	100 pairs

Source: Paul and Paul 2003

Notes:

*Censused annually in the Tampa Bay region from 1994 through 2001

NC = Not censused

3.2.6.1 Seabirds

Seabirds are defined as those species that spend extended periods away from land and obtain all or most of their food from the sea while flying, swimming, or diving. Five taxonomic orders of seabirds (broadly defined as those species that spend a large portion of their lives on or over seawater) are found in both offshore and coastal waters of the GOM. Some species of this group inhabit only pelagic habitats in the GOM (OCS and beyond) (e.g., boobies, petrels, and shearwaters). Most GOM seabird species, however, inhabit waters of the continental shelf, and adjacent coastal and inshore habitats (Clapp et al. 1982).

GOM seabirds are categorized into four broad categories: summer migrant pelagics, summer residents, wintering marine species, or permanent residents (Fritts and Reynolds 1981). Summer migrant pelagic species are those that are present in the GOM during the summer but breed primarily elsewhere. Examples include black terns, boobies, shearwaters, storm petrels, and tropicbirds. Summer residents are those that are present during summer months but also breed in the GOM. Examples include least terns, sandwich terns, and sooty terns. Wintering marine bird species are those that can be found in the GOM only during winter months. Examples of wintering species include herring gulls, ring-billed gulls, jaegers, and the northern gannet. Ring-billed gulls are common within the project area. Permanent resident species are found in the GOM year round. Examples of permanent residents include bridled terns, laughing gulls, magnificent frigate birds, royal terns, and double crested cormorants. Laughing gulls are common and abundant within the project area. CBC surveys conducted during 2006 to 2007 recorded densities of approximately 1,760 individuals within the Alafia Bank Bird Sanctuary, 2,300 individuals within the Tampa survey area, and 6,500 individuals within the Bradenton survey area (Audubon Society 2007).

Shorebirds. Shorebirds include members of the Order Charadriiformes, which outside of their migratory cycles are generally restricted to coastline margins. Shorebirds are among the world's greatest migratory animals. Many North American shorebirds seasonally traverse between the high Arctic and South America, and occasionally spill over into Asia and Europe. Certain coastal and adjacent inland wetland habitats of the GOM serve as vital overwintering habitats and temporary "staging" habitats for shorebirds. Staging birds (those migrant species that reside temporarily along the Gulf Coast) forage within coastal habitats in an effort to accumulate energy reserves necessary for the completion of their migratory efforts (MMS 2001). Many shorebird species typically aggregate in large numbers within select GOM coastal habitats. In addition, many of the overwintering shorebird species remain within specific areas throughout the season and return to the same areas each year. These species are susceptible to localized habitat loss or degradation.

From CBC surveys, seasonally common and abundant shorebirds in the project area include wouldet, black-bellied plover, sanderling, dunlin, short-billed dowitcher, least sandpiper, and killdeer (Audubon Society 2007).

Marsh and Wading Birds. The wetland bird group includes a diverse array of species that typically inhabit most Gulf coast aquatic habitats, ranging from freshwater swamps and waterways to brackish and saltwater wetlands and embayments. Many wetland birds are year-round residents on the GOM coast. Common and abundant wetland bird species within the project area include white ibis, common moorhen, and American coot (Audubon Society 2007).

Waterfowl. Waterfowl are members of the order Anseriformes that inhabit freshwater and marine aquatic habitats. Many of these birds are migrant species that, primarily during winter months, inhabit coastal waters, beaches, flats, sandbars, and wetland habitats along the GOM (MMS 2001). Seasonally common and abundant waterfowl species within the project area include mallard, lesser scaup, and northern shoveler (Audubon Society 2007).

Migratory Birds. The GOM is an important pathway for migratory birds, including many coastal and marine species, and large numbers of terrestrial species. Most migrant birds that overwinter in tropical Central and South America and breed in eastern North America either directly cross the GOM or move north or south by traversing the Gulf coast or the Florida peninsula.

3.2.7 Plankton

Plankton are free-floating or weakly swimming organisms that are suspended in the water column. They have such limited powers of locomotion that they passively drift at the mercy of the prevailing water movements. Phytoplankton are the tiny plants and microscopic algae capable of photosynthesizing organic material from water, CO_2, and light (i.e., primary production). Zooplankton are small animals such as the single-celled protozoans and the larval or adult forms of marine invertebrates and other higher animals (Thurman and Weber 1984).

