AFFECTED ENVIRONMENT — CHAPTER 4

Consistent with Section 1502.15 of the CEQ NEPA regulations (40 CFR Part 1500), this chapter describes key components of the environment affected by the ALWTRP regulatory alternatives. Four major components are examined in detail:

- Section 4.1 discusses the status of Atlantic large whale species;
- Section 4.2 considers the economic and social aspects of the fisheries affected by the ALWTRP rules;
- Section 4.3 describes other protected species that may be affected by elements of the ALWTRP; and
- Section 4.4 provides information about habitat for affected commercial fish species.

4.1 STATUS OF ATLANTIC LARGE WHALE SPECIES

The discussion below examines the status of four key large whale species: the North Atlantic right whale, the humpback whale, the fin whale, and the minke whale. The discussion describes the range, life history, and abundance of each species, as well as factors that may affect their survival (including entanglement).

4.1.1 North Atlantic Right Whale

Two populations of the North Atlantic right whale (*Eubalaena glacialis*), an eastern and a western, are typically recognized (IWC, 1986). However, animals are sighted so infrequently in the eastern Atlantic, it is unclear whether a viable population still exists (NMFS, 1991a). This analysis focuses on the western North Atlantic population of right whales, which occurs in the proposed action area.

North Atlantic right whales are one of the most intensely studied cetacean species. The following six major habitats or high use regions for western North Atlantic right whales have been identified: the coastal waters of the southeastern United States; the Great South Channel; Georges Bank/Gulf of Maine; Cape Cod and Massachusetts Bays; the Bay of Fundy; and the Scotian Shelf (Waring et al., 2013). The minimum stock size for the western North Atlantic right whale is based on a census of individual whales identified using photo-identification techniques. A review of the database as it existed on October 21, 2011, indicated that 444 individually recognized whales in the catalog were known to be alive during 2009 (Waring et al., 2013). This value is minimum and also does not include some calves known to be born during 2009, or any other individual whale seen during 2009 but not yet entered into the catalog (Waring et al., 2013).

Examination of the minimum number alive population index calculated from the individual sightings database, as it existed on 21 October 2011, for the years 1990 -2010 reveals a positive and slowly accelerating trend in population size. Mean growth rate for the period was 2.6% (Waring et al., 2013). NMFS believes that the western population of North Atlantic right whales is well below the optimum sustainable population (OSP). Potential biological removal (PBR) is the product of minimum population size, one-half the maximum net productivity rate and a “recovery” factor for endangered, depleted, threatened stocks or stocks of unknown status relative to OSP. The recovery factor for right whales is 0.10 because this species is listed as endangered under the ESA. The minimum population size is 444 and the maximum productivity rate is 0.04, thus PBR for the Western Atlantic stock of North Atlantic right whale is 0.9.

The North Atlantic right whale is also listed as endangered under the ESA. Pursuant to the ESA, a Recovery Plan was published in 1991 and revised in 2005. The most recent 5-year status review was completed in September 2012.

In 1994, NMFS published a final rule designating critical habitat for right whales (59 FR 28793, June 3, 1994). The designated critical habitat included portions of Cape Cod Bay and Stellwagen Bank, the Great South Channel (each off the coast of Massachusetts), and the waters adjacent to the coast of Georgia and the east coast of Florida. These areas were determined to be essential to the conservation of right whales because of their importance as foraging, calving, and nursing habitats. For example, Cape Cod Bay and the Great South Channel represent two of the four known principal feeding grounds for adult right whales in the Western North Atlantic and the only two within U.S. waters. In addition, the waters off Georgia and Northern Florida have been identified as the only known calving ground for right whales. However, the designations were based primarily on right whale sightings data as opposed to an analysis of the physical and biological habitat features essential to the conservation of the species.

In July 2002, NMFS received a petition requesting revision of the current critical habitat designation for right whales, by combining and expanding the current Cape Cod Bay and Great South Channel critical habitats in the Northeast and by expanding the current critical habitat in the Southeast. In August 2003, NMFS determined that the requested revision, as specified by the petitioner, was not warranted at that time. However, NMFS indicated that it would continue to analyze the physical and biological habitat features essential to the conservation of right whales. Specifically, in the waters off the Northeast U.S., NMFS plans to continue its own work and collaborate with others working in the Gulf of Maine ecosystem to characterize the spatial and temporal distribution of zooplankton. Furthermore, in the waters off the Southeast U.S., NMFS will continue to analyze right whale distribution data in relation to bathymetry and sea surface temperature derived from Advanced Very High Resolution Radiometer (AVHRR) imagery (68 FR 51758).

On March 8, 2008, NMFS published a final rule listing North Atlantic and North Pacific right whales as separate species under the ESA (73 FR 12024). This listing followed the completion of a status review of right whales in the North Pacific and North Atlantic oceans in December 2006. The status review indicated that separating the northern right whale into two different species was warranted in light of the compelling evidence provided by recent scientific studies on right whale taxonomy and classification. Genetic data now provide unequivocal support to distinguish three right whale lineages (including the southern right whale) as separate phylogenetic species: (1) the North Atlantic right whale (*E. glacialis*), ranging in the North Atlantic Ocean; (2) the North Pacific right whale (*E. japonica*), ranging in the North Pacific Ocean; and (3) the southern right whale (*E. australis*), historically ranging throughout the southern hemisphere's oceans (Rosenbaum et al., 2000).

On October 1, 2009, NMFS received a petition from the Center for Biological Diversity (CBD), Defenders of Wildlife, Humane Society of the United States, Ocean Conservancy, and the Whale and Dolphin Conservation Society (the Petitioners) to revise the designated critical habitat of the North Atlantic right whale. On October 27, 2009, NMFS sent a letter to the petitioners acknowledging receipt of the petition. On October 6, 2010, NMFS announced the 90-day finding and 12-month determination on how to proceed with a petition to revise critical habitat for the North Atlantic right whale (*Eubalaena glacialis*) pursuant to the ESA (75 FR 61690). The petition seeks to revise the existing critical habitat designation by expanding the areas designated as critical feeding and calving habitat areas for the North Atlantic right whale. Additionally, the petition seeks to include a migratory corridor as part of the critical habitat designation for the North Atlantic right whale. The 90-day finding is that the petition, in conjunction with the information readily available in the files, presents substantial scientific information indicating that the requested revision may be warranted. The 12-month determination on how to proceed with the petition is that NMFS intends to continue the ongoing rulemaking process which is expected to culminate with the publication of a proposed critical habitat rule for the North Atlantic right whale in the **Federal Register**.

Based on an analysis of the best scientific and commercial data available and after taking into consideration current population trends and abundance, demographic risk factors affecting the continued survival of the species, and ongoing conservation efforts, we determined that the North Atlantic right whale is in danger of extinction throughout its range because of: (1) overutilization for commercial, recreational scientific, or educational purposes; (2) the inadequacy of existing regulatory mechanisms; and (3) other natural and manmade factors affecting its continued existence. The listing of the endangered northern right whale (Eubalaena spp.) as two separate, endangered species, North Pacific right whale (E. japonica) and North Atlantic right whale (E. glacialis), was effective on April 7, 2008.

4.1.1.1 Range

North Atlantic right whales have a wide distribution that overlaps with U.S. and Canadian commercial fishing grounds in the western Atlantic as well as shipping traffic to and from numerous ports. Coastal areas frequented by right whales are heavily developed. North Atlantic right whales generally occur west of the Gulf Stream, from the southeast U.S. to Canada (e.g., Bay of Fundy and Scotian Shelf) (Kenney, 2002; Waring et al., 2003). They are not found in the Caribbean and have been recorded only rarely in the Gulf of Mexico. North Atlantic right whales are abundant in Cape Cod Bay between February and April (Hamilton and Mayo, 1990; Schevill et al., 1986; Watkins and Schevill, 1982) and in the Great South Channel in May and June (Kenney et al., 1986; Payne et al., 1990). North Atlantic right whales also frequent Stellwagen Bank and Jeffreys Ledge, as well as Canadian waters including the Bay of Fundy and Browns and Baccaro Banks, in the spring through fall. NMFS and Provincetown Center for Coastal Studies aerial surveys during springs of 1999-2006 found right whales along the Northern Edge of Georges Bank, in the Great South Channel, in Georges Basin, and in various locations in the Gulf of Maine including Cashes Ledge, Platts Bank and Wilkinson Basin (Waring et al., 2012). The distribution of right whales in summer and fall seems linked to the distribution of their principal zooplankton prey (Winn et al., 1986). Calving occurs in the winter months in coastal waters off of Georgia and Florida (Kraus et al., 1988). Mid-Atlantic waters are used as a migratory pathway from the spring and summer feeding/nursery areas to the winter calving grounds off the coast of Georgia and Florida.

North Atlantic right whales, like other baleen whales, winter in the lower latitudes where calving takes place, then migrate to higher latitudes for the spring, summer and fall. However, there is much about right whale movements and habitat that is still not fully understood. Telemetry data have shown lengthy and somewhat distant excursions into deep water off the continental shelf (Mate et al., 1997). Photo-ID data have also indicated excursions of animals as far as Newfoundland, the Labrador Basin, southeast of Greenland, and Norway (Knowlton et al., 1992). In the winter, only a minority of the known right whale population appears on the calving grounds. The winter distribution of the remaining right whales remains uncertain (Waring et al., 2006). Results from winter surveys and passive acoustic studies suggest that animals are dispersed among several areas, including Cape Cod Bay (Brown et al., 2002). During the winter of 1999/2000, significant numbers of right whales were recorded in the Charleston, SC area. Because survey efforts in the Mid-Atlantic have been limited, it is unknown whether this is typical or whether it represents a northern expansion of the normal winter range, perhaps due to unseasonably warm waters.

Other uncertainties also exist. For example, some female right whales have never been observed on the Georgia/Florida calving grounds but have been observed with a calf on the foraging grounds the following spring/summer, although this is becoming rarer (Best et al., 2001, Kraus et al., 2007). It is unknown whether these females are calving in an unidentified calving area or have been missed during surveys off of Florida and Georgia (Best et al., 2001). To a greater degree, some mature females that are observed in the Southeast U.S. calving grounds are not re-sighted in the Bay of Fundy. In fact, analysis based on both genetics and sighting histories of photographically identified individuals suggests that approximately one-third of the known population utilizes summer nursery areas other than the Bay of Fundy (Waring et al., 2006). This, along with the absence of some photo-identified whales from known habitats for months or years at a time, suggests the presence of an unknown, offshore feeding ground (Kenney, 2002). Cole et al. (2013) identified a likely candidate mating are within the Gulf of Maine. Finally, the location of the North Atlantic right whale's mating area(s) is largely unknown. While behavior suggestive of mating is frequently observed on the foraging grounds, given the known length of gestation in other baleen whales, it is more likely that mating and conception occur in the winter (Kenney, 2002). However, as mentioned above, many of the mature whales in this population are not sighted on the known calving grounds off the southeastern U.S. during these months. Evaluation of this information, along with genetics data, suggests that two mating areas may exist with a somewhat different population composition (Best et al., 2001).

One emerging result of the genetic studies is the importance of obtaining biopsy samples from calves on the calving grounds. Only 60% of all known calves are seen with their mothers in summering areas, when their callosity patterns are stable enough to reliably make a photo-ID match later in life. The remaining 40% are not seen on a known summering ground. From 1980 to 2001, there were 64 calves born that were not sighted later with their mothers and thus, unavailable to provide age-specific mortality information (Frasier et al., 2007). An additional interpretation of paternity analyses is that the population size may be larger than previously thought. Fathers for only 45% of known calves have been genetically determined. However, genetic profiles were available for 69% of all photo-identified males (Frasier 2005). The conclusion was that the majority of these calves must have different fathers that cannot be accounted for by the unsampled males and the population of males must be larger (Frasier 2005); although this inference of additional animals that have never been photographed.

4.1.1.2 Life History and Reproductive Success

Kraus et al. (2001) have estimated the mean age at first calving for female right whales to be 9.53 (+/- 2.32) years (Reeves et al., 2001).[1] Calving interval rates, which averaged 3.7 years between 1980 and 1992, seemed to be increasing over time, although the trend was not statistically significant (p=0.083) (Knowlton et al., 1994). Mean calf production from 1993 to 2009 was 17.2. An updated analysis of calving intervals through the 1997/1998 season suggested that the mean calving interval had increased since 1992 from 3.67 years to more than 5 years, which is a significant trend (Kraus et al., 2001). An IWC workshop on status and trends of the North Atlantic right whale agreed that calving intervals had increased and that the reproduction rate was approximately half that reported from studied populations of southern right whales (Reeves et al., 2001). Analysis completed since that workshop found that in the most recent years, calving intervals were closer to three years (Kraus et al., 2007).

Between 1980 and 2000, a total of 222 right whale births were documented in the western North Atlantic. Seven of these 222 whales are known to have died. Due to low calf production in 1999 (four calves) and 2000 (one calf), in April 2000, the Northeast Fisheries Science Center brought together 35 scientists from a broad range of disciplines to identify factors potentially affecting reproduction dysfunction in North Atlantic right whales. At this workshop, five factors were considered as potential contributors to the declining reproductive success of North Atlantic right whales: (1) environmental contaminants/endocrine disrupters; (2) body

[1] The longevity of right whales is unknown.

condition/nutritional stress; (3) genetics; (4) infectious diseases; and (5) marine biotoxins. The workshop concluded that none of the five factors could be eliminated as possible contributors to the observed reproductive dysfunction. Furthermore, the workshop concluded that if calf production and recruitment do not recover from the low levels observed in recent years, the population of North Atlantic right whales is unlikely to recover, even if known anthropogenic causes of mortality are reduced to zero (Reeves et al., 2001).

Since 2000, there have been at least 240 right whale births through the 2010/2011 calving season (Waring et al., 2013). During the 2004 and 2005 calving seasons, three adult females were found dead with near-term fetuses (Waring et al., 2012).

4.1.1.3 Abundance

As is the case with most wild animals, an exact count of right whales in the Western North Atlantic cannot be obtained. However, abundance can be reasonably estimated as a result of extensive study of this population. The western North Atlantic minimum stock size is based on a census of individual whales identified using photo-identification techniques. The western North Atlantic population size was estimated to be at least 444 individuals in 2009 based on a census of individual whales identified using photo identification techniques. This value is a minimum and does not include animals that were alive prior to 2008, but not recorded in the individual sightings database as seen during 1 December 2008 to 21 October 2011. This number does include the 19 calves born in 2009 but not yet catalogued (Waring et al, 2013).

Previous estimates using the same method with the added assumption that whales seen within the previous seven years were still alive resulted in counts of 295 animals in 1992 (Knowlton et al., 1994) and 299 animals in 1998 (Kraus et al., 2001). An IWC workshop on status and trends of western North Atlantic right whales gave a minimum direct-count estimate of 263 whales alive in 1996 and noted that the true population was unlikely to be substantially greater than this (Best et al., 2001).

As is the case with other mammalian species, there is an interest in monitoring the number of females in the western North Atlantic right whale population since their numbers will affect the overall population trend. Participants at the 1999 IWC workshop reviewed the sex composition of this right whale population based on sighting and genetics data (Best et al., 2001). Of the 385 right whales presumed alive at the end of 1998, 157 were males, 153 were females, and 75 were of unknown sex (Best et al., 2001). Sightings data were also used to determine the number of presumably mature females (females known to be at least nine years old) in the population and the number of females observed with at least one calf. For the period 1980 to 1998, there were at least 90 (presumed living) females nine years old or older. Of these, 75 had produced a calf during that same period (Best et al., 2001; Kraus et al., 2001). As described above, the 2000/2001 and 2002/2003 calving seasons had relatively high calf production and included additional first time mothers. These potential gains have been offset, however, by continued losses to the population, including the deaths of mature females.

The 1999 IWC workshop participants also reviewed photo-ID data and modeling of right whale survival (Best et al., 2001). Despite differences in approach, all of the models indicated a decline in right whale survival in the 1990s relative to the 1980s, with female survival, in particular, apparently affected (Best et al., 2001; Waring et al., 2006). In 2002, the NMFS Northeast Fisheries Science Center (NEFSC) hosted a workshop to review right whale population models and examine potential bias in the models and changes in the population trend based on new information collected in the late 1990s (Clapham et al., 2002). Three different models were used to explore right whale survivability and to address potential sources of bias. Although biases were identified that could negatively affect the results, all three modeling techniques resulted in the same conclusion: survival has continued to decline and the decline appears to be focused on females (Clapham et al., 2002).

An increase in mortality in 2004 and 2005 was cause for serious concern (Kraus et al., 2005). Calculations based on demographic data through 1999 (Fujiwara and Caswell 2001) indicated that this mortality rate increase would reduce population growth by approximately 10% per year (Kraus et al, 2005). Of these mortalities, six were adult females, three of which were carrying near-term fetuses. Furthermore, four of these females were just starting to bear calves, losing their complete lifetime reproductive potential (Waring et al., 2013).

Despite the preceding, examination of the minimum number alive population index calculated from the individual sightings database, as it existed on July 6, 2010, for the years 1990 through 2007, suggests a positive trend in population size. These data reveal a significant increase in the number of catalogued whales alive during this period, but with significant variation due to apparent losses exceeding gains during 1998-1999. Mean growth rate for the period was 2.4% (Waring et al., 2013).

PBR is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor for endangered, depleted, threatened stocks, or stock of unknown status relative to OSP (MMPA Sec. 3. 16 U.S.C. 1362) (Wade and Angliss, 1997). The recovery factor for right whales is 0.10 because this species is listed as endangered under the ESA. The minimum population size is 444 and the maximum net productivity is 0.04; thus, PBR for the Western Atlantic stock of North Atlantic right whale is 0.9 (Waring et al., 2013).

4.1.1.4 Factors Affecting Survival

Some researchers have suggested that the population is affected by a decreased reproductive rate (Best et al., 2001; Kraus et al., 2001). As of 1999, only 70 percent of mature females (aged nine years or older) were known to have given birth (Best et al., 2001). An analysis of the age structure of this population suggests that it contains a smaller proportion of juvenile whales than expected (Hamilton et al., 1998; Best et al., 2001), which may reflect lowered recruitment and/or higher juvenile mortality. In addition, it is possible that the apparently low reproductive rate is due in part to an unstable age structure or to reproductive senescence on the part of some females. However, few data are available on either factor, and senescence has not been documented for any baleen whale (Waring et al., 2013). Several factors -- reduced genetic diversity, pollution, and nutritional stress -- have been considered to help explain an apparent decline in reproductive success (Best et al., 2001; Kraus et al., 2001):

- **Reduced Genetic Diversity**: Historically, the North Atlantic right whale was driven to near-extinction by 800 years of commercial hunting. The size of the western North Atlantic population of right whales at the termination of whaling is unknown, but is generally believed to have been very small. Such an event may have resulted in a loss of genetic diversity which could affect the ability of the current population to successfully reproduce (i.e., decreased conceptions, increased abortions, and increased neonate mortality). Studies by Schaeff et al. (1997) and Malik et al. (2000) indicate that western North Atlantic right whales are less genetically diverse than southern right whales (Schaeff et al., 1997; Malik et al., 2000). However, several apparently healthy populations of cetaceans, such as sperm whales and pilot whales, have even lower genetic diversity than observed for western North Atlantic right whales (Best et al., 2001).

- **Pollution**: While contaminant studies have confirmed that right whales are exposed to and accumulate contaminants, researchers could not conclude that these contaminant loads were negatively affecting right whales since concentrations were lower than those found in marine mammals proven to be affected by PCBs and DDT (Weisbrod et al., 2000).

- **Nutritional Stress**: Although North Atlantic right whales have thinner blubber than right whales from the South Atlantic, there is no evidence at present to demonstrate that the decline in birth rate and increase in calving interval is related to a food shortage (Kenney, 2000). Experts at the 1999 IWC workshop pointed out that since *Calanus* sp. is the most common zooplankton in the North Atlantic and current right whale abundance is greatly below historical levels, food limitations do not seem to be a significant factor (Best et al., 2001). Nevertheless, a connection between right whale reproduction and environmental factors may yet be found. Modeling work by Caswell and Fujiwara suggests that the North Atlantic Oscillation (NAO), a naturally occurring climactic event, does affect the survival of mothers, the reproductive rate of mature females, and calf survival (Clapham et al., 2002). Further work is needed to assess the magnitude and manner in which the NAO may affect right whale reproductive success.