Holoplankton (e.g., copepods) spend their entire life as plankton, while meroplankton spend only a portion of their life cycles as plankton. Meroplankton include both the egg and larval stages of benthic invertebrates and fish (i.e., ichthyoplankton). Hereafter, holoplankton would be referred to as "zooplankton" and meroplankton would be referred to as "planktonic fish and shellfish" or "ichthyoplankton" (when referring to planktonic fish only).

3.2.7.1 Phytoplankton

Phytoplankton form the base of the pelagic marine food web by directly and indirectly supporting communities of zooplankton, nekton (i.e., free swimming organisms), and microbes (i.e., bacteria). Because phytoplankton are photosynthetic, their occurrence is generally limited to the euphotic zone (i.e., depth of light penetration sufficient for primary production) (Thurman and Weber 1984). The phytoplankton of the west Florida shelf consists mainly of diatoms and dinoflagellates. However, blue-green algae and other microscopic bacterioplankton are thought to be 10 to 60 times more productive than phytoplankton (Okey and Mahmoudi 2002).

The dominant diatoms in the oceanic waters of western Florida include species of *Ethmodiscus*, *Gossleriella*, and *Planktoniella*. The dominant dinoflagellates in oceanic waters are species of *Amphisolenia*, *Heterodinium*, and *Pyrocystis*. Species of the blue-green algae, *Oscillatoria* are also common in oceanic waters (Vargo and Hopkins 1990).

The dominant diatom species in western Florida estuaries is *Skeletonema costatum*. Other dominant estuarine diatom species include *Chaetoceros* spp., *Asterionellopsis glacialis*, *Rhizosolenia* spp., and *Bellerochea malleus*. Common dinoflagellate species in estuaries were *Ceratium furca*, C. hircus, *Alexandrium balechii*, *Gynodinium splendens*, and several *Peridinium* and *Procentrum* species. *Gymnodinium breve* is a toxic algae that is dominant during red tide blooms (Vargo and Hopkins 1990).

3.2.7.2 Zooplankton (Holoplankton)

Zooplankton can occur throughout the water column from surface to bottom, and exhibit diurnal migrations throughout various depths. They represent a vital link between the primary producing phytoplankton and larger marine organisms (e.g., invertebrates and fish) in the marine food web, and they support a variety of commercially important finfish and shellfish species (Thurman and Weber 1984). On the western Florida shelf, the highest zooplankton abundance is associated with a salinity gradient in nearshore waters, a vertical density gradient (due to temperature and salinity) (i.e., zooplankton is more abundant in cooler upwelled water than warmer surface water) in offshore waters, and with an increase in particulate matter (Okey and Mahmoudi 2002).

The zooplankton community of the GOM shelf waters is less diverse and more abundant than in deeper oceanic waters. In the shelf waters, zooplankton is dominated by calanoid copepod species such as *Centropages*, *Eucalanus, Labidocera,* and *Paracalanus*. Euphausiids (krill) and chaetognaths are also common. Dominant Euphasiids include species of *Euphausia* and *Stylocheiron,* while the most common chaetognath species is *Saggitta helenae*. Biomass of oceanic zooplankton decreases with depth and varies throughout the day because of diel vertical migrations (Vargo and Hopkins 1990).

In the estuaries of western Florida, meroplankton are more important than in the shelf waters although holoplankton are still present in estuarine waters. The most important copepod species of Tampa Bay are *Acartia tonsa*, *Parvocalanus crassirostris*, *Oithona colcarva,* and *O. nana*. The chaetognaths *Saggitta hispida* and *S. tenuis* are also common (Vargo and Hopkins 1990).

3.2.7.3 Planktonic Fish and Shellfish

Many commercially, recreationally, and ecologically important fish and invertebrate species are planktonic as eggs and larvae (i.e., meroplankton). Fish eggs and larvae are also called ichthyoplankton. The following sections characterize the plankton of the GOM and the proposed project area that eventually grow to become free-swimming or benthic fish and invertebrate species.