The small population size and low annual reproductive rate suggest that human sources of mortality may have a greater impact on right whale population growth rates than is the case for other whales (Waring et al., 2006). Ship strikes and fishing gear entanglements are the principal factors believed to be retarding growth and recovery of western North Atlantic right whales. Data collected from 1970 through 1999 indicate that anthropogenic interactions in the form of ship strikes and gear entanglements are responsible for a minimum of two-thirds of the confirmed and possible mortality of non-neonate right whales. Of the 45 right whale mortalities documented during this period, 16 were due to ship collisions and three were due to entanglement in fishing gear (there were also 13 neonate deaths and 13 deaths of non-calf animals from unknown causes). Based on the criteria developed by Knowlton and Kraus (2001), 56 additional serious injuries and mortalities from entanglement or ship strikes are believed to have occurred between 1970 and 1999: 25 from ship strikes and 31 from entanglement. Nineteen were considered to be fatal interactions (16 ship strikes, three entanglements); ten were possibly fatal (two ship strikes, eight entanglements); and 27 were non-fatal (seven ship strikes, 20 entanglements) (Knowlton and Kraus, 2001). The population has continued to suffer losses that are attributed to ship strikes and fishing gear entanglements (Waring et al., 2003; Waring et al., 2006). From 2006 through 2010, 9 of 15 records of mortality or serious injury (including records from both U.S. and Canadian waters) involved entanglement or fishery interactions (Waring et al. 2013).

Scarification analysis also provides information on the number of right whales that have survived ship strikes and fishing gear entanglements. Based on photographs of catalogued animals from 1959 and 1989, Kraus (1990) estimated that 57 percent of right whales exhibited scars from entanglement and seven percent from ship strikes (propeller injuries) (Kraus, 1990). This work was updated by Hamilton et al. (1998) using data from 1935 through 1995 to estimate that 61.6 percent of right whales exhibit injuries caused by entanglement, and 6.4 percent exhibit signs of injury from vessel strikes. In an analysis of the scarification of right whales, 338 of 447 (75.6%) whales examined during 1980 to 2002 were scarred at least once by fishing gear (Knowlton et al., 2005). Further research using the North Atlantic Right Whale Catalog has indicated that annually between 14% and 51% of right whales are involved in entanglements (Knowlton et al., 2005). In addition, several whales have apparently been entangled on more than one occasion and some right whales that have been entangled were subsequently involved in ship strikes. Knowlton et al. (2003) found that 543 separate entanglement interactions documented between 1980 and 2000 involved 413 individual right whales. The number of entanglements per individual ranged from zero to five. Of the 413 right whales, 71.9 percent (297 right whales) showed signs of having been entangled. Nearly 35 percent (144 of 413) were entangled at least once and 0.9 percent (four animals) were entangled at least five times. Because some animals may drown or be killed immediately, the actual number of interactions is expected to be higher. Recent work from Knowlton et al. (2012) increased the time series from 1980 to 2009 and found that 82.9% of right whales have had at least one previous entanglement in gear. Fifty-nine percent of right whales had been entangled more than once. It would appear that there is a higher rate of entanglement among calves and juveniles. Of the 86 serious injury events that occurred from 1980-2009, 74 of these were whales of a known age. Fifty-one percent of these events occurred with calves and juveniles Decomposed and/or unexamined animals (e.g., carcasses reported but not retrieved or necropsied) represent “lost data,” some of which may relate to human impacts (Waring et al., 2006).

4.1.1.5 Behavior and Susceptibility to Entanglement

As mentioned previously, right whales are susceptible to entanglement in fishing gear. Johnson et al. (2005) noted that any part of the gear (buoy line, groundline, floatline, and surface system line) creates a risk for entanglement. Several aspects of right whale behavior may contribute to this high entanglement frequency.

Of 31 recorded right whale entanglement events examined between 1993 and 2002, 24 (77.4 percent) involved animals with gear in the mouth (some included other points of gear attachment on the body as well) and 16 (51.6 percent) were entangled only at the mouth (Johnson et al., 2005). This suggests that a large number of entanglements occur while right whales feed, since open mouth behavior is generally associated with feeding only. Although the sample size was small for cases in which the point of gear attachment and the associated gear part could be examined, Johnson et al. (2005) reported that two out of three right whale floating groundline entanglements and six out of eight vertical line entanglements (buoy line and surface system lines) involved the mouth (note that some of these cases may have involved other body parts as well).[2] In addition, three buoy line entanglement events involved the tail; the entanglement of one of these animals additionally involved groundline.

Right whales feed by swimming continuously with their mouths open, filtering large amounts of water through their baleen and capturing zooplankton on the baleen's inner surface. A study of right whale foraging behavior in Cape Cod Bay conducted by Mayo and Marx (1990) revealed that right whales feeding at the surface had their mouths open for approximately 58 minutes of each hour. Also, feeding right whales exhibited increased turning behavior and a convoluted path once they had found a sufficiently dense patch of zooplankton on which to feed. This behavior differed significantly from that of traveling whales, that swam in relatively straight paths with their mouths closed. In addition, socializing whales (two or more whales at the surface occasionally making physical contact) exhibited even more twisted paths than feeding whales. Socializing was often associated with rolling and lifting the flippers above the water's surface, behaviors that may add to entanglement risk, especially from buoy line and surface system lines.

Goodyear (1996) studied well-known right whale feeding areas (Cape Cod/Massachusetts Bay, Great South Channel, and the Bay of Fundy) and reported that feeding behavior varies based on the location of prey. Right whales spend a substantial amount of time feeding below the surface in the Bay of Fundy, where no surface feeding activities were observed. In order to meet their metabolic needs, right whales must feed on dense aggregations of copepods. Right whales received most of their food energy (approximately 91.1 percent) during deep dives (average depth of 134 meters), with the remainder (approximately 9.9 percent) occurring through surface feeding. Right whales spend about one-third of their time surface feeding in the Cape Cod/Massachusetts Bay and Gulf of Maine areas, which may increase entanglement risk from buoy line and surface system lines during the times they visit these areas (December to May). While in the Great South Channel (April to June), right whales spend approximately 10 percent of the time feeding at the surface and 90 percent of the time feeding at lower depths.

4.1.2 Humpback Whale

The North Atlantic humpback whale (*Megaptera novaeangliae*) is listed as an endangered species under the ESA. A Recovery Plan has been published and is in effect (NMFS, 1991b).

[2] Not included in these numbers is one right whale that was entangled in both buoy line and groundline on the tail.

4.1.2.1 Range

In the western North Atlantic, humpback whales calve and mate in the West Indies during the winter and migrate to northern feeding areas during the summer months. Calves are recruited to the feeding grounds of their mothers in a practice referred to as maternal philopatry (Clapham and Mayo, 1987; Katona and Beard, 1990). In the Gulf of Maine, sightings are most frequent from mid-March through November between 41 degrees north and 43 degrees north, from the Great South Channel north along the outside of Cape Cod to Stellwagen Bank and Jeffreys Ledge, and peak in May and August (CETAP, 1982). Studies have matched 27 percent of the individuals on the Canadian Scotian Shelf to the Gulf of Maine population (Clapham et al., 2003) and one study identified a Gulf of Maine whale as far away as west Greenland (Katona and Beard, 1990). Small numbers of individuals may be present in New England waters year-round, including the waters of Stellwagen Bank (Clapham et al, 1993). They feed on a number of species of small schooling fishes, particularly sand lance, mackerel, and Atlantic herring, by targeting fish schools and filtering large amounts of water for their associated prey. Humpback whales have also been observed feeding on krill (Wynne and Schwartz, 1999).

In winter, humpback whales from different feeding areas mate and calve primarily in the West Indies, where spatial and genetic mixing among these groups occurs (Clapham et al., 1993; Katona and Beard, 1990; Palsboll et al., 1997; Stevick et al., 1998). Various papers have summarized information gathered from a catalogue of photographs of individuals from the western North Atlantic population of humpback whales (Clapham, 1992; Clapham and Mayo, 1990; Clapham et al., 1999; Barlow and Clapham, 1997). These photographs identified western North Atlantic humpbacks wintering in tropical breeding grounds in the Antilles, primarily on Silver and Navidad Banks, north of the Dominican Republic. The primary winter range also includes the Virgin Islands and Puerto Rico.

Humpback whales are assumed to use the Mid-Atlantic as a migratory pathway to and from the calving/mating grounds. The Mid-Atlantic may also be an important winter feeding area for juveniles. Since 1989, observations of juvenile humpbacks in the Mid-Atlantic have been increasing during the winter months, peaking from January through March (Swingle et al., 1993). Biologists theorize that non-reproductive animals may be establishing a winter feeding range in the Mid-Atlantic since they are not participating in reproductive behavior in the Caribbean (Barco et al., 2002). Swingle et al. (1993) identified a shift in distribution of juvenile humpback whales in the nearshore waters of Virginia, primarily in winter months. Identified whales using the Mid-Atlantic area were found to be residents of the Gulf of Maine and Atlantic Canada (Gulf of St. Lawrence and Newfoundland) feeding groups, suggesting a mixing of different feeding populations in the Mid-Atlantic region (Barco et al., 2002). Strandings of humpback whales have increased between New Jersey and Florida since 1985, consistent with the increase in Mid-Atlantic whale sightings. Strandings were most frequent from September through April in North Carolina and Virginia waters, and involved primarily juvenile humpback whales of no more than 11 meters in length (Wiley et al., 1995).

In early 1992, a major research program known as the Years of the North Atlantic Humpback (YoNAH)(Smith et al., 1999) was initiated. This was a large-scale, intensive study of humpback whales throughout almost their entire North Atlantic range, from the West Indies to the Arctic. During two primary years of field work, photographs for individual identification and biopsy samples for genetic analysis were collected from summer feeding areas and from the breeding grounds in the West Indies. Additional samples were collected from certain areas in other years.

4.1.2.2 Life History and Reproductive Success

It is generally believed that copulation and calving take place on the winter range in the Greater and Lesser Antilles. The gestation period in humpback whales is 12 months and females give birth every two to three years, usually between December and May (Clapham and Mayo, 1987).

4.1.2.3 Abundance

Photographic mark-recapture analyses from the Years of the North Atlantic Humpback (YONAH) project gave an ocean-basin-wide population estimate of 11,570 for 1992/1993 (CV = 0.069, Stevick et al., 2001), and an additional genotype-based analysis yielded a similar but less precise estimate of 10,400 whales (CV=0.138)(Smith et al., 1999). This estimate is regarded as the best available estimate for the North Atlantic population, though the figure is considered negatively biased because YONAH sampling was not spatially representative in the feeding grounds (Waring et al., 2006). Researchers have used three approaches in their attempt to estimate the abundance for the Gulf of Maine stock: mark-recapture estimates, minimum population size, and line-transect estimates (Clapham et al., 2003). An abundance estimate of 847 animals (CV=0.55) was derived from a line-transect sighting survey conducted during August 2006 which covered 10,676 km of trackline from the 2000m depth contour on the southern edge of Georges Bank to the upper Bay of Fundy and to the Gulf of St. Lawrence. The most recent line-transect survey in 2011, which did not include the Scotian Shelf portion of the stock, produced an estimate of abundance for Gulf of Maine humpback whales of 331 animals (CV=0.48) with a resultant minimum population estimate for this stock of 228 animals. The line-transect based Nmin is unrealistic because at least 500 uniquely identifiable individual whales from the GOM stock were seen during the calendar year of that survey and the actual population would have been larger because re-sighting rates of GOM humpbacks have historically been <1.Using the minimum count from at least 2 years prior to the year of a stock assessment report allows time to resight whales known to be alive prior to and after the focal year. Thus the minimum population estimate is set to the 2008 mark-recapture based count of 823.

Modeling using data obtained from photographic mark-recapture studies estimates the growth rate of the Gulf of Maine feeding population at 6.5 percent (Barlow and Clapham, 1997). More recent studies have found lower growth rates of 0.0 percent to 4.0 percent, although these results may be a product of shifts in humpback distribution (Clapham et al., 2003). Current data suggest that the Gulf of Maine humpback whale stock is steadily increasing in size (Waring et al., 2012). With respect to the North Atlantic population overall, there are indications of increasing abundance. One study estimated a growth rate of 3.1 percent for the period from 1979 to 1993 (Stevick et al., 2001).

As noted, PBR is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362) (Wade and Angliss, 1997). The minimum population size for the Gulf of Maine stock is 823 whales. The maximum productivity rate is 0.065. The "recovery" factor, which accounts for endangered, depleted, or threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.10 because the humpback whale is listed as endangered under the ESA. Thus, PBR for the Gulf of Maine humpback whale stock is 2.7 whales per year.

4.1.2.4 Factors Affecting Survival

Humpback whales, like other baleen whales, may be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources attributable to commercial fishing, coastal development, vessel traffic, and other influences. However, explicit evidence of these influences is limited. Changes in humpback distribution in the Gulf of Maine have been found to be associated with changes in herring, mackerel, and sand lance abundance associated with local fishing pressures (Payne et al., 1986). Likewise, there are strong indications that a mass mortality of humpback whales in the southern Gulf of Maine in 1987/1988 was the result of the consumption of mackerel whose livers contained high levels of a red-tide toxin (Geraci et al., 1989). It has been suggested that red tides are related to increased freshwater runoff from coastal development, but there are insufficient data to link these effects directly with humpback whale mortality (Clapham et al., 1999).

As is the case with other large whales, the major known sources of anthropogenic mortality and injury of humpback whales are commercial fishing gear entanglements and ship strikes. Sixty percent of Mid-Atlantic humpback whale mortalities that were closely investigated showed signs of entanglement or vessel collision (Wiley et al., 1995). From 2006 through 2010, there were at least 10 reports of mortalities as a result of collision with a vessel and 29 serious injuries and mortalities attributed to entanglement. Many carcasses also washed ashore or were spotted floating at sea for which the cause of death could not be determined. Based on photographs of the caudal peduncle of humpback whales, Robbins and Mattila (1999) estimated that at least 48 percent -- and possibly as many as 78 percent -- of the Gulf of Maine stock of humpback whales exhibit scarring caused by entanglement. Robbins (2009) later found that 64.9% of the North Atlantic population had entanglement scarring when first assessed in 2003, encountering new scarring at an annual rate of 12.1%. These estimates are based on sightings of free-swimming animals that initially survive the encounter. Because some whales may drown immediately, the actual number of interactions may be higher. Decomposed and/or unexamined animals (e.g., carcasses reported but not retrieved or necropsied) represent "lost data", some of which may relate to human impacts (Waring et al., 2006).

4.1.2.5 Behavior and Susceptibility to Entanglement

As mentioned previously, humpback whales are, like right whales, susceptible to entanglement in fishing gear. Johnson et al. (2005) noted that any part of the gear (buoy line, groundline, floatline, and surface system line) creates a risk for entanglement. Johnson et al. (2005) also reported that of the 30 humpback whale entanglements examined in the study, 16 (53 percent) involved entanglements in the tail region and 13 (43 percent) involved entanglements in the mouth (note that in both cases, some entanglements included other points of gear attachment on the body). Although the sample size was small for cases in which the point of gear attachment and the associated gear part could be examined, two out of two floating groundline entanglements and four out of seven buoy line entanglements involved the mouth.[3] In addition, five out of seven buoy line entanglements and three out of four gillnet floatline entanglements involved the tail (Johnson et al., 2005).[4]

Based on studies of humpback whale caudal peduncle scars, Robbins and Mattila (2000) reported that calves had a lower entanglement risk than yearlings, juveniles, and mature whales; the latter three maturational classes exhibited comparable levels of high probability scarring. Based on these data as well as evidence that animals acquire new injuries when mature, the authors concluded that actively feeding whales may be at greater risk of entanglement. In any case, juveniles seemed to be at the most risk, possibly due to their relative inexperience.

Humpback whales employ a variety of foraging techniques, which differ from right whale foraging behavior, but which may create entanglement risk (Hain et al., 1982 and Weinrich et al., 1992). One such technique is lunge feeding, in which the whale swims toward a patch of krill or small fish, then lunges into the patch with its mouth agape. The flippers may aid in concentrating the prey or in maneuvering. Another feeding method, called "flick-feeding," involves flexing the tail forward when the whale is just below the surface, which propels water over the whale's head, temporarily disorienting its prey. The whale then swims with its mouth open, through the wave it created. A third foraging strategy is bubble feeding, in which whales swim upwards, while blowing nets or clouds of bubbles, in a spiral under a concentration of prey. This creates a barrier through which the disoriented fish cannot escape. The whales then swim up through the bubble formation, engulfing their prey. These techniques demonstrate that humpback whales commonly use their mouths, flippers, and tails to aid in feeding. Thus, while foraging, all body parts are at risk of entanglement.

4.1.3 Fin Whale

In 1976, the IWC's Scientific Committee proposed seven stocks for North Atlantic fin whales (*Balaenoptera physalus*): (1) North Norway, (2) West Norway-Faroe Islands, (3) British Isles-Spain and Portugal, (4) East Greenland-Iceland, (5) West Greenland, (6) Newfoundland-Labrador, and (7) Nova Scotia (Perry et al., 1999). However, it is uncertain whether these boundaries define biologically isolated units (Waring et al., 2006).

The present IWC scheme defines the North Atlantic fin whale stock off the eastern coast of the U.S., north to Nova Scotia, and east to the southeastern coast of Newfoundland as a single stock (Donovan, 1991). However, information suggests some degree of separation within this

[3] Note that one humpback whale was entangled in both buoy line and groundline and was placed in both categories.

[4] Note that the entanglements in buoy line exceed the total of seven because some animals were entangled in multiple locations on their body (e.g., both the mouth and the tail).

population. A number of researchers have suggested the existence of fin whale subpopulations in the North Atlantic based on local depletions resulting from commercial whaling or genetics data (Mizroch and York, 1984; Bérubé et al., 1998). Photo identification studies in western North Atlantic feeding areas, particularly in Massachusetts Bay, have shown a high rate of annual return by fin whales, both within years and between years, suggesting some level of site fidelity (Seipt et al., 1990).

This particular stock is considered strategic because the fin whale is listed as endangered under the ESA. A final Recovery Plan for fin whales was published in July 2010.

4.1.3.1 Range

Fin whales inhabit a wide range of latitudes between 20 to 75 degrees north and 20 to 75 degrees south (Perry et al., 1999). Like right and humpback whales, fin whales are believed to use high latitude waters primarily for feeding, and low latitude waters for calving. However, evidence regarding where the majority of fin whales winter, calve, and mate is still scarce. Clark (1995) reported a general pattern of fin whale movements in the fall from the Labrador/Newfoundland region, south past Bermuda and into the West Indies, but neonate strandings along the U.S. Mid-Atlantic coast from October through January suggest the possibility of an offshore calving area (Clark, 1995; Hain et al., 1992).

Fin whales are common in waters of the U.S. EEZ principally from Cape Hatteras northward. Fin whales accounted for 46% of the large whales and 24% of all cetaceans sighted over the continental shelf during aerial surveys (CETAP 1982) between Cape Hatteras and Nova Scotia during 1978 to 1982. In this region, fin whales are probably the dominant large cetacean species during all seasons, having the largest standing stock, the largest food requirements, and therefore the largest impact on the ecosystem of any large cetacean species (Hain et al., 1992; Kenney et al. 1997). New England waters represent a major feeding ground for fin whales. There is site fidelity by females and perhaps some segregation by sexual, maturational or reproductive class in the feeding area (Agler et al., 1993).

The predominant prey of fin whales varies greatly in different areas depending on what is locally available (IWC, 1992). In the western North Atlantic, fin whales feed on a variety of small schooling fish (e.g., herring, capelin, and sand lance) as well as squid and planktonic crustaceans (Wynne and Schwartz, 1999). Results from the Navy's SOSUS program (Clark 1995) indicate a substantial deep-ocean distribution of fin whales. It is likely that fin whales occurring in the U.S. Atlantic EEZ undergo migrations into Canadian waters, open-ocean areas, and perhaps even subtropical or tropical regions (Waring et al., 2012).

4.1.3.2 Life History and Reproductive Success

Compared to humpback and right whales, relatively little is known about the life history of fin whales. Both males and females reach sexual maturity between five and fifteen years of age (Perry et al., 1999). Conception is believed to occur during a five-month period in the winter; following a 12-month gestation period, females give birth to a single calf.