Commercially important shellfish species on the western Florida shelf include pink shrimp (*Panaeus duorarum*), rock shrimp (*Sicyonia brevierostris*), spiny lobster (*Panulirus argus*), stone crab (*Menippe mercernaria*), blue crab (*Callinectes sapidus*), calico scallop (*Argopecten gibbus*), and squid (*Loligo brevis*). Commercially important fish species on the outer western Florida shelf include round scad (*Decapterus punctuatus*), rough scad (*Trachurus lathami*), and striped mullet (*Mugil cephalus*). On the inner shelf commercially important (as bait fish) species include menhaden (*Brevoortia* spp.), Spanish sardine (*Sardinella aurita*), Atlantic thread herring (*Opisthonema oglinum*), and Atlantic bumper (*Chloroscombrus chrysurus*). Examples of species that are not commercially important across the western Florida shelf are two spot flounder (*Bothus robinsi*), gray flounder (*Etropus rintosus*), and sand perch (*Diplectrum formosum*). Commercially unimportant species that occur on the inner shelf are pigfish (*Orthopristis chrysoptera*) and spotted whiff (*Citharchthys macrops*) (Vargo and Hopkins 1990).

Commercially important shellfish species that occur in western Florida estuaries include pink shrimp. However, planktonic shellfish and benthic invertebrate species include cirripedes (barnacles), echinoderms, gastropods, bivalves, and polychaetes. Commercially important species include anchovies (Family Engraulidae), herrings (Family Clupeidae), and drums (Family Sciaenidae). Striped anchovies (*Anchoa hepsetus*) were more abundant in the lower estuary where salinity is higher, while bay anchovies (*A. mitchili*) were abundant in the upper estuaries where salinity is lower. Anchovies are more abundant during summer months. Atlantic thread herring and menhaden spawn offshore and the larvae are carried into the estuaries. Menhaden are more abundant in the winter and Atlantic thread herring are more abundant in the summer. Sand sea trout (*Cynoscion arenarius*) are abundant throughout the year with peaks in March and October. Spotted sea trout (*C. nebulosus*) are abundant in all seasons but winter with a peak in late spring. These two sea trout are recreationally important drums (Family Sciaenidae). Species of gobies (Family Gobiidae), blennies (Family Bleniidae), and silver perch (*Bairdiella chrysoura*) (Family Sciaenidae) are also examples of species that are not commercially important and occur in western Florida estuaries (Vargo and Hopkins 1990).

Distribution in the Project Area. Research indicates that eggs and yolk-sac larvae are only planktonic for a few days after being spawned, although the exact duration depends on the species. The presence of these life stages is an indication of spawning areas and seasonal spawning migrations of adults (Ditty et al. 1988). Water temperature often triggers spawning and is therefore a major influence on the distribution of larval fish (MMS 2002a). Larval densities are lowest during winter and peak during the summer as indicated by **Table 3.2-8**. Most fish species would be in the project area in the spring, late spring, and early fall. On the Florida continental shelf, many taxa are present earlier and later compared to the northernmost GOM. Examples include scaled sardine (*Harengula jaguana*) and Atlantic thread herring (*Opisthonema oglinum*) (Ditty et al. 1988).

Ichthyoplankton distribution is also influenced by currents that facilitate ichthyoplankton transport. These hydrographic features include tidal transport, duration of the pelagic period, larval behavior (e.g., diel migration), and larval mortality and growth. Two of the most important hydrographic features in the GOM are the Mississippi River discharge plume and the Loop Current. Researchers hypothesize that ichthyoplankton aggregate at the frontal zone of the Mississippi River, and that the discharge plume might indicate that frontal waters provide feeding and growth opportunities for larvae (MMS 2002b). Evidence indicates that eddies that spin off the loop current transport deepwater fish larvae onto the Florida shelf (Houde et al. 1979). The applicant is currently conducting loop current modeling to assess what affect it may have on larval transport and entrainment within the project area. The results of this modeling effort, when available, will be considered in the Ichthyoplankton Impact Analysis.

Daily or diel migrations might result from changes in light intensity, nutrients, and density gradients in the water column (Nybakken 1997). Vertical diel migrations of larvae have been documented for red drum (*Sciaenops ocellatus*), as well as for a wide range of other marine taxa (Helfman et al. 1997). Most commonly, larval fish migrate to lower depths during daytime; however, reverse migrations, where larvae migrate towards the surface during the daytime, have also been documented (Schultz et al. 2003, Lyczkowski et al. 1991, Jenkins et al. 1998).