The mean calving interval for fin whales is 2.7 years, with a range of between two and three years. Agler et al. (1993) found the gross annual reproductive rate (i.e., calves as a percentage of total population) of fin whales in the Gulf of Maine to be about eight percent during the 1980s. Sigurjonsson (1995) reported the range of pregnancy rates (i.e., percent of adult females pregnant in a given year) for the species as 36 percent to 47 percent.

4.1.3.3 Abundance

Various estimates have been provided to describe the current status of fin whales in western North Atlantic waters. An abundance estimate of 1,925 (CV=0.55) fin whales was derived from a line-transect sighting survey conducted between June 12 and August 4, 2004, by a ship and plane that surveyed 10,761 km of trackline in waters north of Maryland (Palka 2006). An abundance estimate of 2,269 (CV=0.37) fin whales was estimated from an aerial survey conducted in August 2006 which covered 10,676 km of trackline in the region from the southern edge of Georges Bank to the upper Bay of Fundy and to the entrance of the Gulf of St. Lawrence. An abundance estimate of 1,716 (CV=0.26) fin whales was generated from the Canadian trans North Atlantic Sighting Survey in July and August 2007. Finally, an abundance estimate of 2,235 (CV=0.36) fin whales was generated from a shipboard and aerial survey conducted during June - August 2011. The aerial portioned covered 6850 km of tracklines that were over waters from Massachusetts to New Brunswick, Canada (waters north of New Jersey and shallower than the 100-m depth contour, through the US and Canadian Gulf of Maine and up to and including the lower Bay of Fundy). The shipboard portioned covered 3811 km of tracklines that were in water offshore of North Carolina to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the US EEZ) (Waring et al., 2013). The best estimate of abundance for fin whales is 3,522 (CV=0.27), and the minimum population estimate for the western North Atlantic fin whale is 2,817 (Waring et al., 2013).

Information on the abundance and population structure of fin whales worldwide is limited. NMFS recognizes three fin whale stocks in the Pacific for the purposes of managing this species under the MMPA: Alaska (Northeast Pacific), California/Washington/Oregon, and Hawaii. Reliable estimates of current abundance for the entire Northeast Pacific fin whale stock are not available. Stock structure for fin whales in the southern hemisphere is unknown and there are no current estimates of abundance for southern hemisphere fin whales. Therefore, given the best available information, changes in the status of the North Atlantic fin whale population are considered likely to affect the overall survival and recovery of the species.

As noted, PBR is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362). The minimum population size is 2,817, and the maximum productivity rate is 0.04, the default value for cetaceans. The “recovery” factor is assumed to be 0.10 because the fin whale is listed as endangered under the ESA. Thus, PBR for the western North Atlantic fin whale is 5.6 (Waring et al, 2013).

4.1.3.4 Factors Affecting Survival

Hunting of fin whales continued well into the 20th century. Fin whales were given total protection in the North Atlantic in 1987, with the exception of a subsistence whaling hunt for Greenland (Gambell, 1993; Caulfield, 1993). However, Iceland reported a catch of 136 whales in the 1988/89 and 1989/90 seasons, and has since ceased reporting fin whale kills to the IWC (Perry et al., 1999). In total, there have been 239 reported kills of fin whales from the North Atlantic from 1988 to 1995.

Like right whales and humpback whales, anthropogenic mortality of fin whales includes entanglement in commercial fishing gear and ship strikes. A review of the records of stranded, floating or injured fin whales for the period 2005 through 2009 on file at NMFS found two records with substantial evidenc of fishery interactions causing mortality, and two records resulting in serious injury (Henry et al., 2011). Within that same time period, nine records were found that had sufficient information to confirm the cause of death as collisions with vessels (Henry et al, 2011) Experts believe that fin whales are struck by large vessels more frequently than any other cetacean (Laist et al., 2001).

4.1.3.5 Behavior and Susceptibility to Entanglement

As discussed, fishing gear entanglements are a source of anthropogenic mortality to fin whales. Feeding behavior may be an important factor that contributes to the risk of entanglement.

Fin whales exhibit lunge feeding techniques near the ocean surface, similar to humpback whales. Fin whales typically approach a prey patch horizontally, sometimes rapidly turning or rolling on their side inside a prey patch (Watkins and Schevill, 1979). Fin whales have also been observed feeding below the surface and fairly close to the bottom in about 15 to 20 meters of water. Entanglement data from 1997 through 2003 indicate few records of fin whale entanglement events (Kenney and Hartley, 2001; Hartley et al., 2003; Whittigham et al., 2005a; Whittingham et al., 2005b) Based on this information, fin whales seem to encounter gear less often than right and humpback whales. This statement is also supported by fin whale catalogs curated by College of the Atlantic and the Center for Coastal Studies, both of which contain records identifying fin whales that lack entanglement-related scarring.

4.1.4 Minke Whale

The minke whale (*Balaenoptera acutorostrata*) is not listed as endangered or threatened under the ESA, although the species is protected under the MMPA. The total fishery-related mortality and serious injury for this stock does not exceed PBR (see below). Therefore, this is not considered a strategic stock.

4.1.4.1 Range

Minke whales off the eastern coast of the United States are considered to be part of the Canadian east coast population, which inhabits the area from the eastern half of Davis Strait south to the Gulf of Mexico. Spring and summer are times of relatively widespread and common occurrence, and during this time minke whales are most abundant in New England waters. During fall, there are fewer minke whales in New England waters, while during winter, the species seems to be largely absent (Waring et al., 2012). Records hint at a possible winter distribution in the West Indies and in mid-ocean south and east of Bermuda (Mitchell, 1991). As with several other cetacean species, the possibility of a deep-ocean component to distribution exists but remains unconfirmed.

4.1.4.2 Life History and Reproductive Success

Female minke whales reach sexual maturity between six and eight years of age (Waring et al., 2012). The calving interval is between 1 and 2 years, and calves are probably born during October to March after 10 to 11 months gestation and nursing lasts for less than six months (Waring et al., 2012).

4.1.4.3 Abundance

An abundance estimate of 2,591 (CV=0.81) minke whales was generated from a shipboard and aerial survey conducted during June-August 2011 (Palka 2012). The aerial portion that contributed to the abundance estimate covered 5,313 km of tracklines that were over waters waters north of New Jersey and shallower than the 100-m depth contour through the U.S. and Canadian Gulf of Maine, and up to and including the lower Bay of Fundy. The shipboard portion covered 3,107 km of tracklines that were in water offshore of North Carolina to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the U.S. EEZ). Both sighting platforms used a two-simultaneous team data collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers, 2004). Estimation of the abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the multiple covariate distance sampling (MCDS) option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009). An abundance survey was conducted concurrently in the southern U.S. waters (from North Carolina to Florida). The abundance estimates from this southern survey are being calculated and are not available at this time. The best estimate of the population of Canadian east coast minke whales is 20,741 (CV=0.30). The minimum population estimate is 16,199 (Waring et al., 2013).

PBR is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor. The minimum population size is 16,199 and the maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is assumed to be 0.5 because the stock is of unknown status. The PBR for this stock of minke whales is 162 (Waring et al., 2013). Data are insufficient for determining a population trend for this species.

4.1.4.4 Factors Affecting Survival

Human-caused mortality in minke whales is relatively low in comparison to PBR for the species (69). However, fishing-related entanglements do occur. The strandings and entanglement database, maintained by the New England Aquarium and NER NMFS include 36 records of minke whales within U.S. waters from 1975 to 1992. The gear includes unspecified fishing nets, unspecified cables or lines, fish traps, weirs, seines, gillnets, and lobster gear. The existing data can be summarized as follows:

- **U.S. Lobster Trap/Pot Fishery**: Annual mortalities attributed to the Gulf of Maine and Mid-Atlantic lobster trap/pot fishery, as determined from strandings and entanglement records that have been audited, were one in 1991, two in 1992, one in 1994, one in 1995, zero in 1996, one in 1997, zero from 1998 to 2001, 1 in 2002, and 0 in 2003 through 2009.

- **Northeast Bottom Trawl Fishery**: Fisheries observer data from the years 2005 through 2009 were pooled and bycatch rates for minke whales were estimated using a stratified ratio-estimator. Estimated bycatch rates from the pooled fisheries observer data were expanded by annual (2005-2009) fisheries data collected from mandatory vessel trip reports. The estimated annual mortality (CV in parentheses) attributed to this fishery was 4.78 (0.75) for 2005, 3.71 (0.73) for 2006, 3.28 (0.72) for 2007, 2.86 (0.73) for 2008, and 2.86 (0.75) for 2009. Annual average estimated minke whale mortality and serious injury from the Northeast bottom trawl fishery during 2005 to 2009 was 3.5 (CV=0.34) (Waring et al., 2012).

- **Other Fisheries**: The audited NER entanglement/strandings database contains records of minke whales seriously injured or killed as a result of entanglement. Mortalities and serious injuries that were likely a result of a U.S. fishery interaction with an unknown fishery include 3 in 1997, 3 in 1999, 1 in 2000, 2 in 2001, 1 in 2002, 5 in 2003, 2 in 2004, 0 in 2005 and 2006, 1 in 2007, 1 in 2008 and 0 in 2009. During 2005 to 2009, as determined from stranding and entanglement records, the minimum detected annual average mortality and serious injury is 0.8 minke whales in unknown U.S. fisheries (Waring et al., 2012).

From 1999 to 2003, no minke whales were reported to be involved in ship strike incidents. During 2004 and 2005, one minke whale mortality was attributed to ship strike in each year. During 2006 to 2008, no minke whale was confirmed struck by a ship. During 2009, one minke whale was confirmed dead due to a ship strike off New Jersey. Thus, during 2005 to 2009, as determined from stranding and entanglement records, the minimum detected annual average was 0.4 minke whales per year struck by ships (Waring et al., 2012)

In October 2003, an Unusual Mortality Event was declared involving minke whales and harbor seals along the coast of Maine; since then, the number of minke whale stranding reports has returned to normal. On October 11, 2009, the NOAA research vessel FSV Delaware II captured a minke whale during mid-water trawling operations associated with the 2009 Atlantic

Herring Acoustic survey. Although brought on deck, the animal was released alive and seemed to exhibit healthy behavior upon release (Waring et al., 2012).

4.1.4.5 Behavior and Susceptibility to Entanglement

Based on Waring et al. (2012), fishing gear entanglements account for the majority of the human-caused mortalities of minke whales. Like the other large whale species discussed, feeding behavior may be an important factor that contributes to entanglement risk.

Minke whales in the Northwest Atlantic typically feed on small schooling fish, such as sand lance, herring, cod, and mackerel (Ward, 1995). The whales may follow the movements of their prey and subsequently swim closer to shore and to heavy concentrations of fishing gear, making them more susceptible to entanglements. Studies conducted in the Bay of Fundy and Gulf of St. Lawrence indicated that minke whales feed by displaying surface lunges and rolling (Sears et al., 1981; Haycock and Mercer, 1984). In contrast, a study conducted on minke whales in Cape Cod Bay and Massachusetts Bay showed a lack of surface feeding behavior (Murphy, 1995). It is likely, however, that large whales may encounter gear in any part of the water column.

4.2 OVERVIEW OF AFFECTED FISHERIES

The environment affected by the ALWTRP regulations includes human communities, particularly communities whose social and economic fabric depends in part upon commercial fishing operations that must comply with ALWTRP requirements. The affected fisheries include the following:

- American lobster;
- multispecies gillnet fisheries;
- monkfish;
- spiny dogfish;
- shark;
- coastal migratory pelagic species fisheries;
- black sea bass;
- hagfish;
- red crab;
- scup;
- Jonah crab; and
- conch/whelk.

The sections below provide a baseline socioeconomic characterization of these fisheries, discussing fishery regulations, landings, revenue, numbers of permitted vessels, and key ports.

The final section briefly reviews several additional fisheries that are either very small, occur primarily in waters exempted from the ALWTRP, or for which only a minor segment of the vessels fish gear that is regulated under the ALWTRP.

The analyses presented in this section are based primarily on data collected and maintained by NMFS' Northeast Regional Office, Northeast Fisheries Science Center, and Southeast Regional Office. The data represent the best available information on east coast fishing activity. Below, we describe the databases used and highlight key sources of uncertainty in the analyses.

Northeast Dealer Data

In the Northeast, all seafood dealers handling the catch of federally-permitted vessels are required to hold dealer permits. While there is no fee for the permit, NMFS requires that dealers submit reports on the catch that they purchase. Specifically, a dealer must submit a report to NMFS for each fishing trip from which it purchased catch. Each dealer report includes information on:

- date of purchase;
- dealer name and address;
- dealer number;
- vessel name and permit number;
- pounds of each species, by market category, if applicable;
- value of each species, by market category, if applicable; and
- port landed.

Field office staff enter data into a coded form and send the data to the Northeast Fisheries Science Center to be incorporated into NMFS' larger Oracle database.

Analyses based on the dealer data warrant the following caveats:

- The purchase reports that seafood dealers submit to NMFS are not required to provide information on the gear used to land the catch reported. This information is deduced by each individual NMFS Field Office based on personal knowledge of the vessel's primary gear, the predominant species caught on the trip, or firsthand information from the fisherman. Therefore, breakouts of catch by gear type are subject to uncertainty.

- NMFS records only one gear type per dealer report. Thus, if two or more types of gear were used to catch the different species listed on the same dealer report, only the primary gear used on the trip will be noted and gear used to catch secondary species may be mischaracterized. This creates further uncertainty regarding gear types.

- Only dealers that hold Federal permits for handling certain species are required to submit dealer reports. Most notably, dealers who are only permitted to handle lobsters are exempt from any Federal reporting requirements. Thus, a considerable amount of lobster landings are reported through state data collection programs.

Southeast Logbook Data

NMFS requires all fishermen holding permits for Gulf of Mexico reef fish, South Atlantic snapper-grouper, King and Spanish mackerel, and shark to submit an individual report for every fishing trip made. Required information includes vessel data (such as vessel and crew characteristics), gear information, and catch information, including area fished and pounds landed. The characterization of affected fisheries relies on the logbook data to estimate the quantity of key southeast species caught with gear affected by ALWTRP regulations.[5]

The logbook data are subject to the following caveats:

- The logbook provides for the designation of only one type of gear per species for any one trip. If more than one type of gear is used for an individual species, some portion of the catch may be misattributed to the primary (recorded) gear used.

- The Southeast logbook program does not require fishermen to provide information on the value of their landings. Thus, this information is not available for southeast fisheries.

Permit Data

Fishermen are required to hold permits to fish for all federally managed species.[6] Permit requirements are included as part of the Fishery Management Plans developed by the Regional Fishery Management Councils and/or the Atlantic States Marine Fisheries Commission (ASMFC) and implemented by NMFS. Permit data are collected when fishermen apply to renew their fishing permits. NMFS' Northeast and Southeast Regional offices maintain separate permit databases.

The characterization of affected fisheries relies on permit data to identify the number of vessels that may target a particular species. The analysis distinguishes between commercial and

[5] This analysis refers to various types of gear as "affected by ALWTRP regulations." It is important to note, however, that not all of this gear is currently regulated under the ALWTRP. References to gear "affected by ALWTRP regulations" also include those types of gear potentially subject to the requirements of the ALWTRP, as specified by the regulatory alternatives discussed in Chapter 3.

[6] Fisheries may be managed by NMFS or by cooperative agreement between NMFS and the individual states.

charter/party permits using permit category data. Because fishermen may not actually target all species for which they hold permits, this approach may lead to an overestimate of the number of vessels actively involved in a fishery.

The analysis also relies on permit data to identify the number of vessels likely to fish with gear regulated under the ALWTRP. When applying for permits in the Northeast, fishermen are required to indicate what gear they are likely to use, although they are not restricted to the use of this gear (unless stipulated in the FMP). As a result, the permit database indicates the gear the permit holder intended to use when the permit application was filed, not necessarily the gear currently used. The degree of inaccuracy that stems from this data limitation is unknown, but is likely minor. In addition to the caveat above, it is important to note that permit applications can designate multiple types of gear (ranked by likelihood of use). For the purpose of characterizing affected fisheries, the analysis examines the distribution of permits by both primary gear (i.e., the gear that the permit holder is most likely to use) and all gear noted on the permit application. This approach provides a more accurate indication of the number of vessels that may be affected by ALWTRP requirements.

Permit records provided by the Southeast Regional Office do not itemize the types of gear permitted in the case of general species/fishery specific commercial permits; gear-specific permits are only required to fish for certain species with specific types of gear (e.g., to fish for king mackerel with a gillnet, one must hold a "Gillnet Endorsement for King Mackerel" permit). Thus, we are not able to estimate the number of fishermen permitted to fish with specific types of gear for fisheries that are primarily based in the Southeast.

4.2.1 American Lobster

The American lobster, *Homarus americanus*, is a bottom-dwelling, marine crustacean characterized by a shrimp-like body and ten legs, two of which are enlarged to serve as crushing and gripping appendages. American lobster are widely distributed over the continental shelf of North America. Inshore, they are most abundant from Maine through New Jersey, with abundance declining from northern to southern areas. Offshore, lobsters occur in U.S. waters from Maine through North Carolina (Atlantic States Marine Fisheries Commission, August 19, 2003). The inshore fishery dominates the industry, accounting for the highest percentage of lobster harvest (Atlantic States Marine Fisheries Commission, 2009).

Lobster growth and reproduction are linked to the molting cycle. Lobsters are encased in a hard external skeleton that provides body support and protection. Periodically, this skeleton is cast off to allow body size to increase and mating to take place. Eggs (7,000 to 80,000) are extruded and carried under the female's abdomen during a 9 to 11 month incubation period. The eggs hatch during late spring or early summer and the pelagic larvae undergo four molts before attaining adult characteristics and settling to the bottom. Lobsters typically reach legal, commercial size after five to seven growing seasons, or approximately 20 molting cycles.

Several types of gear are used in the American lobster fishery, but the majority of landings are associated with traps/pots. Between 1981 and 2007 traps/pots accounted for 98% of landings (Atlantic States Marine Fisheries Commission, 2009). Traps/pots may be set singly, each having its own surface line and buoy, or in multiple-trap/pot "trawls" where the traps/pots are linked together by groundlines, with surface lines and buoys (or high flyers) at the first and/or last trap/pot. Traps/pots are further divided into general categories: inshore traps/pots and offshore traps/pots. Inshore trapping/potting typically involves smaller vessels fishing in coastal waters of depths up to 50 fathoms. In contrast, offshore, or deep-sea trapping/potting, usually involves much larger vessels using much heavier traps/pots and stronger line (Sainsbury, 1971).

Harvest levels of American lobster first prompted concern in the 1970s, resulting in the first Fishery Management Plan (FMP) for the American lobster, adopted in 1983. This first FMP called for fishing effort limits, minimum carapace size requirements, a prohibition on the possession of egg-bearing (or "berried") lobsters, and a prohibition on landing lobster parts. Since that time, a number of plan amendments have been developed for both state and Federal waters. In December 1999, NMFS issued a Final Rule (64 FR 68228) transferring the Federal lobster fishery regulations created under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (50 CFR Part 649) to the state-oriented Atlantic Coastal Fisheries Cooperative Management Act (Atlantic Coastal Act) (50 CFR Part 697). This decision recognized that the Federal FMP, which covered only Federal waters, was insufficient to address overfishing.

Currently, the inshore American lobster fishery is managed under Amendment 3 of the Atlantic States Marine Fisheries Commission's American Lobster Management Plan, as well as Addenda I through XVI to the plan. Adopted in December 1997, primary regulatory measures under Amendment 3 include carapace size limits, protection of ovigerous females, gear restrictions, and nominal effort control measures. In addition, Amendment 3 created seven lobster management areas (see Exhibit 4-1). These include the Inshore Gulf of Maine (Area 1), Inshore Southern New England (Area 2), Offshore Waters (Area 3), Inshore Northern Mid-Atlantic (Area 4), Inshore Southern Mid-Atlantic (Area 5), New York and Connecticut State Waters (Area 6), and Outer Cape Cod. Lobster Conservation Management Teams (LCMTs), composed of industry representatives, were formed for each management area. They advise the American Lobster Management Board and recommend changes to the management plan within their area.

Under Federal regulations for the American lobster fishery, Federal permits are limited access meaning that no new entrants are allowed, although permits may be bought, sold, and transferred to another vessel. In 2011, there were approximately 2,800 Federal lobster permits issued to vessels using trap/pot gear. The number of commercial trap/pot vessels that hold Federal permits for each lobster management area is presented in Exhibit 4-2.

Exhibit 4- 1

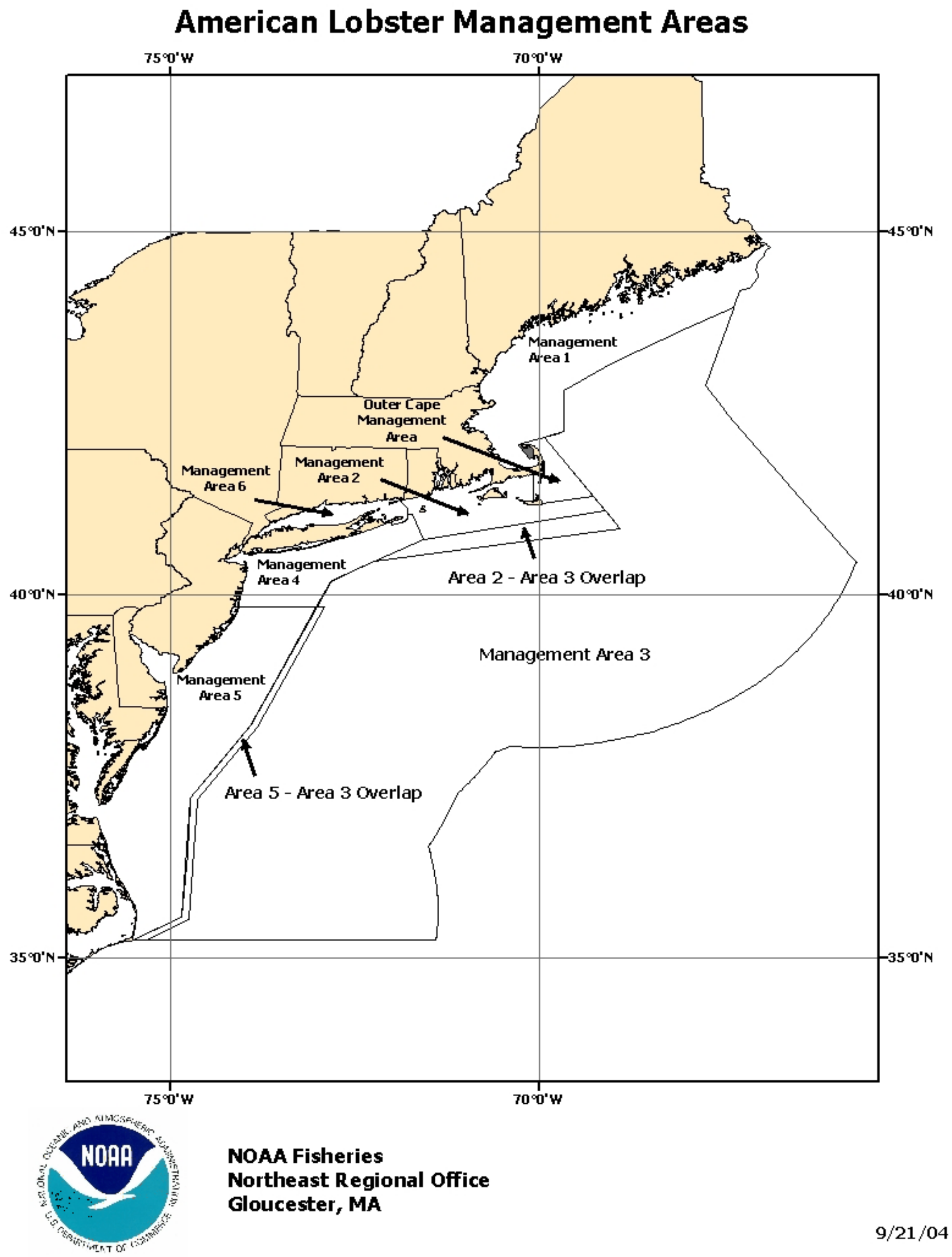

American Lobster Management Areas
75°0'W
70°0'W
45°0'N
40°0'N
35°0'N
Management Area 1
Outer Cape Management Area
Management Area 6
Management Area 2
Management Area 4
Area 2 - Area 3 Overlap
Management Area 3
Management Area 5
Area 5 - Area 3 Overlap
NOAA Fisheries
Northeast Regional Office
Gloucester, MA
9/21/04

Exhibit 4-2 FEDERAL COMMERCIAL LOBSTER TRAP/POT PERMITS BY LOBSTER MANAGEMENT AREA[1], FY2011[2]	
Lobster Management Area	**Number of Permits / Permitted Vessels**
1	1,977
2	394
3	107
4	72
5	44
6	62
Outer Cape	145

Note:
[1] Note that a single permit is often issued for more than one area.
[2] Permits are issued by fishing year. 2011 extended from May 1, 2011, to April 30, 2012.

Source: Permit data provided by NMFS, Northeast Region, Fisheries Statistics Office.

Each state sets its own requirements for trapping/potting lobsters in state waters. State-permitted operators who wish to fish in Federal waters must also hold a Federal permit and abide by the more restrictive of the two (Federal or state) regulations.

Lobster has consistently ranked among the Atlantic coast's most commercially important species. In 2011, total revenue totaled more than $420 million up from approximately $400 million the year before. Additional detail on annual lobster landings and ex-vessel revenue is presented in Exhibit 4-3.

Exhibit 4-3 LANDINGS AND REVENUE FOR THE AMERICAN LOBSTER FISHERY: 2006 - 2011		
Fishing Year	**Landings (million lbs)**	**Revenue ($ millions)**
2006	92.61	395.15
2007	78.37	354.99
2008	88.09	326.75
2009	98.22	303.32
2010	116.25	399.48
2011	126.46	423.79

Source: Dealer data provided by NMFS Northeast Region. Fisheries Statistics Office.

The greater abundance of lobster in northern waters is reflected in the distribution of landings by state. Maine consistently accounts for the greatest share of the lobster catch, with landings in 2011 of approximately 105 million pounds. Massachusetts, the second leading producer, had landings in 2011 of nearly 13 million pounds. Together, Maine and Massachusetts accounted for about 94 percent of total national landings. Lobster landings and revenue by state for 2011 are presented in Exhibit 4-4.

Exhibit 4-4

LOBSTER LANDINGS AND REVENUE BY STATE: 2011

State	Landings (lbs)	Landings (% of Total)	Revenues ($)	Revenues (% of Total)
Maine	104,976,057	83.01%	$335,006,687	79.05%
Massachusetts	13,384,453	10.58%	$53,329,231	12.58%
New Hampshire	3,919,783	3.10%	$16,345,547	3.86%
Rhode Island	2,752,701	2.18%	$12,728,035	3.00%
New Jersey	626,019	0.50%	$2,766,736	0.65%
New York	572,579	0.45%	2,522,311	0.60%
Connecticut	163,887	0.13%	$815,830	0.19%
Maryland	39,790	0.03%	$184,865	0.04%
Virginia	12,878	0.01%	$62,525	0.01%
Delaware	8,880	0.01%	$23,464	0.01%
TOTAL	126,457,027	100.00%	$423,785,231	100.00%

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office

Exhibit 4-5 provides additional data on the distribution of lobstering activity, highlighting the top grossing ports for lobster in 2010. As shown, Maine ports account for a significant portion of the total lobster catch. However, most lobster is landed at smaller ports along the New England coast, rather than at a single dominant port.

Exhibit 4-5

LOBSTER LANDINGS VALUE BY PORT, FY2011[1]

Port	County	State	Total Value of all Landings ($)
Stonington	Hancock	ME	46,346,812
Rockland	Knox	ME	18,648,406
Vinalhaven	Knox	ME	16,691,032
Friendship	Knox	ME	14,525,366
Other Knox County Ports	Knox	ME	41,813,915
Other Ports			284,222,864
TOTAL			392,152,940

Notes:
[1] Ports are listed in descending order based on the value of total landings. The top five ports are presented in this exhibit.

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

4.2.2 Northeast Multispecies

The Northeast Multispecies Fishery Management Plan (FMP) governs commercial fishing in New England and Mid-Atlantic waters for fifteen species (and 24 stocks) of demersal fish. These species, which are listed in Exhibit 4-6, are grouped together under one FMP because the fish share common habitats and are often caught at the same time. They are present in shallow coastal areas, deep waters, and ocean banks such as Georges and Stellwagen Banks. The majority of the commercial fishing activity targeting these species occurs in the Northeast, where cooler waters support a greater abundance of groundfish. For more information on each species regulated under the Multispecies FMP, including common and scientific names, a brief summary of key biological facts relevant to each species, commercial uses, and a drawing of a representative member of each species, see Appendix 4-B.

Exhibit 4-6

SPECIES/STOCKS MANAGED UNDER THE NORTHEAST MULTISPECIES FISHERY MANAGEMENT PLAN

Species	Associated Stocks
American plaice	One stock: distributed primarily in the Gulf of Maine.
Atlantic cod	Two stocks: Gulf of Maine cod and Georges Bank cod.
Atlantic halibut	One stock: distributed primarily in the Gulf of Maine and on Georges Bank.
Haddock	Two stocks: Gulf of Maine haddock and Georges Bank haddock.
Ocean pout	One stock: distributed throughout the region.
Offshore hake	One stock: distributed primarily offshore in southern New England and the Mid-Atlantic.
Pollock	One stock: distributed in the Gulf of Maine, Georges Bank, and southern New England regions.
Red hake (ling)	Two stocks: Gulf of Maine/northern Georges Bank red and southern Georges Bank/southern New England red.
Redfish	One stock: distributed primarily in the Gulf of Maine and southern Georges Bank.
Silver hake (whiting)	Two stocks: Gulf of Maine/northern Georges Bank whiting and southern Georges Bank/southern New England whiting.
White hake	One stock: distributed primarily in the Gulf of Maine and southern Georges Bank.
Windowpane flounder	Two stocks: Gulf of Maine/Georges Bank windowpane and southern New England/Mid-Atlantic windowpane.
Winter flounder	Three stocks: Gulf of Maine winter, Georges Bank winter, and southern New England/Mid-Atlantic winter.
Witch flounder	One stock: distributed primarily in the Gulf of Maine and on Georges Bank.
Yellowtail flounder	Three stocks: Georges Bank yellowtail, Cape Cod yellowtail, and southern New England/Middle Atlantic yellowtail.
Source: NEFMC, 2003a.	

The Northeast Multispecies FMP was adopted in 1986 and has been modified by numerous amendments and framework adjustments. Management measures currently include a limited access permit system, gear restrictions, seasonal and full-time area closures, days-at-sea allocations, trip limits, minimum fish sizes, and reporting requirements. Framework Adjustment 46 went into effect September 14, 2011 (76 FR 56985), and Amendment 17 was proposed December 12, 2011 (76 FR 77200).

In 2011, 3,044 multispecies permits were issued. This includes active and inactive permits, as well as limited and open access permits. Open access permits include handgear, party/charter, scallop, multispecies 300-pound possession limit, and non-regulated multispecies (small mesh multispecies and halibut) permits. Most full-time commercial groundfish vessels hold limited access permits.

In 2011, 3,044 vessels possessed Northeast multispecies permits. Exhibit 4-7 presents the total number of permitted vessels, by type of gear and primary gear type, for all permit categories. The most prevalent primary gear type is "other gear" – which includes hand lines, rod and reel, harpoons, diving gear, and other unspecified types of gear – followed by bottom trawls. Only 204 vessels (6.7 percent) holding Northeast multispecies permits in 2011 indicated ALWTRP regulated gear (gillnets, traps/pots) as the primary gear (see shading).

Exhibit 4-7

PERMITTED NORTHEAST MULTISPECIES VESSELS, FY2011 [1]

Gear Name	By All Gear		By Primary Gear	
	Number	% of Total	Number	% of Total
Purse Seine	147	4.8%	10	0.3%
Beach Seine	139	4.6%	0	0.0%
Boat Seine	144	4.7%	2	0.1%
Bottom Trawls	1191	39.1%	1330	43.8%
Mid-Water Trawls	490	16.1%	9	0.3%
Other Trawls	441	14.5%	26	0.9%
Dredge	357	11.7%	399	13.1%
Gill/Entangling Nets[2]	749	24.6%	273	9.0%
Pots and Traps[2]	125	4.1%	38	1.3%
Longlines and Setlines	608	20.0%	107	3.5%
Other Gear [3]	2176	71.5%	2555	81.1%
ALL GEAR TYPES [4,5]	3044	100.0%	3038	100.0%

Notes:

[1] Permits are issued by fishing year. Fishing Year 2011 extended from May 1, 2011, to April 30, 2012.

[2] Shading indicates that ALWTRP regulated gear was identified as the primary gear.

[3] Includes hand lines, rod and reel, harpoons, diving gear, and other gear types.

[4] Number of vessels for each gear type will not sum to number of vessels for "all gear types" because vessels may be permitted to fish using multiple gear types.

[5] The number of vessels using all gear types should be the same for "All Gear" and for "Primary Gear." The small difference shown above is likely due to a coding irregularity in the original source data.

Source: Data provided by NMFS, Northeast Region, Fisheries Statistics Office.

A total of 81.5 million pounds of Multispecies FMP-regulated fish were landed in the Northeastern U.S. in 2011. Otter trawls were used to catch the greatest percentage of fish, roughly 55 percent (see Exhibit 4-8). Of the total landings, 8.9 million pounds (11 percent) were caught using gear that is subject to the requirements of the ALWTRP.

Exhibit 4-8

LANDINGS FOR THE NORTHEAST MULTISPECIES FISHERY BY GEAR TYPE, FY2011

Gear Type	Total Pounds Landed	Percent of Total Pounds Landed
Otter Trawl	45,073,177	55.32%
Unknown	25,431,214	31.21%
Fixed or Stake/Set Gillnet	8,903,578	10.93%
Botton Longline	1,125,599	1.38%
Dredge	364,636	0.45%
Other	573,629	0.70%
TOTAL	81,471,833	100.00%

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

As shown in Exhibit 4-9, the ex-vessel value of landings for species managed under the Northeast Multispecies FMP totaled $102.1 million in 2011. Approximately 13 percent of this revenue is attributable to fish caught with ALWTRP affected gear. More than 80 percent of the groundfish were landed at Massachusetts ports; significant landings are also reported for Portland, Maine and Point Judith, Rhode Island. The majority of landings in Portland, Maine are associated with ALWTRP affected gear, whereas ALWTRP affected gear accounts for a smaller share of landings in other ports.

Exhibit 4-9

VALUE OF LANDINGS FOR THE NORTHEAST MULTISPECIES FISHERY BY PORT, FY2011[1]

Port	County	State	Total Value of all Landings ($)	Total Value of Fish Caught with ALWTRP Affected Gear[2] ($)	Percent of Revenues Attributable to ALWTRP Affected Gear
New Bedford	Bristol	MA	34,458,874	69,545	0.20%
Gloucester	Essex	MA	30,845,347	4,793,206	15.54%
Boston	Suffolk	MA	12,312,595	0	0.00%
Portland	Cumberland	ME	3,875,629	2,230,898	57.56%
Point Judith	Washington	RI	3,292,454	3,824	0.12%
Other Ports			17,300,959	5,981,648	34.57%
TOTAL			102,085,858	13,079,121	12.81%

Notes:

1 Ports are listed in descending order based on the value of landings. The top five ports are presented in this exhibit.

2 Includes fixed gillnets (NEGEAR2=10), drift gillnets (11), mixed traps/pots (18), shrimp trap/pots (19), offshore lobster trap/pot (20), inshore lobster trap/pot (21), and crab trap/pots (30).

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

4.2.3 Monkfish

Monkfish (also called goosefish or anglerfish), *Lophius americanus,* occur from the southern and eastern Grand Banks (Newfoundland) and the northern Gulf of St. Lawrence to the east coast of Florida (to about 29°00′ N latitude), but are common only north of Cape Hatteras. Monkfish have been found in depths ranging from the tide line to 840 meters, although the greatest concentrations occur between 70 and 100 meters, and in deeper water at about 190 meters. Females live approximately 12 years and reach an average size of just over 100 centimeters, while males have rarely been found older than six years and reach lengths of approximately 90 centimeters.

The New England Fishery Management Council (NEFMC) and the Mid-Atlantic Fishery Management Council (MAFMC) work together to develop measures for management of the monkfish fishery in Federal waters under the Magnuson-Stevens Act. Regulations to implement the Monkfish FMP became effective, in part, in November 1999 (the remainder on May 1, 2000) and include separation of the management unit into two management areas (the Northern Fishery Management Area and the Southern Fishery Management Area), limited access vessel permits, dealer and operator permits, trip limits, days-at-sea (DAS) allocations, reporting requirements, and gear restrictions (including a limit on the number and length of gillnets fished, a gillnet tagging requirement, and a minimum mesh size for gillnets). The principal types of gear used in the commercial monkfish fishery are trawl and sink gillnet gear (see below); scallop dredge gear also contributes to landings.

In addition to measures promulgated under the FMP, operation of the gillnet sector of the monkfish fishery is further modified by management measures developed under the ALWTRP, the Harbor Porpoise Take Reduction Plan, and the ESA Final Rule for Large-Mesh Gillnet Fisheries. Cumulatively, these measures provide for additional gear restrictions and seasonal area closures to reduce interactions between monkfish (and other gillnet fisheries) and large whales, sea turtles, and harbor porpoise.

The management unit (over which permits are granted) for monkfish extends throughout the portion of its principal range in U.S. waters, from Maine to Cape Hatteras, North Carolina. The limited access program restricts participation in the monkfish fishery to those boats with sufficient landings during a qualification period. During 2011, 720 vessels qualified for monkfish limited access permits, and 1,824 vessels received incidental catch permits. Exhibit 4-10 presents the number of vessels permitted to fish monkfish, by gear type and primary gear type. The prevalent primary gear type among permitted vessels is the bottom trawl, followed by "other gear" and gill/entangling nets. A total of 479 vessels (approximately 18.9 percent) holding monkfish permits indicated an ALWTRP affected gear as their primary gear.

Exhibit 4-10

PERMITTED MONKFISH VESSELS, FY2011 [1]

Gear Name	By All Gear Number	By All Gear % of Total	By Primary Gear Number	By Primary Gear % of Total
Purse Seine	160	6.3%	10	0.4%
Beach Seine	152	6.0%	0	0.0%
Boat Seine	153	6.0%	1	0.0%
Bottom Trawls	1,436	56.8%	1031	40.8%
Mid-Water Trawls	631	25.0%	9	0.4%
Other Trawls	587	23.2%	23	0.9%
Dredge	745	29.5%	305	12.1%
Gill/Entangling Nets[2]	1,106	43.7%	432	17.1%
Pots and Traps[2]	131	5.2%	47	1.9%
Longlines and Setlines	609	24.1%	58	2.3%
Other Gear [3]	1,259	49.8%	612	24.2%
ALL GEAR TYPES [4,5]	2,529	100.0%	2,517	100.0%

Notes:

[1] Permits are issued by fishing year. Fishing year 2011 extended from May 1, 2011, to April 30, 2012. Permits are valid for the monkfish management unit, which extends from Maine to Cape Hatteras, North Carolina.

[2] Shading indicates that ALWTRP regulated gear was identified as the primary gear.

[3] Includes hand lines, rod and reel, harpoons, diving gear, and other gear types.

[4] Number of vessels for each gear type will not sum to number of vessels for "all gear types" because vessels may be permitted to fish using multiple gear types.

[5] The number of vessels using all gear types should be the same for "All Gear" and for "Primary Gear." The small difference shown above is likely due to a coding irregularity in the original source data.

Source: Data provided by NMFS, Northeast Region, Fisheries Statistics Office.

Roughly 10.6 million pounds of monkfish were landed in the Northeastern U.S. in 2011. Gillnets and trawls were used to catch the greatest percentage of monkfish, and they landed 62 percent and 19 percent of the annual yield, respectively (see Exhibit 4-11). Of the total landings, about 6.7 million pounds (about 62 percent) were caught using ALWTRP regulated gear (fixed and drift gillnets and trap/pots).

Exhibit 4-11 MONKFISH LANDINGS BY GEAR TYPE, 2011		
Gear Type	**Total Pounds Landed**	**Percent of Total Pounds Landed**
Gillnets	6,655,626	62.37%
Trawls	2,012,995	18.86%
Wire Baskets	1,583,590	14.84%
Dredge	350,207	3.28%
Long Lines	46,979	0.44%
Hand Lines	7,986	0.07%
Pots and Traps	8,770	0.08%
Other Nets or Weirs	4,679	0.04%
Troll Lines	722	0.01%
Diving	2	0.00%
TOTAL	10,671,556	100.00%
Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.		