In offshore waters, many ichthyoplankton taxa are collected within specific depth contours. Inshore demersal species, such as Atlantic bumper (*Caranx ruber*) (an important forage species), spotted sea trout (*Cynoscion nebulosus*), pigfish (*Orthopristis chrysoptera*), and black drum (*Pogonias cromis*), are found in water depths shallower than 25 m (82 feet). Several clupeids (herrings) (*Brevoortia patronus*, *Opisthonema oglinum*, and *Sardinella aurita*) and serranids (sea basses) (*Centropristis striata*, *Diplectrum formosum*, and *Serraniculus pumilio*) are found at depths less than 50 m (164 feet). Species collected exclusively at depths of 50 to 200 m (164 to 656 feet) were tuna (*Auxis* sp. and *Euthynnus alletteratus*), blue runner (*Caranx crysos*), round herring (*Etrumeus teres*), red barbier (*Hemanthias vivanus*), red snapper (*Lutjanus campechanus*), king mackerel (*Scomberomorus cavalla*), and rough scad (*Trachurus lathami)*. Wide-ranging epipelagic species, collected in water depths exceeding 150 m (492 feet), include skipjack tuna (*Euthynnus pelamis*), sailfish (*Istiophorus platypterus*), and Atlantic swordfish (*Xiphias gladius*). **Table 3.2-9** presents the primary depth distribution of larvae of some abundant fish species in the northern GOM. Species likely to occur in the project area are the species distributed in water depths of less than 30 m (100 feet) (Ditty et al. 1988).

Abundance in the Project Area. Plankton survey data are used to characterize the abundance of fish eggs and larvae around the proposed Port Dolphin Terminal. South East Area Monitoring and Assessment Program (SEAMAP) data are used to characterize ichthyoplankton abundance. Plankton surveys have been conducted in the GOM as part of SEAMAP since 1982. Plankton is collected using both neuston nets and bongo nets. The neuston net has a 1-by-2-m (3.28-by-6.56-foot) mouth opening and a mesh size of 0.950 mm. This net is fished at a depth of 0.5 m (1.64 feet) along the surface of the water. Neuston net data cannot be expressed in terms of water volume and were not used for this analysis. The bongo net has a 60-cm (23.6-inch) diameter mouth opening and carries 0.333-mm mesh netting. The bongo net is fitted with a flowmeter that allows the volume of water filtered during the tow to be measured. This net is fished from approximately 1 to 5 m (3.28 to 16.4 feet) off the bottom to the water's surface and yields a sample from the water column that is integrated over depth (i.e., an oblique tow).

Table 3.2-8. Monthly and Peak Seasonal Occurrence of Larval Fish (< 10-mm standard length) in the North-Central GOM