The ex-vessel value of monkfish landings in the Northeast totaled approximately $26.2 million in 2011. Of this total, about 50 percent came from fish caught with ALWTRP affected gear. Exhibit 4-12 summarizes the top grossing ports for monkfish in 2011. As shown, landings are distributed among a variety of Northeastern ports. Vessels landing their catch at several of these ports, particularly Long Beach/Barnegat Light, New Jersey, depend heavily upon ALWTRP affected gear.

Exhibit 4-12 VALUE OF MONKFISH LANDINGS BY PORT, FY2011[1]					
Port	**County**	**State**	**Total Value of all Landings ($)**	**Total Value of Fish Caught with ALWTRP Affected Gear[2] ($)**	**Percent of Revenues Attributable to ALWTRP Affected Gear**
New Bedford	Bristol	MA	5,435,764	1,513,547	27.84%
Gloucester	Essex	MA	3,731,414	556,797	14.92%
Point Judith	Washington	RI	2,623,599	685,823	26.14%
Long Beach/Barnegat Light	Ocean	NJ	2,419,738	2,293,980	94.80%
Boston	Suffolk	MA	2,017,109	0	0.00%
Other Ports			10,012,888	7,992,228	79.82%
TOTAL			26,240,512	13,042,375	49.70%

Notes:
1 Ports are listed in descending order based on the value of landings. The top five ports are presented in this exhibit.
2 Includes fixed gillnets (NEGEAR2=10), drift gillnets (11), mixed traps/pots (18), shrimp trap/pots (19), offshore lobster trap/pot (20), inshore lobster trap/pot (21), and crab trap/pots (30).

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

4.2.4 Spiny Dogfish

Spiny dogfish, *Squalus acanthias*, is a shark belonging to the class Chondrichthyes (cartilaginous fishes). They can be found on both sides of the Atlantic. In the Northwest Atlantic, they range from Florida to Labrador, but are most abundant from Nova Scotia to Cape Hatteras. The Northwest Atlantic stock tends to spend summer months in waters from Massachusetts to Canada and the remainder of the year entirely in U.S. waters. Spiny dogfish are landed in every state from Maine to North Carolina and in all months of the year. During the fall and winter months, spiny dogfish are taken principally in Mid-Atlantic waters and southward from New Jersey to North Carolina. During the spring and summer months, spiny dogfish are landed mainly in northern waters from New York to Maine (Atlantic States Marine Fisheries Commission, 2002).

The New England Fishery Management Council (NEFMC) and the Mid-Atlantic Fishery Management Council (MAFMC) work together to develop measures for management of the spiny dogfish fishery in Federal waters under the Magnuson-Stevens Act. Regulations to implement the Spiny Dogfish Fishery Management Plan (FMP) became effective February 2000, and include permitting requirements for vessels (open access permit), dealers, and vessel operators. The regulations implementing the FMP also require establishment of an annual commercial quota subdivided into two semi-annual periods. The FMP was modified in 2006 (Framework 1) to allow for annual specifications to remain in effect for up to 5 years. All spiny dogfish landed for a commercial purpose from Maine through Florida must be applied against the commercial quota, regardless of where the spiny dogfish were caught. The fishery is closed for the remainder of the quota period once the quota available for that period has been harvested. Since spiny dogfish are also commercially fished in state waters where the ASMFC has primary oversight, the ASMFC has developed an Interstate Fishery Management Plan (ISFMP) for spiny dogfish. That plan was approved in late 2002 and implemented by each state beginning May 1, 2003 (consistent with the start of the 2003 spiny dogfish fishing year under the Federal FMP).

Because of mortality rates, the Spiny Dogfish FMP initially contained a restrictive rebuilding schedule, limiting the harvest of dogfish until the stock is rebuilt. For the period from May 1, 2000, through April 30, 2002, the annual quota was set at 4 million pounds, with trip limits of 600 pounds and 300 pounds for quota periods I and II, respectively. In July 2005, however, ASMFC published a draft addendum to the spiny dogfish FMP. The addendum calls for a system under which quotas can be specified in any given year for up to 5 years, based on expectations of future stocks projected by the best information (ASMFC, 2005). This amendment was adopted in November 2005, and is now in effect.

Exhibit 4-13 presents the number of permitted vessels by gear type and primary gear. Approximately 2,743 vessels were permitted to fish for spiny dogfish in 2011. The most common primary gear type among permitted vessels is the bottom trawl, followed by "other gear" and gill/entangling nets. A total of 584 vessels (21.3 percent) holding spiny dogfish permits in 2011 indicated an ALWTRP affected gear (predominantly gillnets) as the primary gear (see shading).

Exhibit 4-13

PERMITTED SPINY DOGFISH VESSELS, FY2011 [1]

	By All Gear		By Primary Gear	
Gear Name	**Number**	**% of Total**	**Number**	**% of Total**
Purse Seine	172	6.3%	21	0.8%
Beach Seine	143	5.2%	0	0.0%
Boat Seine	153	5.6%	2	0.1%
Bottom Trawls	1,439	52.5%	1,076	39.4%
Mid-Water Trawls	698	25.4%	16	0.6%
Other Trawls	621	22.6%	35	1.3%
Dredge	561	20.5%	171	6.3%
Gill/Entangling Nets[2]	1,310	47.8%	553	20.2%
Pots and Traps[2]	119	4.3%	31	1.1%
Longlines and Setlines	811	29.6%	106	3.9%
Other Gear [3]	1,500	54.7%	726	26.6%
ALL GEAR TYPES [4,5]	2,743	100.0%	2,732	100.0%

Notes:

1 Permits are issued by fishing year. Fishing year 2011 extended from May 1, 2011, to April 30, 2012.

2 Shading indicates that ALWTRP regulated gear was identified as the primary gear.

3 Includes hand lines, rod and reel, harpoons, diving gear, and other gear types.

4 Number of vessels for each gear type will not sum to number of vessels for "all gear types" because vessels may be permitted to fish using multiple gear types.

5 The number of vessels using all gear types should be the same for "All Gear" and for "Primary Gear." The small difference shown above is likely due to a coding irregularity within the original data source.

Source: Data provided by NMFS, Northeast Region, Fisheries Statistics Office.

A total of 20.9 million pounds of spiny dogfish were landed in the Northeastern U.S. in 2011. Gillnets were used to catch the greatest share of spiny dogfish at 69.5 percent (see Exhibit 4-14).

Exhibit 4-14 SPINY DOGFISH LANDINGS BY GEAR TYPE, 2012		
Gear Type	**Total Pounds Landed**	**Percent of Total Pounds Landed**
Gillnets	14,528,128	69.52%
Trawls	2,165,523	10.36%
Other	1,449,149	6.93%
Bottom Longlines	1,429,224	6.84%
Handlines	972,179	4.65%
Pots and Traps	317,030	1.52%
Dredge	27,186	0.13%
Troll Lines	6,000	0.03%
Harpoon	1,500	0.01%
Vertical Longlines	600	0.00%
Floating Traps	20	0.00%
TOTAL	20,896,539	100.00%
Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.		

The ex-vessel value of spiny dogfish landings in the Northeast totaled approximately $4.5 million in 2011. Of this total, 71 percent came from fish caught with an ALWTRP affected gear type. Exhibit 4-15 summarizes the top grossing ports for spiny dogfish in 2011. As shown, several Massachusetts ports dominate spiny dogfish landings.

Exhibit 4-15 VALUE OF SPINY DOGFISH LANDINGS BY PORT, FY2011[1]					
Port	**County**	**State**	**Total Value of all Landings ($)**	**Total Value of Fish Caught with ALWTRP Affected Gear[2] ($)**	**Percent of Revenues Attributable to ALWTRP Affected Gear**
Gloucester	Essex	MA	570,141	431,888	75.75%
Chatham	Barnstable	MA	546,656	288,464	52.77%
Virginia Beach/Lynnhaven	City of Virginia Beach	VA	350,098	350,098	100.00%
New Bedford	Bristol	MA	301,707	205,866	68.23%
Ocean City	Worcester	MD	251,325	186,253	74.11%
Other Ports			2,443,720	1,705,106	69.78%
TOTAL			4,463,647	3,167,675	70.97%

Notes:

1 Ports are listed in descending order based on the value of landings. The top five ports are presented in this exhibit.

2 Includes fixed gillnets (NEGEAR2=10), drift gillnets (11), mixed traps/pots (18), shrimp trap/pots (19), offshore lobster trap/pot (20), inshore lobster trap/pot (21), and crab trap/pots (30).

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

4.2.5 The Directed Shark Gillnet Fishery

Sharks belong to the class Chondrichthyes (cartilaginous fishes), which also includes rays, skates, and deepwater chimaeras (ratfishes). There is great diversity in size, feeding habits, behavior, and reproduction among the 350 species of sharks. Shark habitat can be described in four broad categories: (1) coastal, (2) pelagic, (3) coastal-pelagic, and (4) deep-dwelling. Coastal species inhabit estuaries, the nearshore and waters of the continental shelves, e.g., blacktip, finetooth, bull, lemon, and sharpnose sharks (which are thought to enter wetland tidal creeks). Pelagic species, on the other hand, range widely in the upper zones of the oceans, often traveling over entire ocean basins. Examples include mako, blue, and oceanic whitetip sharks. Coastal-pelagic species are intermediate in that they occur both inshore and beyond the continental shelf, but have demonstrated mid-ocean or transoceanic movements. Sandbar, scalloped hammerhead, and dusky sharks are examples of this group. Deep-dwelling sharks, e.g., most cat sharks and gulper sharks, inhabit the dark, cold waters of the continental slopes and deeper waters of the ocean basins. For additional information on the life history and essential fish habitat of each shark species, see Chapters 5 and 6 of the Highly Migratory Species (HMS) FMP, and Chapter 10 of Amendment 1 to the HMS FMP.

There is extreme diversity in the more than 350 species of sharks found in the world's oceans. In the western Atlantic, 39 species are managed under the HMS FMP; the spiny dogfish is managed under the authority of the Atlantic States Marine Fisheries Commission as well as the New England and mid-Atlantic Fishery Management Councils. Based on a combination of ecology and fishery dynamics, the sharks included under the HMS FMP have been divided into four species groups for management purposes: (1) large coastal species, (2) small coastal species, (3) pelagic species, and (4) prohibited species. Exhibit 4-16 lists the shark species in each management group. Data on other species collectively categorized as 'deepwater and other sharks' (such as smooth dogfish and the catsharks) are collected, but those species are not actively managed at this time.

Exhibit 4-16

COMMON SHARK SPECIES, BY SHARK CLASS

Species Group	Common Name	Species
Large Coastal Sharks (LCS)	Sandbar	*Carcharhinus plumbeus*
	Silky	*Carcharhinus falciformis*
	Tiger	*Galeocerdo cuvier*
	Spinner	*Carcharhinus brevipinna*
	Blacktip	*Carcharhinus limbatus*
	Bull	*Carcharhinus leucas*
	Lemon	*Negaprion brevirostris*
	Nurse	*Ginglymostoma cirratum*
	Great hammerhead	*Sphyrna mokarran*
	Scalloped hammerhead	*Sphyrna lewini*
	Smooth hammerhead	*Sphyrna zygaena*
Small Coastal Sharks (SCS)	Atlantic sharpnose	*Rhizoprionodon terraenovae*
	Blacknose	*Carcharhinus acronotus*
	Bonnethead	*Sphyrna tiburo*
	Finetooth	*Carcharhinus isodon*
Pelagic Sharks	Blue	*Prionace glauca*
	Porbeagle	*Lamna nasus*
	Shortfin mako	*Isurus oxyrinchus*
	Thresher	*Alopias vulpinus*
	Oceanic whitetip	*Carcharhinus longimanus*
Prohibited Sharks	Sand tiger	*Odontaspis taurus*
	Bigeye sand tiger	*Odontaspis noronhai*
	Whale	*Rhincodon typus*
	Basking	*Cetorhinus maximus*
	White	*Carcharodon carcharias*
	Dusky	*Carcharhinus obscurus*
	Bignose	*Carcharhinus altimus*
	Galapagos	*Carcharhinus galapagenisis*
	Night	*Carcharhinus signatus*
	Caribbean reef	*Carcharhinus perezi*
	Narrowtooth	*Carcharhinus brachyurus*
	Caribbean sharpnose	*Rhizoprionodon porosus*
	Smalltail	*Carcharhinus porosus*
	Atlantic angel	*Squatina dumerili*
	Longfin mako	*Isurus paucus*
	Bigeye thresher	*Alopias superciliosus*
	Sevengill	*Heptranchias perlo*
	Sixgill	*Hexanchus griseus*
	Bigeye sixgill	*Hexanchus vitulus*

Source: Final Amendment 1 to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks, NMFS, 2003.

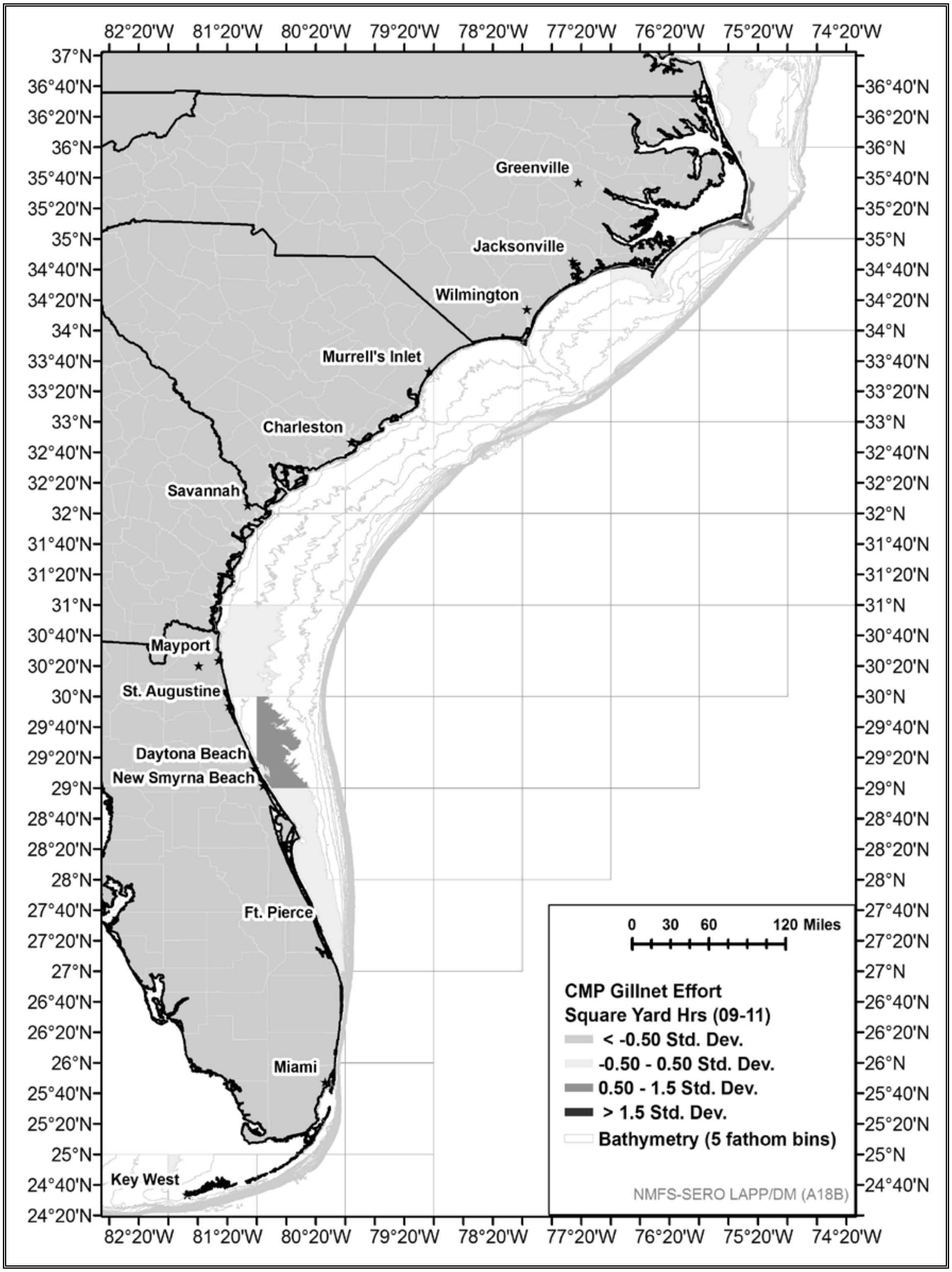
Sharks were first managed in 1993 under NMFS' Fishery Management Plan (FMP) for Sharks of the Atlantic Ocean. This 1993 FMP was replaced in 1999 when NMFS published the final FMP for Atlantic Tunas, Swordfish and Sharks (also called the Highly Migratory Species (HMS) FMP). All Federal fisheries for Atlantic sharks, except spiny dogfish, are managed under the HMS FMP. The HMS FMP contains numerous measures to rebuild or prevent overfishing of Atlantic sharks in commercial and recreational fisheries, including permitting and reporting requirements, quotas for commercial landings, recreational bag limits, fishery closures, minimum size requirements, limited access, and a list of prohibited shark species. NMFS recently amended the HMS FMP, and published a final rule for Amendment I to the FMP in the Federal Register on December 24, 2003 (68 FR 74746). On April 15, 2004, NMFS published a notice in the Federal Register that identified NOAA-approved Vessel Monitoring System (VMS) devices for use by vessels participating in all of the Atlantic HMS fisheries and vessels participating in the Southeast shark gillnet fishery (69 FR 19979). A proposed rule to identify an effective date for the VMS requirement was published on May 18, 2004 (69 FR 28106). For more information about recent management actions to the HMS FMP see Chapter 9.4.3.5.

In the Atlantic Ocean, the directed shark fishery is most active in southern waters. As of October 2011, 412 vessels in southern waters possessed permits to fish for shark. Of these vessels, 199 had incidental shark permits, and 210 had directed shark permits. However, few permit holders have been known to use gillnet gear to target sharks in recent years.

4.2.6 Coastal Migratory Pelagic Species

Coastal migratory pelagic species are characterized as coastal, fast swimming, fast-growing, schooling fishes (Hoese, H.D. and Moore, R.H., 1977). Coastal migratory pelagic (CMP) fishes inhabiting waters off the southeastern United States include Spanish mackerel (*Scomberomorus maculatus*), king mackerel (*Scomberomorus cavalla*), cobia (*Rachycentron canadum*). These species range in coastal and continental shelf waters from the Northeastern United States to Brazil. King and Spanish mackerel are major target species of important commercial fisheries in Florida and North Carolina, as well as major target species for the private boat and charter boat recreational fishery in the South Atlantic region. Small amounts of king and Spanish mackerel are caught as an incidental catch or supplemental commercial target species off Georgia and South Carolina. Spanish mackerel is landed primarily by run-around gillnets, other gillnets, and to a lesser extent, hook and line. Most king mackerel landed in the South Atlantic region are taken by hook and line gear. Of the coastal pelagic species, only Spanish mackerel are caught in significant quantities by gillnets. Gillnet effort in the Southeast is typically between April and November with peaks in May and October. Exhibit 4-17 includes a gradation of gillnet effort in the Southeast Atlantic. Gillnet effort for coastal migratory pelagic species in the South Atlantic from 2009 -2011. Effort is calculated as a function of gillnet depth, length, and soak hours and displayed as standard deviations to protect data confidentiality. Orange coloration represents average effort whereas red is above average and yellow is below average. These data were compiled from the 2012 SEFSC Commercial Logbook and provided by the NMFS SERO LAPP/DM Branch.

Exhibit 4-17



The Fishery Management Plan (FMP) for Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic is jointly managed by the South Atlantic and Gulf of Mexico Fishery Management Councils (GMFMC and SAFMC, 1983). The plan was approved in 1982 and implemented by regulations effective in February of 1983. Current regulations implemented under the FMP address king and Spanish mackerel, and cobia. The present management regime for CMP species recognizes two migratory groups each of king mackerel, Spanish mackerel, and cobia: the Gulf Migratory Group and the Atlantic Migratory Group. King mackerel from these two groups seasonally mix on the East Coast of Florida.

Fishing season for CMP species is open year-round until the annual landings quota is filled. The Atlantic landings quotas are 3.88 million pounds for king mackerel; 3.13 million pounds for Spanish mackerel; and 125,712 for Cobia. An annual permit is required to fish under the commercial quota for king and Spanish mackerel. In 2005, NMFS adopted Amendment 15 to the FMP for Coastal Migratory Pelagic Resources. The amendment defined the limited access system and made permanent a previously adopted temporary moratorium on king mackerel permits. Amendment 17, adopted in 2006, established a limited access system on for-hire CMP permits in the Gulf. CMP for-hire permits in the South Atlantic and Spanish mackerel commercial permits are open access. A cobia commercial permit is currently under consideration. In 2011, Amendment 18, established annual catch limits, annual catch targets and accountability measures for all coastal pelagic species.

During the 2012 calendar year, 4,742 vessels possessed permits to fish for coastal migratory pelagic species. The breakdown of vessels by permit type is presented in Exhibit 4-18. Vessels may have multiple permits.

Exhibit 4-18

VESSELS POSSESSING ATLANTIC COASTAL MIGRATORY PELAGIC PERMITS IN 2012, BY PERMIT TYPE

Permit Type[1]	Number of Vessels
Charter Vessels	1,525
King Mackerel (commercial)	1,403
King Mackerel (gillnet endorsement)	22
Spanish Mackerel (commercial)	1,792

Notes:
[1] Permit data provided by the Southeast Regional Office does not itemize "gear types permitted" in the case of general species/fishery specific commercial permits. However, certain gear-specific permits are required to fish for certain species with specific gear types (e.g., in order to fish for king mackerel with a gillnet, one must hold a "Gillnet Endorsement for King Mackerel" permit).

Source: Data provided by NMFS, Southeast Region, Constituency Services Branch, 7 Aug 2012.

4.2.7 Black Sea Bass

Black sea bass, *Centropristris striata,* occur in coastal waters from the Gulf of Maine to the Florida Keys, but are more commonly found from Cape Cod, MA to Cape Canaveral, FL. Two distinct populations (northern and southern Atlantic) are thought to exist, with overlapping ranges; hence, they are managed separately (NMFS, 2003c). However, current genetic research indicates that there is mixing between the two populations and they may indeed be one stock (South Atlantic Fishery Management Council, 2003).

Most black sea bass begin life as females and later transform into males, and most individuals (both sexes) attain sexual maturity by age three. Transformation from female to male generally occurs between ages two and five. Females are rarely found older than eight years (>35 cm), while males may live up to 15 years (>60 cm.) Black sea bass are omnivorous and generally feed on crustaceans, mollusks, echinoderms, fish, and plants.[7]

The discussion below provides a brief overview of the northern and southern black sea bass fisheries.

4.2.7.1 Northern Fishery

The northern portion of the black sea bass fishery, which extends from Cape Hatteras to the U.S./Canada border, is managed under the Summer Flounder, Scup, and Black Sea Bass FMP. Because the fishery occurs in both state and Federal waters, the Mid-Atlantic Fishery Management Council (MAFMC) and the Atlantic States Marine Fisheries Commission (ASMFC) jointly developed the FMP.[8] Amendment 13 to this FMP provided the most recent management changes for the black sea bass fishery. Amendment 13 established an annual (calendar year) coast-wide catch quota for the commercial black sea bass fishery to replace the quarterly quota allocation system, and allows vessels to retain their Northeast Region Black Sea Bass Permit during a Federal fishery closure. Framework Adjustment 5 to the FMP, adopted in 2004, allows for annual specifications to remain in effect for up to 3 years (69 FR 62818).

Current management measures under the FMP include mandatory vessel trip reporting and gear restrictions. The owner of a vessel issued a black sea bass moratorium permit must mark all traps/pots with the vessel's USCG number or state registration number. Traps/pots must also have an escape vent compliant with the options listed in 50 CFR 648.144 (b)(2), as well as a ghost panel affixed to the trap/pot with degradable fasteners and hinges (50 CFR 648.144(b)(3)).[9] There is no tagging program for this gear and no trap/pot limit.

The commercial fishery has limited-access restrictions. In the 2011 fishing year, 1,554 vessels held permits for this fishery (799 vessels held commercial moratorium permits; 819 vessels held charter party permits). Exhibit 4-19 presents the number of vessels permitted to fish for black sea bass in the Northeast in 2011, organized by intended gear. The most prevalent primary gear type is “other gear” – which includes hand lines, rod and reel, harpoons, diving gear, and other unspecified types of gear – followed by bottom trawls and traps/pots. A total of

[7] Status of Fisheries Resources off Northeastern United States-Black Sea Bass, viewed on http://www.nefsc.noaa.gov/sos/spsyn/og/seabass/ on 8/14/03.

[8] Black sea bass fished south of Cape Hatteras, NC are managed by the South Atlantic Fishery Management Council under the Snapper/Grouper FMP.

[9] Additional gear restrictions apply to otter trawl gear.

182 vessels (about 12 percent) holding black sea bass permits in the Northeast in 2011 indicated an ALWTRP affected gear type as their primary gear.

Exhibit 4-19

PERMITTED NORTHERN BLACK SEA BASS VESSELS, FY2011 [1]

Gear Name	By All Gear		By Primary Gear	
	Number	% of Total	Number	% of Total
Purse Seine	61	3.9%	7	0.5%
Beach Seine	58	3.7%	0	0.0%
Boat Seine	59	3.8%	0	0.0%
Bottom Trawls	551	35.5%	460	29.7%
Mid-Water Trawls	269	17.3%	7	0.5%
Other Trawls	227	14.6%	7	0.5%
Dredge	163	10.5%	26	1.7%
Gill/Entangling Nets[2]	274	17.6%	48	3.1%
Pots and Traps[2]	271	17.4%	134	8.6%
Longlines and Setlines	183	11.8%	7	0.5%
Other Gear [3]	1160	74.6%	865	55.8%
ALL GEAR TYPES [4,5]	1,554	100.0%	1,551	100.0%

Notes:
1 Permits are issued by fishing year. Fishing year 2011 extended from May 1, 2011, to April 30, 2012.
2 Shading indicates that ALWTRP regulated gear was identified as the primary gear.
3 Includes hand lines, rod and reel, harpoons, diving gear, and other gear types.
4 Number of vessels for each gear type will not sum to number of vessels for "all gear types" because vessels may be permitted to fish using multiple gear types.
5 The number of vessels using all gear types should be the same for "All Gear" and for "Primary Gear." The small difference shown above is likely due to a coding irregularity within the original data source.

Source: Data provided by NMFS, Northeast Region, Fisheries Statistics Office.

Landings of black sea bass in the Northeastern U.S. totaled 1.7 million pounds in 2011. Trawls and pots and traps were used to catch the greatest percentage of black sea bass, about 37 percent and 26 percent, respectively (see Exhibit 4-20).

Exhibit 4-20

NORTHERN BLACK SEA BASS LANDINGS BY GEAR TYPE, 2011

Gear Type	Total Pounds Landed	Percent of Total Pounds Landed
Trawls	623,643	36.93%
Pots and Traps	446,343	26.43%
Other	393,232	23.28%
Hand Lines	164,766	9.76%
Dredge	35,924	2.13%
Gillnets	12,413	0.74%
Troll Lines	7,226	0.43%
Other Nets	3,999	0.24%
Long Lines	877	0.05%
Rakes and Hoes	309	0.02%
Harpoon	50	0.00%
Diving	38	0.00%
TOTAL	1,688,820	100.00%

Source: : Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

The ex-vessel value of northern black sea bass landings in the Northeast totaled $5.4 million in 2011. Exhibit 4-21 summarizes the top grossing ports for black sea bass in 2011. As shown, Mid-Atlantic ports predominate in the use of ALWTRP affected gear.

Exhibit 4-21

VALUE OF NORTHERN BLACK SEA BASS LANDINGS BY PORT, FY2011[1]

Port	County	State	Total Value of all Landings ($)	Total Value of Fish Caught with ALWTRP Affected Gear[2] ($)	Percent of Revenues Attributable to ALWTRP Affected Gear
Point Judith	Washington	RI	534,565	21,305	3.99%
Pt. Pleasant	Ocean	NJ	507,051	48,168	9.50%
Ocean City	Worcester	MD	454,439	144,990	31.91%
Hampton	City of Hampton	VA	401,502	0	0.00%
Cape May	Cape May	NJ	354,428	55,215	15.58%
Other Ports			3,078,499	942,654	30.62%
TOTAL			5,330,484	1,212,332	22.74%

Notes:

1 Ports are listed in descending order based on the value of landings. The top five ports are presented in this exhibit.

2 Includes fixed gillnets (NEGEAR2=10), drift gillnets (11), mixed traps/pots (18), shrimp trap/pots (19), offshore lobster trap/pot (20), inshore lobster trap/pot (21), and crab trap/pots (30).

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

4.2.7.2 Southern Fishery[10]

The southern portion of the black sea bass fishery, which extends from Cape Hatteras, NC to Cape Canaveral, FL, is managed under the South Atlantic Fishery Management Council's (SAFMC) Snapper-Grouper Fishery Management Plan (FMP). Amendment 8 of this FMP established a limited-entry system for the snapper-grouper fishery. Under this system, individuals who wish to obtain a snapper-grouper permit must buy two transferable vessel permits, one of which is then retired, thus reducing participation in the fishery and pressure on the resource. These regulations were implemented July 16, 1998.[11] In 2012, Amendment 18A to the Snapper-Grouper FMP further limited participation and effort in the black sea bass fishery by limiting permits to only those fishers with relatively strong landings history and limiting pots to only 35 per vessel annually. Furthermore, pots must now be brought back to shore at the conclusion of each trip, which are typically 24 hours or less. SAFMC published a proposed rule (Amendment 19) on July 2, 2013 (78 FR 39700) which, among other things, proposed a closure of the commercial black sea bass fishery in the South Atlantic from approximately Cape Hatteras, North Carolina to Cape Canaveral, Florida from November 1 through April 30. That closure became effective when the final rule was published on September 23, 2013 (78 FR 58249).

While black sea bass pots are allowed throughout the EEZ north of Cape Canaveral, Florida (except in special management zones), the majority of the pot fishery is concentrated off North Carolina and northern South Carolina and North Florida. Pots must include a panel or door with an opening equal to or larger than the interior end of the pot's funnel, and the hinges and fasteners of each panel or door must be made of a degradable material. The fishing year is June 1 through May 31 each year; however, commercial black sea bass pot fishing has not occurred during the November through April time period since December 2009. In those years, the annual catch limit was reached and fishing by the commercial sector was prohibited.

The southern black sea bass pot fishery, which is managed under the Snapper-Grouper FMP, is a limited access fishery with only 32 endorsements (see Exhibit 4-22).

[10] The information in this section is taken from the SAFMC Summary of the Trap/Pot Fisheries Currently Managed by the SAFMC, distributed at the ALWTRT Meeting held April 28-30, 2003, in Warwick, Rhode Island.

[11] M. Murphy, pers. comm., 2003.

Exhibit 4-22 BLACK SEA BASS POT ENDORSMENTS IN SOUTHEAST ATLANTIC (as of July, 2012)	
State	**Number of Tags**
Florida	7
Georgia	0
South Carolina	9
North Carolina	16
TOTAL	32
Source: Data provided by NMFS, Southeast Regional Office, Constituency Services Brach.	

In the Southern black sea bass fishery, fishermen are required to purchase a tag for each pot they possess. Fishermen are currently only allotted a maximum of 35 pots per vessel annually. The number of pot tags held gives a rough indication of fishing effort. As shown in Exhibit 4-23, fishermen in the Southeast Atlantic currently hold 885 black sea bass pot tags.

Exhibit 4-23 BLACK SEA BASS POT TAGS IN SOUTHEAST ATLANTIC (as of July, 2012)	
State	**Number of Tags**
Florida	140
Georgia	0
South Carolina	235
North Carolina	510
TOTAL	885
Source: Data provided by NMFS, Southeast Regional Office, Sustainable Fisheries Division.	

4.2.8 Hagfish

The Atlantic hagfish, *Myxine glutinosa*, is found along the Northeast coast from Newfoundland to North Carolina. Hagfish generally inhabit areas of soft bottom mud and prefer the cool temperatures found in deep water. They have a long eel-like form and can reach a maximum size of between one and a half and two feet. Hagfish are commonly referred to as "slime eels" or "slime hags" because of their ability to secrete copious amounts of slime from a series of mucous sacs on either side of their abdomen (NMFS, 1996).

The hagfish fishery developed out of a need to find other marketable species in areas where traditional commercial stocks have declined. A 1996 report submitted to NMFS examined the potential for establishing a hagfish fishery in the Northeastern U.S. and concluded that adequate demand exists. This demand comes largely from Korea, where the eelskin is tanned into leather and the meat is used as a food source. Traditionally, the fish are exported whole and all processing takes place in Korea.

Currently, the Atlantic hagfish fishery is not regulated, but NMFS and the New England Fishery Management Council are moving toward developing a management scheme for the fishery. In April 2002, the Northeast Region Coordinating Council placed the review of a hagfish assessment on the agenda for the 37th Stock Assessment Review Committee (SARC) workshop.[12] On August 28, 2002 NMFS issued a Notice of Proposed Rulemaking that established a control date for potential future use in determining historical or traditional participation in the fishery.[13] In this notice, NMFS also stated its intent to encourage the New England Fishery Management Council to develop an FMP for the fishery, preventing overcapitalization and increased pressure on the stock due to a movement of vessels into the fishery. This action was motivated, in part, because scientific studies suggest that Atlantic hagfish are likely vulnerable to overfishing due to the low reproductive capacity of the species (67 FR 55191). As a result of these findings, NMFS and the Council are currently developing a hagfish FMP (NMFS, 2005).

Landings of hagfish in the Northeastern U.S. totaled 4.9 million pounds in 2010. [14] Nearly all hagfish were caught with fish pots, gear that may be affected by revisions to the ALWTRP. Exhibit 4-24 summarizes landings by the type of gear used.

Exhibit 4-24

NORTHERN HAGFISH LANDINGS BY GEAR TYPE, 2011

Gear Type	Total Pounds Landed	Percent of Total Pounds Landed
Pots and Traps	1,350,801	89.08%
Gill Nets	75,178	4.96%
Other Nets	74,961	4.94%
Dredge	15,532	1.02%
TOTAL	1,516,472	100.00%

Note:
[1] Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

The ex-vessel value of hagfish landings in the Northeast totaled approximately $1.1 million in 2011. Revenues were recorded in the ports of Portland, Maine and Gloucester, Massachusetts (see Exhibit 4-25).

[12] The SARC was tasked with determining stock size and abundance and estimating biological reference points. It met on June 4, 2003, and developed a set of research needs for the future; the final report on this meeting is forthcoming.

[13] The notice also served to deny the rulemaking requested in a Petition for Rulemaking asking NMFS to implement emergency measures to limit entry into the fishery, as emergency action was deemed unnecessary.

[14] Because hagfish is not traditionally considered a target species, reporting of hagfish landings is not required. Thus, landings reported are likely an underestimate of actual landings.

Exhibit 4-25

VALUE OF HAGFISH LANDINGS BY PORT, 2011

Port	County	State	Total Value of all Landings	Total Value of Fish Caught with ALWTRP Affected Gear[1]	Percent of Revenues Attributable to ALWTRP Affected Gear
Portland	Cumberland	ME	$791,733	$716,053	90.44%
Gloucester	Essex	MA	$337,092	$337,092	100.00%
TOTAL			$1,128,825	$1,053,145	93.30%

Notes:
[1] Includes fixed gillnets (NEGEAR2=10), drift gillnets (11), mixed traps/pots (18), shrimp trap/pots (19), offshore lobster trap/pot (20), inshore lobster trap/pot (21), and crab trap/pots (30).

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

4.2.9 Red Crab

Deep-sea Red Crab, *Chaceon quinquedens,* are distributed along the continental shelf edge and slope of the western Atlantic from Emerald Bank, Nova Scotia to the Gulf of Mexico. They are typically found at depths of 200 to 1,800 meters (700-5,900 feet), reach a maximum carapace width of 180 mm, and may live 15 years or more (Serchuk and Wigley, 1982).[15] Scientific research suggests that red crabs are most likely opportunistic omnivores due to the limited availability of food at the depths common for this species. The red crab fishery was previously limited by the high catch-related mortality of the crabs (and rapid degradation of the meat) and a lack of economical processing. Technological advances have made fishing for this species feasible and fresh and frozen meat from the crab is now sold commercially (NEFMC, 2002).

Vessels operating in the red crab fishery typically make 28 to 35 trips per year, with each trip lasting seven to ten days. Trips are limited in duration primarily by the hold capacity of the vessel and the need to keep the product fresh and alive. Vessels fish 500 to 600 traps/pots using 90 to 120 traps/pots per trawl. Traps/pots are allowed to soak 18 to 36 hours, with an average soaking time of 22.5 hours. The reported average trap/pot loss is just over 10 pots/traps per trip (NEFMC, 2002).

Management of the red crab fishery under the Magnuson-Stevens Act occurred relatively recently. Following a request from the New England Fishery Management Council (NEFMC), the Secretary of Commerce issued an emergency rule effective May 18, 2001 for management of the red crab fishery in the Exclusive Economic Zone (EEZ) from 35°15.3' North Latitude (the latitude of Cape Hatteras Light, NC) northward to the U.S./Canada border. An FMP was subsequently developed by the NEFMC, approved by NMFS and implemented by regulations effective October 20, 2002 (NEFMC, 2002). The regulations include measures to limit and

[15] Serchuk and Wigley (1982) suggest that precise information on life-span and growth rate for red crabs is lacking.

control effort in the fishery, including a limited-access permit system. Specifically, access to the fishery is limited to those fishermen who met specific criteria during a qualifying period; no additional entrants are allowed, but permits may be sold or otherwise transferred to a new owner. The regulations include gear restrictions and days-at-sea (DAS) allocations. Other measures include gear marking requirements, mandatory vessel trip reports, and a requirement for operator permits and dealer permits (NMFS, 2002a). Amendment 3 to the Red Crab FMP was published in 2011. This amendment established an annual catch limit and accountability measures, as well as removing the DAS system and implementing a hard total allowable landings limit.

Of the 1,539 vessels permitted to fish for red crab in 2011, 1,534 vessels had incidental bycatch permits and five had controlled access permits. Exhibit 4-26 presents a count of vessels permitted to fish for red crab by all intended gear types, and by primary gear type, within the red crab management unit. Traps/pots are the most prevalent primary gear, followed closely by bottom trawls, then dredges. In all, 852 vessels (55.1 percent) holding red crab permits in 2011 indicated an ALWTRP affected gear type as the primary gear. It is noteworthy that virtually all of the red crab sold commercially since 2011 was landed by the five vessels with controlled access permits; these vessels use trap/pot gear potentially subject to ALWTRP regulations.

Exhibit 4-26

NORTHEAST PERMITTED RED CRAB VESSELS, 2011[1]

	By All Gear		**By Primary Gear**	
Gear Name	**Number**	**% of Total**	**Number**	**% of Total**
Purse Seine	10	0.4%	2	0.1%
Beach Seine	7	0.3%	0	0.0%
Boat Seine	8	0.3%	0	0.0%
Bottom Trawls	586	23.5%	441	28.7%
Mid-Water Trawls	136	5.5%	5	0.3%
Other Trawls	109	4.4%	16	1.0%
Dredge	268	10.8%	121	7.9%
Gill/Entangling Nets[2]	193	7.0%	65	4.2%
Pots and Traps[2]	917	36.8%	787	51.2%
Longlines and Setlines	56	2.2%	1	0.1%
Other Gear [3]	201	8.1%	98	6.4%
ALL GEAR TYPES [4,5]	2,491	100.0%	1,536	100.0%

Notes:

1 Permits are issued by fishing year. Fishing year 2011 extended from March 1, 2011, to February 28/29, 2012.

2 Shading indicates that ALWTRP regulated gear was identified as the primary gear.

3 Includes hand lines, rod and reel, harpoons, diving gear, and other gear types.

4 Number of vessels for each gear type will not sum to number of vessels for "all gear types" because vessels may be permitted to fish using multiple gear types.

5 The number of vessels using all gear types should be the same for "All Gear" and for "Primary Gear." The small difference shown above is likely due to a coding irregularity within the original data source.

Source: Data provided by NMFS, Northeast Region, Fisheries Statistics Office.