Family (common name)	Taxa (common name)	Scientific Name	J	F	M	A	M	J	J	A	S	O	N	D
Herring and Menhaden	Gulf menhaden	*Brevoortia patronus*	*	*	X	X	--	--	--	--	X	X	X	*
	Round herring	*Etrumeus teres*	*	*	*	X	X	X					X	X
	Atlantic thread herring	*Opisthonema oglinum*			X	X	*	*	*	*	X	X	X	
Anchovy	Striped	*Anchoa hepsetus*	X	X	*	*	*	*	*	*	*	X	X	X
	Bay	*Anchoa mitchilli*	X	X	*	*	*	*	*	*	*	X	X	X
	Longnose	*Anchoa nasuta*	X	X	*	*	*	*	*	*	*	X	X	X
Sea Bass and Grouper	Sand perch	*Diplectrum formosum*	X	X	X	X	*	*	*	*	X	X	X	X
	Pygmy sea bass	*Serraniculus pumilio*	--	--	--	--	X	*	*	*	*	X	X	--
Jacks, Scads, Pompanos, and relatives	Blue runner	*Caranx crysos*	--	--	X	X	X	*	*	*	X	X	X	--
	Atlantic bumper	*Chloroscombrus chrysurus*	--	--	--	X	X	*	*	*	*	X	--	--
	Round scad	*Decapterus punctatus*	--	--	X	*	*	*	*	*	*	X	X	--
	Rough scad	*Trachurus lathami*	*	*	X	X	X	--	--	--	--	--	X	X
	Dolphin	*Coryphaena hippurus Linnaeus*	--	--	--	--	X	X	X	X	X	X	X	--
Snapper	Red	*Lutjanus campechanus*	--	--	--	X	X	*	*	*	X	X	X	--
	Gray	*Lutjanus griseus*	--	--	--	X	X	*	*	*	X	X	X	--
	Lane	*Lutjanus synagris*	--	--	--	X	X	*	*	*	X	X	X	--
Mojarras	Pigfish	*Orthopristis chrysoptera*	X	X	*	X	X	--	--	--	--	--	--	--
Porgies	Sheepshead	*Archosargus probatocephalus*	X	*	*	*	X	--	--	--	--	--	--	--
	Pinfish	*Lagodon rhomboides*	*	*	X	X	--	--	--	--	--	X	X	*
Drums, Croakers, Sea Trout	Spotted sea trout	*Cynoscion nebulosus*	--	X	X	*	*	*	*	*	X	X	--	--
	Spot	*Leiostomus xanthurus*	*	X	X	X	--	--	--	--	--	X	X	*
	Atlantic croaker	*Micropogon undulates*	*	X	X	X	--	--	--	--	X	*	*	*
	Red drum	*Sciaenops ocellatus*	--	--	--	--	--	--	--	X	*	*	X	--
Spadefish	Atlantic spadefish	*Chaetodipterus faber*	--	--	--	X	X	*	*	*	X	--	--	--
Mackerels, Tunas, Wahoo	Bullet mackerel	*Auxis rochei*	X	X	X	X	*	*	*	*	*	X	X	--
	Little tunny	*Euthynnus alletteratus*	--	--	--	X	*	*	*	*	*	X	X	--
	Skipjack tuna	*Euthynnus pelamis*	--	--	--	X	X	X	X	X	X	X	--	--
	King mackerel	*Scomberomorus cavalla*	--	--	--	--	X	X	X	*	*	X	X	--
	Spanish mackerel	*Scomberomorus maculatus*	--	--	--	X	X	X	X	*	*	X	--	--
	Bluefin tuna	*Thunnus thynnus*	--	--	--	X	X	X	--	--	--	--	--	--
Butterfish	Gulf butterfish	*Peprilus burti*	*	*	*	X	X	X	X	X	X	X	*	*

Source: Ditty et al. 1988

Notes:

X = Seasonality

* = Peak Seasonal Occurrence

Table 3.2-9. Primary Depth Distribution of Larval Fish (< 10-mm standard length) in the GOM, North of 26º N Latitude

Common Name	Scientific Name	< 25 m (< 82 feet)[a]	< 50 m (< 164 feet)[a]	< 100 m (< 328 feet)[a]	50–200 m (164–656 feet)[a]	> 150 m (> 492 feet)[a]
Sheepshead	*Archosargus probatocephalus*[b]	X				
Atlantic spadefish	*Chaetodipterus faber*	X				
Atlantic bumper	*Chloroscombrus chrysurus*	X				
Sand sea trout	*Cynoscion arenarius*	X				
Spotted sea trout	*C. nebulosus*[b]	X				
Pigfish	*Orthopristis chrysoptera*	X				
Northern harvestfish	*Peprilus paru*	X				
Black drum	*Pogonias cromis*[b]	X				
Anchovies	*Anchoa* spp.	X	X			
Gulf menhaden	*Brevoortia patronus*[b]	X	X			
Black sea bass	*Centropristis striata*	X	X			
Sand perch	*Diplectrum formosum*	X	X			
Scaled herring	*Harengula jaguana*	X	X			
Pinfish	*Lagodon rhomboides*[b]	X	X			
Spot	*Leiostomus xanthurus*[b]	X	X			
Atlantic croaker	*Micropogonias undulatus*[b]	X	X			
Atlantic thread herring	*Opisthonema oglinum*	X	X			
Round sardine	*Sardinella aurita*	X	X			
Spanish mackerel	*Scomberomorus maculatus*	X	X			
Pygmy sea bass	*Serraniculus pumilio*	X	X			
Round scad	*Decapterus punctatus*	X	X	X		
Gulf butterfish	*Peprilus burti*	X	X	X		
Mackerel	*Auxis spp.*				X	
Blue runner	*Caranx crysos*				X	
Round herring	*Etrumeus teres*				X	
Little tunny	*Euthynnus alletteratus*				X	
Red barbier	*Hemanthias vivanus*				X	
Red snapper	*Lutjanus campechanus*				X	
King mackerel	*Scomberomorus cavalla*				X	
Rough scad	*Trachurus lathami*				X	
Skipjack tuna	*Euthynnus pelamis*					X
Sailfish	*Istiophorus* spp.					X
Swordfish	*Xiphias gladius*					X

Source: MMS 2002b

Notes:

[a] Depth ranges are those at which more than 75 percent of larvae were collected.

[b] Estuarine-dependent species.

The center of the proposed location of the Port Dolphin Buoys is approximately 27.41 degrees (°) latitude and -83.20° longitude. Ichthyoplankton abundance was estimated using SEAMAP bongo net samples (oblique tows taken throughout the water column) between the 36.6-m and 91.4-m (120-foot and 300–foot) isobaths within a rectangle around the proposed location with corners positioned as follows (see **Figure 3.2-3** and **Appendix E** for a detailed explanation of the SEAMAP data analysis):

- Northwest corner: 28.225° latitude/-84.015° longitude
- Northeast corner: 28.225° latitude/-82.385° longitude
- Southwest corner: 26.595° latitude/-84.015° longitude
- Southeast corner: 26.595° latitude/-82.385° longitude.

The larvae in the proposed Port Dolphin deepwater Port samples represent 217 taxa (i.e., larvae identified to the lowest taxon possible). These taxa are presented in **Table 4-1 of Appendix E**. The 10 most abundant taxa, in order of decreasing abundance, are gobies (Family Gobiidae), Spanish sardine (*Sardinella aurita*), round scad (*Decapterus punctatus*), Atlantic thread herring (*Opisthonema oglinum*), lizardfishes (Family Synodontidae), scorpionfishes (Family Scorpaenidae), unidentified fish, cusk eels (Family Ophidiidae), codfishes (*Bregmaceros sp.*), and perches (Order Perciformes).

As presented in **Table 3.2-10**, samples from the Port Dolphin study area indicate that, on average, 3,398 eggs and 12,084 larvae occur per 1 million gallons of seawater. Between 1982 and 1999, 143 sampling trips occurred in the study area. Eggs and larvae were collected on all 143 sampling trips, which occurred during the months of May-November. There were no trips reported with egg samples in 1995. There were no trips with larval samples in 2000. A summary of the sampling trips that caught eggs and larvae is presented in **Table 3-1 of Appendix E**.

Table 3.2-10. Estimate of Egg and Larval Abundance at the Proposed Site for Port Dolphin, Based on SEAMAP Data

Life Stage	Number of Samples	Number of Eggs or Larvae/Million Gallons of Seawater	
		Mean	Standard Error
Eggs	143	3,398	486
Larvae	143	12,084	1,028

Estimates of abundance indicate that the density of larvae is higher than the density of eggs, which is not expected,as fecundity and survival rates of eggs result in fewer numbers of larvae. Limitations of the sampling method, including sampling frequency, could contribute to this. The distribution of fish eggs and larvae depends on spawning behavior of adults, hydrographic structure and transport on a variety of scales (e.g., tidal and current transport and diel migrations), and duration of the egg stage (e.g., for many GOM species only 1 or 2 days). These factors can result in the patchy distribution of eggs and account for a lower egg density than larval density.

Data Limitations and Adjustments. While the estimates of ichthyoplankton abundance are based on the best available data, estimates of population size, distribution, and density are subject to measurement errors and limitations. Measurement errors can result from the inherent patchiness of plankton distribution, too few samples, limitations (bias) of the sampling methods, inconsistent sampling techniques, and different sampling gear. Limitations of the sampling method and sampling gear include a lack of data on the vertical distribution of ichthyoplankton; a lack of data throughout the year and seasons; and sampling gear mesh size that can underestimate smaller eggs, larvae, and zooplankton.