About 3.6 million pounds of red crab were landed in the Northeastern U.S. in fishing year 2011. All of the red crab landed was caught using pots/traps by the limited access fleet potentially subject to ALWTRP gear modification requirements (see Exhibit 4-27).

Exhibit 4-27

RED CRAB LANDINGS BY GEAR TYPE, 2011

Gear Type	Total Pounds Landed	Percent of Total Pounds Landed
Pots and Traps	3,597,848	100.00%
TOTAL	3,597,848	100.00%

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

The ex-vessel value of red crab landings in the Northeast totaled roughly $3.5 million in 2011. All of this revenue came from crab landed with ALWTRP affected gear. Exhibit 4-28 summarizes the top grossing ports for red crab in 2011. As shown, New Bedford, Massachusetts accounts for the vast majority of red crab revenues.

Exhibit 4-28

VALUE OF RED CRAB LANDINGS BY PORT, 2011

Port	County	State	Total Value of all Landings ($)	Total Value of Landings with ALWTRP Affected Gear[1] ($)	Percent of Revenues Attributable to ALWTRP Affected Gear
New Bedford	Bristol	MA	3,485,424	3,485,424	100.00%
Other Maryland	Not-Specified	MD	1,772	1,772	100.00%
Ocean City	Worcester	MD	488	488	100.00%
Other Atlantic	Atlantic	NJ	27	27	100.00%
TOTAL			3,487,711	3,487,711	100.00%

Notes:
1 Includes fixed gillnets (NEGEAR2=10), drift gillnets (11), mixed traps/pots (18), shrimp trap/pots (19), offshore lobster trap/pot (20), inshore lobster trap/pot (21), and crab trap/pots (30).

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

4.2.10 Scup

Scup, *Stenotomus chrysops*, occur primarily in the Mid-Atlantic Bight from Cape Cod, MA to Cape Hatteras, NC. Seasonal migrations occur during spring and autumn. In summer, scup are common in inshore waters from Massachusetts to Virginia, while in winter, scup are found in offshore waters between Hudson Canyon and Cape Hatteras at depths ranging from 70 to 180 meters (38 to 98 fathoms). Sexual maturity is essentially complete by age three at a total length of 21 centimeters (8.3 inches), and spawning occurs during summer months. Scup attain a maximum fork length of about 40 centimeters (16 inches), and ages of up to 20 years have been reported. Tagging studies have indicated the possibility of two stocks, one in southern New

England waters and the other extending south from New Jersey. However, because the separation of stocks is not well-defined spatially, they are not considered distinct (NMFS, 2003b).

The fishery is now managed under the Mid-Atlantic Fishery Management Council's Summer Flounder, Scup, and Black Sea Bass FMP. Management within the commercial fishery includes a moratorium on commercial permits. Under this moratorium, only a limited number of permits are granted each year. Additional regulations include annually adjustable commercial trawl mesh and minimum size restrictions, and commercial catch quotas for the fishing year (January 1-December 31) (Mid-Atlantic Fishery Management Council, 2003). The scup season is divided into three periods: Winter I, Summer, and Winter II. The fishery is closed each period once the quota for the season has been reached. Also, Framework Adjustment 5 to the FMP, adopted in 2004, allows for annual specifications to remain in effect for up to 3 years (69 FR 62818).

In 2011, NMFS issued commercial moratorium permits for scup to 761 vessels and charter/party permits to 761 vessels. Both the commercial moratorium and charter/party permits have mandatory reporting requirements and are included in the Vessel Trip Reporting system. Exhibit 4-29 presents the number of vessels permitted to fish for scup in the Northeast under the authority of the Summer Flounder, Scup, and Black Sea Bass FMP, by intended gear type and intended primary gear type. The most prevalent primary gear type is "other gear" – which includes hand lines, rod and reel, harpoons, diving gear, and other unspecified types of gear – followed by bottom trawls. A total of 114 vessels (about 8 percent) holding scup permits in 2011 indicated an ALWTRP affected gear type as their primary gear.

Scup landings in the Northeastern U.S. totaled approximately 15 million pounds in 2011. Trawls and other or non-coded types of fishing gear were used to catch the greatest percentage of scup, with about 59 percent and 26 percent, respectively (see Exhibit 4-30).

The ex-vessel value of scup landings in the Northeast totaled $8.2 million in 2011. Exhibit 4-31 summarizes the top grossing ports for scup in 2011. As shown, Point Judith, Rhode Island is the leading port, although significant quantities of scup are also landed at other locations.

Exhibit 4-29

PERMITTED SCUP VESSELS, 2011 [1]

Gear Name	By All Gear		By Primary Gear	
	Number	**% of Total**	**Number**	**% of Total**
Purse Seine	70	4.8%	5	0.3%
Beach Seine	67	4.6%	0	0.0%
Boat Seine	70	4.8%	0	0.0%
Bottom Trawls	606	41.3%	523	35.8%
Mid-Water Trawls	285	19.4%	4	0.3%
Other Trawls	245	16.7%	8	0.5%
Dredge	171	11.7%	26	1.8%
Gill/Entangling Nets[2]	295	20.1%	57	3.9%
Pots and Traps[2]	152	10.4%	57	3.9%
Longlines and Setlines	189	12.9%	3	0.2%
Other Gear [3]	1,044	71.2%	788	53.9%
ALL GEAR TYPES [4,5]	1,466	100.0%	1,462	100.0%

Notes:

1 Permits are issued by fishing year. Fishing year 2011 extended from May 1, 2011, to April 30, 2012.

2 Shading indicates that ALWTRP regulated gear was identified as the primary gear.

3 Includes hand lines, rod and reel, harpoons, diving gear, and other gear types.

4 Number of vessels for each gear type will not sum to number of vessels for "all gear types" because vessels may be permitted to fish using multiple gear types.

5 The number of vessels using all gear types should be the same for "All Gear" and for "Primary Gear." The small difference shown above is likely due to a coding irregularity within the original data source.

Source: Data provided by NMFS, Northeast Region, Fisheries Statistics Office.

Exhibit 4-30

SCUP LANDINGS BY GEAR TYPE, 2011

Gear Type	Total Pounds Landed	Percent of Total Pounds Landed
Trawls	8,835,763	58.78%
Other	3,899,385	25.94%
Pots and Traps	1,045,200	6.95%
Hand Lines	607,869	4.04%
Dredge	317,594	2.11%
Other Nets	255,831	1.70%
Troll Lines	44,784	0.30%
Gill Nets	21,927	0.15%
Long Lines	2,961	0.02%
By Hand	799	0.01%
Rakes	247	0.00%
TOTAL	15,032,360	100.00%

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office

Exhibit 4-31

VALUE OF SCUP LANDINGS BY PORT, 2011[1]

Port	County	State	Total Value of all Landings ($)	Total Value of Fish Caught with ALWTRP Affected Gear[2] ($)	Percent of Revenues Attributable to ALWTRP Affected Gear
Point Judith	Washington	RI	2,297,993	30,594	1.33%
Montauk	Suffolk	NY	1,613,316	63	0.00%
Pt. Pleasant	Ocean	NJ	590,225	0	0.00%
Little Compton	Newport	RI	536,355	120,021	22.38%
New Bedford	Bristol	MA	447,315	44,780	10.01%
Other Ports			2,665,153	209,811	7.87%
TOTAL			8,150,357	405,269	4.97%

Notes:
1 Ports are listed in descending order based on the value of landings. The top five ports are presented in this exhibit.
2 Includes fixed gillnets (NEGEAR2=10), drift gillnets (11), mixed traps/pots (18), shrimp trap/pots (19), offshore lobster trap/pot (20), inshore lobster trap/pot (21), and crab trap/pots (30).

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

4.2.11 Jonah Crab

Jonah crab, *Cancer borealis,* is currently an unregulated species in Federal waters. Little is known about the species' biology, distribution, and relative abundance. Also known as the Rock crab and the Bull crab, Jonah crabs are found from Florida to Nova Scotia, mainly in offshore, rocky habitats. Females obtain a carapace width of 100 mm after about eight years, and males reach 130 mm in six to seven years. Individuals larger than 190 mm have not been observed, and it is believed that a terminal molt size might exist (NMFS, 2002b).

Jonah crab is a traditional by-catch of the Maine lobster fishery. Jonah crab landings have traditionally been used by lobstermen as a supplement to cover operating expenses. However, due to a recent increase in crab abundance and market demand, it has become profitable for lobstermen to target Jonah crab with lobster traps/pots during times of low lobster landings (generally in the spring). This in turn has led to interest in targeting Jonah crabs year round.

The State of Maine Department of Marine Resources (DMR) applied for an Exempted Fishing Permit that would allow lobstermen to fish experimental Jonah crab traps/pots in addition to their allotment of lobster traps/pots. This request triggered a Section 7 consultation that found that the proposed exemption would result in jeopardy to right whales. As a result, the action and consulting agencies developed a Reasonable and Prudent Alternative (RPA) and in September 2003, DMR was granted a one-year Exempted Fishing Permit. This permit allowed 100 participating fishermen to fish their permitted allotment of lobster traps/pots (in state and/or Federal waters) plus 200 experimental Jonah crab traps/pots in Federal waters of Federal Lobster Management Area 1.[16] Through this process, DMR hopes to demonstrate that the experimental Jonah crab trap/pot targets crabs, rather than lobster. If proven, DMR hopes to encourage NMFS and the ASMFC to revise the lobster regulations such that these modified traps/pots would not be considered lobster traps/pots and, consequently, would not be counted toward the fishermen's total allotment of traps/pots under the lobster regulations. The DMR expects that this study could lead to further examination of the potential sustainability and practicality of a directed Jonah crab fishery in the area.[17]

Landings of Jonah crab in the Northeastern U.S. totaled 11.4 million pounds in 2011.[18] Pots and traps were used to catch the 96 percent of Jonah crab landings during that year (see Exhibit 4-32).

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[16] This permit was also granted for the previous fishing year.

[17] C. Wilson, pers. comm., 2003.

[18] Data on Jonah crab landings may be inaccurate due to frequent misidentification at the docks as well as substantial cash transactions that are never documented.

Exhibit 4-32

JONAH CRAB LANDINGS BY GEAR TYPE, 2011

Gear Type	Total Pounds Landed	Percent of Total Pounds Landed
Pots and Traps	10,972,241	96%
Other	157,516	1%
Dredge	123,135	1%
Trawls	101,458	1%
Hand Line	16,795	0%
Tongs	8,078	0%
Other Nets	3,573	0%
Gillnets	2,166	0%
By Hand	81	0%
Rakes	73	0%
TOTAL	11,385,116	100%

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

The ex-vessel value of Jonah crab landings in the Northeast totaled approximately $6.5 million in 2011. Exhibit 4-33 identifies the top grossing ports. As shown, three ports account for the majority of revenues: New Bedford, Massachusetts, Sandwich, Massachusetts, and Point Judith, Rhode Island.

Exhibit 4-33

VALUE OF JONAH CRAB LANDINGS BY PORT, 2011

Port	County	State	Total Value of all Landings ($)	Total Value of Landings with ALWTRP Affected Gear[2] ($)	Percent of Revenues Attributable to ALWTRP Affected Gear
New Bedford	Bristol	MA	1,528,324	1,468,552	96.09%
Point Judith	Washington	RI	1,081,392	1,027,745	95.04%
Sandwich	Barnstable	MA	830,838	821,991	98.94%
Fairhaven	Bristol	MA	736,654	636,791	86.44%
Newport	Newport	RI	730,703	721,253	98.71%
Other Ports			1,544,180	1,506,380	97.55%
TOTAL			6,452,091	6,182,712	95.82%

Notes:

1 Ports are listed in descending order based on the value of landings. The top five ports are presented in this exhibit.

2 Includes fixed gillnets (NEGEAR2=10), drift gillnets (11), mixed traps/pots (18), shrimp trap/pots (19), offshore lobster trap/pot (20), inshore lobster trap/pot (21), and crab trap/pots (30).

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

4.2.12 Conch and Whelk[19]

The Atlantic Coast whelk fishery targets two principal species, the knobbed whelk (*Busycon carica*) and the channeled whelk (*Busycon canaliculatum*).[20] Both species are found in temperate waters from Massachusetts to Florida. They range from seven to ten inches in length.

The commercial whelk pot fishery along the Atlantic coast runs from Massachusetts to the Carolinas. Whelk meat is sold for consumption in both the domestic and international (primarily Asian) markets; however, recent data suggest that the majority of whelk meat is used as bait in the horseshoe crab fishery.

Approximately 2.3 million pounds of whelk were landed in the Northeast U.S. in 2011. Whelk is primarily caught by potting or dredging, and these methods accounted for approximately 78 percent and 16 percent of the landings, respectively. Exhibit 4-34 illustrates the distribution of landings by gear type.

Exhibit 4-34

CONCH/WHELK LANDINGS BY GEAR TYPE, 2011

Gear Type	Total Pounds Landed	Percent of Total Pounds Landed
Pots and Traps	1,773,807	77.87%
Dredge	361,627	15.87%
Other	56,786	2.49%
Trawls	50,208	2.20%
Long lines	19,386	0.85%
Gillnets	7,793	0.34%
Rakes	5,122	0.22%
Hand Line	1,016	0.04%
Troll Line	888	0.04%
By Hand	687	0.03%
Other Nets	318	0.01%
Tongs	271	0.01%
Rakes	65	0.00%
TOTAL	2,277,974	100.00%

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

[19] Information in this section is taken from U.S. Fish and Wildlife Service, 2000.

[20] The knobbed and channeled whelk caught along the Atlantic coast are commonly referred to as "conch" in industry transactions.

The ex-vessel value of whelk landings in the Northeast totaled approximately $9.0 million in 2011. Exhibit 4-35 summarizes the top grossing ports for whelk in 2011. Landings are distributed among a variety of ports, with Edgarton and Harwichport, Massachusetts most prominent.

Exhibit 4-35

VALUE OF WHELK LANDINGS BY PORT, 2011[1]

Port	County	State	Total Value of all Landings ($)	Total Value of Landings with ALWTRP Affected Gear[2] ($)	Percent of Revenues Attributable to ALWTRP Affected Gear
Edgartown	Dukes	MA	719,706	719,700	100.00%
Harwichport	Barnstable	MA	649,716	647,707	99.69%
Oak Bluffs	Dukes	MA	628,820	628,820	100.00%
Bristol	Bristol	RI	483,956	479,170	99.01%
Nantucket	Nantucket	MA	391,023	0	0.00%
Other Ports			4,423,590	3,870,866	87.51%
TOTAL[3]			7,296,811	6,346,263	86.97%

Notes:
1 Ports are listed in descending order based on the value of landings. The top five ports are presented in this exhibit.
2 Includes fixed gillnets (NEGEAR2=10), drift gillnets (11), mixed traps/pots (18), shrimp trap/pots (19), offshore lobster trap/pot (20), inshore lobster trap/pot (21), and crab trap/pots (30).
3 The dealer data do not assign approximately $1.7 million in ex-vessel revenue to a specific port. Total ex-vessel for the whelk fishery is approximately $8,978,147.

Source: Dealer data provided by NMFS, Northeast Region, Fisheries Statistics Office.

4.2.13 Other Affected Fisheries

The gear modifications required by the ALWTRP will affect all fisheries that use gillnets or traps/pots. The previous sections discuss fisheries that rely heavily on such gear and thus are most likely to be affected by changes in ALWTRP requirements. Other trap/pot fisheries that may be affected to a lesser extent by changes in ALWTRP regulations include the fisheries for Northern shrimp (Maine), blue crab, rock crab, catfish, tautog, cod, haddock, pollock, redfish, white hake, and American eel. Some of these trap/pot fisheries are small and primarily recreational (e.g., tautog). Others are commercially significant, but either make limited use of affected trap/pot gear (e.g., Northern shrimp, cod) or occur primarily in coastal or estuarine waters not covered by the ALWTRP (e.g., blue crab, American eel). As noted, Appendix 4-A provides a complete listing of the species landed using trap/pot gear.

Other potentially affected gillnet fisheries include Atlantic croaker, Atlantic mackerel, black drum, bluefish, bonito, herring, jack crevalle, menhaden, pompano, shad, skate, spot, striped bass, sturgeon, weakfish, white perch, Southern Kingfish (whiting), and yellow perch. Catch of these species by ALWTRP affected gear types is relatively small. However, to the extent that these species are caught with ALWTRP affected gear in ALWTRP regulated areas, and are part of a Category I or II fishery as designated by the List of Fisheries, fishermen may be affected by the ALWTRP.

The total ex-vessel revenue associated with ALWTRP gear used in all the affected fisheries is approximately $462 million.

4.3 OTHER AFFECTED SPECIES

The ALWTRP may also benefit other protected species that inhabit the same waters as Atlantic large whales. Evidence suggests that some of these species can become entangled in fishing gear; therefore, this risk may be affected by changes in ALWTRP requirements. This section discusses the life cycle and abundance of each species and briefly reviews threats to each species' survival, including interaction with commercial fishing gear. Chapter 5 provides more detailed information on the entanglement risk these species face, and the potential risk reduction offered by the regulatory alternatives under consideration.

The discussion below is divided into two categories: (1) species not likely to be affected by changes in ALWTRP requirements; and (2) species potentially affected by changes in ALWTRP requirements. Exhibit 4-36 summarizes the species of interest and their current status under the ESA or MMPA.

Exhibit 4-36

OTHER SPECIES POTENTIALLY AFFECTED BY ALWTRP MODIFICATIONS

Potential Effect	Category	Species	Status
Not Likely to Be Affected	Fish	Atlantic Salmon	Endangered
		Shortnose Sturgeon	Endangered
	Birds	Piping Plover	Endangered
		Roseate Tern	Endangered
Potentially Affected	Whales	Blue Whale	Endangered
		Brydes Whale	Protected
		Sei Whale	Endangered
		Sperm Whale	Endangered
	Fish	Atlantic Sturgeon	New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs as “endangered,” and the Gulf of Maine DPS as “threatened”
	Porpoises and Dolphins	Harbor Porpoise	Protected
		WNA Coastal Bottlenose Dolphin	Protected
		Atlantic White-Sided Dolphin	Protected
		Risso’s Dolphin	Protected
		Spotted Dolphin	Protected
		Striped Dolphin	Protected
		Pilot Whale	Protected
		Offshore Bottlenose Dolphin	Protected
		Common Dolphin	Protected
	Seals	Harbor Seal	Protected
		Gray Seal	Protected
		Harp Seal	Protected
	Turtles	Kemp’s Ridley Sea Turtle	Endangered
		Loggerhead Sea Turtle	Threatened
		Leatherback Sea Turtle	Endangered
		Green Sea Turtle	Endangered
		Hawksbill Sea Turtle	Endangered
		Olive Ridley Sea Turtle	Threatened

4.3.1 Species Not Likely to Be Affected

Several endangered or protected species are found in waters regulated under the ALWTRP but are not likely to be entangled in trap/pot or gillnet gear managed by the Plan. These species are discussed briefly below.

4.3.1.1 Atlantic Salmon

At one time, Atlantic salmon (*Salmo salar*) distinct population segments (DPSs) probably existed in Long Island Sound and Central New England.[21] Today, the only remaining U.S. Atlantic salmon DPS is in the Gulf of Maine. The Gulf of Maine DPS is comprised of all anadromous Atlantic salmon whose freshwater range occurs in watersheds from the Androscoggin northward to the Dennys (Fay et al., 2006). The Gulf of Maine (GOM) Distinct Population Segment (DPS) of anadromous Atlantic salmon was initially listed by the USFWS and NMFS (collectively, the Services) as an endangered species on November 17, 2000 (65 FR 69459). A subsequent listing as an endangered species by the Services (74 FR 29344; June 19, 2009) included an expanded range for the GOM DPS of Atlantic salmon.

Atlantic salmon spawn in fresh water in the early autumn. The fertilized eggs remain in gravel on the stream bottom until spring, when they hatch and small fish called “fry” emerge. Fry quickly develop into “parr,” a two- to three-inch-long fish that remains in freshwater. In New England rivers, it takes parr two to three years to grow large enough to develop into “smolts.” In the smolt stage (approximately six inches long), the young salmon migrate downstream to the ocean. Less is known about the animal’s saltwater life, but tagging studies have shown that young salmon migrate as far north as the Labrador Sea during their first summer in the ocean. After their first winter at sea, some of the salmon become sexually mature and return to their natal rivers to spawn. These are referred to as “one seawinter salmon” or “grilse,” and are much more common among Canadian stocks than among the salmon in Maine rivers. Salmon that remain at sea for a second winter to feed in the coastal waters of Canada and Greenland grow to approximately 30 inches in length and eight to 15 pounds. These salmon can return from the ocean anytime from spring through fall, but the peak “run” is in June. Spawning takes place from late October through November. Some salmon return to sea immediately after spawning, but most (80 percent) spend the winter in the stream and migrate back to the ocean in the spring.

Historically, two seawinter fish were caught in commercial gillnet fisheries off Nova Scotia, Newfoundland, Labrador, and West Greenland. These fisheries have recently been closed or vastly reduced to protect the remaining stocks. There has also been recreational fishing for salmon in rivers and estuaries as they return to spawn. In recent years, this activity was limited to catch-and-release fishing; in 2000, recreational fishing was closed altogether (except for an angling fishery on stocked fish farther south in the Merrimack River) (NMFS and U.S. Fish and Wildlife Service, 2000).

Adult returns to the GOM DPS have been very low for many years and remain extremely low in terms of adult abundance in the wild. Further, the majority of all adults in the GOM DPS return to a single river, the Penobscot, which accounted for 91 percent of all adult returns to the GOM DPS in 2007. Of the 1044 adult returns to the Penobscot in 2006, 996 of these were the result of smolt stocking and only the remaining 48 were naturally-reared. A total of 916 and

[21] The ESA extends protection to a distinct population segment (DPS) in part to preserve genetic diversity important to the species’ survival. A DPS is a population segment that is: (1) “discrete” (to some extent separated from the remainder of the species or subspecies), and (2) “significant” (biologically and ecologically).

2,117 adult salmon returned to the Penobscot River in 2007 and 2008, respectively. Most of these returns were also of hatchery origin (USASAC 2008). The term naturally-reared includes fish originating from natural spawning and from hatchery fry (USASAC 2008). Hatchery fry are included as naturally-reared because hatchery fry are not marked; therefore, they cannot be distinguished from fish produced through natural spawning. Because of the extensive amount of fry stocking that takes place in an effort to recover the GOM DPS, it is possible that a substantial number of fish counted as naturally-reared were actually stocked as fry. The abundance of Atlantic salmon in the GOM DPS has been low and either stable or declining over the past several decades. The proportion of fish that are of natural origin is very small (approximately 10%) and is continuing to decline. The conservation hatchery program has assisted in slowing the decline and helping to stabilize populations at low levels, but has not contributed to an increase in the overall abundance of salmon and has not been able to halt the decline of the naturally-reared component of the GOM DPS. No harvest of Atlantic salmon is allowed in the EEZ under the New England Fishery Management Council's Atlantic Salmon FMP (64 FR 40521).

No data exist to demonstrate that Atlantic salmon interact with ALWTRP regulated gear. Any ALWTRP changes to numbers of vertical lines, gear configuration and/or marking will likely have no impact on the survival of Atlantic salmon in the Gulf of Maine.

4.3.1.2 Shortnose Sturgeon

The sturgeon family is among the most primitive of the bony fishes. The shortnose sturgeon (*Acipenser brevirostrum*) shares the same general external morphology of all sturgeon. Its elongated fusiform body is moderately depressed and the body surface contains five rows of bony plates or scutes. Its subterminal mouth has barbels and is well suited for bottom feeding (mollusks and crustaceans are the primary food of adults) and a generally benthic existence.

The shortnose sturgeon is an anadromous fish that spawns in the coastal rivers along the east coast of North America from the St. John River in Canada to the St. Johns River in Florida. It prefers the nearshore marine, estuarine, and riverine habitat of large river systems. Unlike other anadromous species in the region such as shad or salmon, shortnose sturgeon do not appear to frequently make long-distance offshore migrations. Hence, the impact of the ALWTRP on the species is likely to be minor.[22]

Male and female shortnose sturgeons mature at the same length (45 to 55 cm fork length) throughout their range. However, age of maturation varies from north to south due to a slower growth rate in the north. Males may mature at two to three years of age in Georgia, at age three to five from South Carolina to New York, and at age 10 to 11 in the St. John River, Canada. Females exhibit a similar trend and mature at age six or younger in Georgia, at age six to seven from South Carolina to New York, and at age 13 in the St. John River. Age of first spawning in males occurs one to two years after maturity, but among females is delayed for up to five years. Generally, females spawn every three years, although males may spawn every year.

[22] Unless otherwise indicated, the information provided in this section is based on material provided at the NMFS Protected Resources website: http://www.nero.noaa.gov/prot_res/sturgeon/.

While the shortnose sturgeon was rarely the target of a commercial fishery, it often was taken incidentally in the commercial fishery for Atlantic sturgeon. In the 1950s, sturgeon fisheries declined on the east coast and systematic data on shortnose sturgeon landings became scarce. This led the Fish and Wildlife Service (FWS) to conclude that the fish had been eliminated from the rivers in its historic range (except the Hudson River) and was in danger of extinction. FWS believed the population level of the shortnose sturgeon had declined because of pollution and overfishing, both directly and incidentally in shad gillnets.

The shortnose sturgeon (*Acipenser brevirostrum*) was listed as endangered in its entire range on March 11, 1967 (32 FR 4001). Shortnose sturgeon remained on the endangered species list with enactment of the ESA in 1973. Populations occur in New Brunswick, Canada (1), Maine (2), Massachusetts (1), Connecticut (1), New York (1), New Jersey/Delaware (1), Maryland/Virginia (1), North Carolina (1), South Carolina (4), Georgia (4) and Florida (2).

No data exist to demonstrate that shortnose sturgeon interact with ALWTRP regulated gear; therefore, trap/pot and gillnet gear managed under the ALWTRP pose little or no threat to this species.

4.3.1.3 Roseate Tern and Piping Plover

The roseate tern (*Sterna dougallii dougallii*) and piping plover (*Charadrius melodus*) inhabit coastal waters and nest on coastal beaches within the Northeast Region. Terns prey on small schooling fishes, while plovers prey on shoreline invertebrates and other small fauna. Foraging activity for these species occurs either along the shoreline (plovers) or within the top several meters of the water column (terns). Trap/pot and gillnet gear managed under the ALWTRP are expected to pose little or no threat to these species or their forage species.

4.3.2 Species Potentially Affected

A variety of endangered, threatened, or protected species would potentially be affected by changes in ALWTRP requirements. The sections below examine protected whale, porpoise, dolphin, seal, fish and turtle species whose survival may be affected by interactions with commercial fishing gear.

4.3.2.1 Whales

Blue Whale

Like the fin whale, blue whales (*Balaenoptera musculus*) occur worldwide and are believed to follow a similar migration pattern from northern summering grounds to more southern wintering areas (Perry et al., 1999). Three subspecies have been identified: *Balaenoptera musculus musculus, B.m. intermedia*, and *B.m. brevicauda* (NMFS, 1998b). Only *B.m. musculus* occurs in the northern hemisphere. Blue whales range in the North Atlantic from the subtropics to Baffin Bay and the Greenland Sea. The IWC currently recognizes these whales as one stock (Perry et al., 1999).

Blue whales were hunted intensively from the turn of the century, when development of steam-powered vessels and deck-mounted harpoon guns made it possible to exploit them on an industrial scale, to the mid-1960s (NMFS, 1998b). Blue whale populations declined worldwide as the new technology spread and became widely used (Perry et al., 1999). Subsequently, the whaling industry shifted effort away from declining blue whale stocks and targeted other large species, such as fin whales, and then resumed hunting for blue whales when the species seemed to be more abundant (Perry et al., 1999). The result was a cyclical rise and fall, leading to severe depletion of blue whale stocks worldwide (Perry et al., 1999). In all, at least 11,000 blue whales were taken in the North Atlantic from the late 19th century through the mid-20th century. Blue whales were given complete protection in the North Atlantic in 1955 under the International Convention for the Regulation of Whaling. There are no good estimates of the pre-exploitation size of the western North Atlantic blue whale stock, but it is widely believed that this stock was severely depleted by the time legal protection was introduced in 1955 (Perry et al., 1999). Mitchell (1974) suggested that the stock numbered in the very low hundreds during the late 1960s through early 1970s (Perry et al., 1999). Photo-identification studies of blue whales in the Gulf of St. Lawrence from 1979 to 1995 identified 320 individual whales (NMFS, 1998b). NMFS recognizes a minimum population estimate of 308 blue whales within the Northeast Region (Waring et al., 2002).

Blue whales are only occasional visitors to east coast U.S. waters. They are more commonly found in Canadian waters, particularly the Gulf of St. Lawrence, where they are present for most of the year, and in other areas of the North Atlantic. It is assumed that blue whale distribution is governed largely by food requirements (NMFS, 1998b). In the Gulf of St. Lawrence, blue whales seem to predominantly feed on a variety of copepod species (NMFS, 1998b).

Compared to the other species of large whales, relatively little is known about this species. Sexual maturity is believed to occur in both sexes between five and 15 years of age. Gestation lasts ten to 12 months and calves nurse for six to seven months. The average calving interval is estimated to be two to three years. Birth and mating both take place in the winter season (NMFS, 1998b), but the location of wintering areas is speculative (Perry et al., 1999). In 1992, the U.S. Navy and contractors conducted an extensive blue whale acoustic survey of the North Atlantic and found concentrations of blue whales on the Grand Banks and west of the British Isles. One whale was tracked for 43 days, during which it traveled 1,400 nautical miles around the general area of Bermuda (Perry et al., 1999).

There is limited information on the factors affecting natural mortality of blue whales in the North Atlantic. Ice entrapment is known to kill and seriously injure some blue whales during late winter and early spring, particularly along the southwest coast of Newfoundland. Habitat degradation has been suggested as possibly affecting blue whales in the Gulf of St. Lawrence, where habitat has been degraded by acoustic and chemical pollution. However, there are no data to confirm that blue whales have been affected by such habitat changes (Perry et al., 1999).

Ship strikes and entanglements in commercial fishing gear are believed to be the major sources of anthropogenic mortality and injury of blue whales. However, confirmed deaths or serious injuries are few. In 1987, concurrent with an unusual influx of blue whales into the Gulf of Maine, one report was received from a whale watch boat that spotted a blue whale in the southern Gulf of Maine entangled in gear described as probable lobster pot gear. A second animal found in the Gulf of St. Lawrence apparently died from the effects of an entanglement. In March 1998, a juvenile male blue whale was carried into Rhode Island waters on the bow of a tanker. The cause of death was determined to be due to a ship strike that may have occurred outside the U.S. EEZ (Waring et al., 2002).

Sei Whale

The range of sei whales (*Balaenoptera borealis*) extends from subpolar to subtropical and even tropical marine waters; however, the species is most commonly found in temperate waters (Perry et al., 1999). Based on past whaling operations, the IWC recognized three stocks in the North Atlantic: (1) Nova Scotia; (2) Iceland-Denmark Strait; and (3) Northeast Atlantic (Donovan, 1991 *in* Perry et al., 1999). Mitchell and Chapman (1977) suggested that the sei whale population in the western North Atlantic consists of two stocks, a Nova Scotian Shelf stock and a Labrador Sea stock. The Nova Scotian Shelf stock includes the continental shelf waters of the Northeast Region, and extends northeastward to south of Newfoundland. The IWC boundaries for this stock are from the U.S. east coast to Cape Breton, Nova Scotia and east to 42°00'W longitude (Waring et al., 2003). This is the only sei whale stock within ALWTRP boundaries.

Sei whales became the target of modern commercial whalers in the late 19th and early 20th century after stocks of other whales, including right, humpback, fin, and blues, had already been depleted. Sei whales were taken in large numbers by Norway and Scotland from the beginning of modern whaling (NMFS, 1998a). Small numbers were also taken off of Spain, Portugal, and West Greenland from the 1920s to 1950s (Perry et al., 1999). In the western North Atlantic, a total of 825 sei whales were taken on the Scotian Shelf between 1966 and 1972, and an additional 16 were taken by a shore-based Newfoundland whaling station (Perry et al., 1999). The species continued to be exploited in Iceland until 1986 even though measures to stop whaling of sei whales in other areas had been put into place in the 1970s (Perry et al., 1999). There is no estimate for the abundance of sei whales prior to commercial whaling. Based on whaling records, approximately 14,295 sei whales were taken in the entire North Atlantic from 1885 to 1984 (Perry et al., 1999).

Sei whales winter in warm temperate or subtropical waters and summer in more northern latitudes. In the North Atlantic, most births occur in November and December, when the whales are on their wintering grounds. Conception is believed to occur in December and January. Gestation lasts for 12 months, and calves are weaned at between six and nine months, when the whales are on the summer feeding grounds (NMFS, 1998a). Sei whales reach sexual maturity between five and 15 years of age. The calving interval is believed to be two to three years (Perry et al., 1999).

Sei whales occur in deep water throughout their range, typically over the continental slope or in basins situated between banks (NMFS, 1998a). In the northwest Atlantic, the whales travel along the eastern Canadian coast in autumn on their way to the Gulf of Maine and Georges Bank, where they occur in winter and spring. Within the Northeast Region, the sei whale is most common on Georges Bank, including the Great South Channel, and into the Gulf of Maine/Bay of Fundy region during spring and summer. Individuals may range as far south as North Carolina. It is important to note that sei whales are known for inhabiting an area for weeks at a time, then disappearing for years or even decades. This has been observed in many areas, including in the southwestern Gulf of Maine in 1986, but the basis for this phenomenon is not clear.

Although sei whales may prey upon small schooling fish and squid in the Northeast Region, available information suggests that calanoid copepods are the primary prey of this species. There are occasional influxes of sei whales farther into Gulf of Maine waters, presumably in conjunction with years of high copepod abundance inshore. Sei whales are occasionally seen feeding in association with right whales in the southern Gulf of Maine and in the Bay of Fundy, although there is no evidence of interspecific competition for food resources. There is very little information on natural mortality factors for sei whales. Possible causes of natural mortality, particularly for young, old, or otherwise compromised individuals, are shark attacks, killer whale attacks, and endoparasitic helminthes (Perry et al., 1999).

There are insufficient data to determine trends of the sei whale population. The total number of sei whales in the U.S. Atlantic EEZ is unknown. However, five abundance estimates are available for portions of the sei whale habitat: from Nova Scotia during the 1970s, in the U.S. Atlantic EEZ during the springs of 1979-1981, and in the U.S. and Canadian Atlantic EEZ during the summers of 2002, 2004, and 2006. The August 2004 abundance estimate (386) is considered the best available for the Nova Scotia stock of sei whales. The minimum population estimate is 208 (Waring et al., 2012).

Few instances of injury or mortality of sei whales due to entanglement or vessel strikes have been recorded in U.S. waters. For the period 2005 through 2009, the minimum annual rate of human-caused mortality and serious injury to sei whales was 1.02. This value includes incidental fishery interaction records, 0.6, and records of vessel collisions, 0.6 (Henry *et al. 2*011). Annual rates calculated from detected mortalities should not be considered an unbiased representation estimate of human-caused mortality. Detections are haphazard, incomplete and not the result of a designed sampling scheme. As such, they represent a minimum estimate of human-caused mortality which is almost certainly biased low (Waring et al., 2012).

Sperm Whale

Sperm whales (*Physeter macrocephalus*) inhabit all ocean basins, from equatorial waters to the polar regions (Perry et al., 1999). In the western North Atlantic they range from Greenland to the Gulf of Mexico and the Caribbean. The sperm whales that occur in the western North Atlantic are believed to represent only a portion of the total stock (Blaylock et al., 1995). Total numbers of sperm whales off the U.S. or Canadian Atlantic coast are unknown, although eight estimates from selected regions of the habitat do exist for select time periods. The best recent abundance estimate for sperm whales is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 4,804 (CV=0.38), where the estimate from the northern U.S. Atlantic is 2,607 (CV=0.57), and from the southern U.S. Atlantic is 2,197 (CV=0.47). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat (Waring et al., 2007). The IWC recognizes one stock for the entire North Atlantic (Waring et al., 2002).

The IWC estimates that nearly a quarter-million sperm whales were killed worldwide in whaling activities between 1800 and 1900 (IWC, 1971). With the advent of modern whaling the larger rorqual whales were targeted; however, as their numbers decreased, whaling pressure again focused on smaller rorquals and sperm whales. From 1910 to 1982, there were nearly 700,000 sperm whales killed worldwide from whaling activities (Clarke, 1954; Committee for Whaling Statistics, 1959-1983). Some sperm whales were also taken off the U.S. Mid-Atlantic coast (Reeves and Mitchell, 1988; Perry et al., 1999) and in the northern Gulf of Mexico (Perry et al., 1999). Recorded North Atlantic sperm whale catch numbers for Canada and Norway from 1904 to 1972 total 1,995. All killing of sperm whales was banned by the IWC in 1988.

Sperm whales generally occur in waters greater than 180 meters in depth, with a preference for continental margins, seamounts, and areas of upwelling, where food is abundant (Leatherwood and Reeves, 1983). Sperm whales in both hemispheres migrate to higher latitudes in the summer to feed, and return to lower latitudes in the winter, where mating and calving occur. Mature males typically range to greater latitudes than mature females and immature animals, but return to the lesser latitudes in the winter to breed (Perry et al., 1999). Waring et al. (1993) suggest sperm whale distribution is closely correlated with the Gulf Stream edge, with a migration to higher latitudes during summer months resulting in concentrations of whales east and northeast of Cape Hatteras. This distribution extends farther northward to areas north of Georges Bank and the Northeast Channel region in summer, then shifts south of New England in fall, back to the Mid-Atlantic Bight (Waring et al., 2002).

Mature females in the northern hemisphere ovulate from April through August. A single calf is born after a 15-month gestation. A mature female will produce a calf every four to six years. Females attain sexual maturity at a mean age of nine years, while males have a prolonged puberty and attain sexual maturity at a mean age of 19 years (Waring et al., 2002). Male sperm whales may not reach physical maturity until they are 45 years old (Waring et al., 2002). The sperm whale's prey consists of larger mid-water squid and fish species (Perry et al., 1999). Sperm whales, especially mature males in greater latitudinal waters, have been observed to take significant quantities of large demersal and deep water sharks, multispecies, and bony fishes.

Few instances of injury or mortality of sperm whales due to human impacts have been recorded in U.S. waters. Between August 1993 and May 1998, three sperm whale entanglements were documented, one each in longline gear (dead floating whale), fine mesh gillnet (disentangled), and net gear (status unknown). The NEFSC bycatch database contains two records of sperm whale entanglement, both involving injured whales that were released from pelagic drift gillnet gear (Waring et al., 2002). No mortalities or serious injuries have been directly observed in the pelagic longline, pelagic pair trawl, Northeast multispecies sink gillnet, Mid-Atlantic coastal gillnet, or North Atlantic bottom trawl fisheries (Waring et al., 2002).[23] During 2001-2005, human caused mortality was 0.2 sperm whales per year (CV=unknown). This is derived from two components: 0 sperm whales per year (CV=unknown) from U.S. fisheries using observer data and 0.2 sperm whales per year from ship strikes (Waring et al., 2007). Ships can also strike sperm whales, but due to the offshore distribution of this species, interactions (both ship strikes and entanglements) that do occur are less likely to be reported than those involving right, humpback, and fin whales, which are more often found in nearshore areas. Other impacts noted above for baleen whales may also occur.

As a result of their offshore distribution, sperm whales tend to strand less often than, for example, right and humpback whales. Preliminary data for 2000 indicate that out of ten sperm whales reported to the stranding network (nine dead and one injured), there was one possible fishery interaction, one ship strike (wounded with bleeding gash on side), and eight animals for which no signs of entanglement or injury were sighted or reported.

It has been suggested that another potential human-caused source of mortality for sperm whales may be the accumulation of stable pollutants such as polychlorinated biphenyls (PCBs), chlorinated pesticides, polycyclic aromatic hydrocarbons, and heavy metals. Though not conclusively caused by contaminant burden, tissue samples from 21 sperm whales that mass stranded in the North Sea in 1994/95 showed cadmium levels twice as high as those found in North Pacific sperm whales, possibly affecting the stranded animals' health and behavior (Holsbeek, et al. 1999).

4.3.2.2 Harbor Porpoise

The harbor porpoise (*Phocoena phocoena*) is found in temperate and subpolar waters in the Northern Hemisphere. The species frequents nearshore waters such as bays and estuaries, but also travels in deeper offshore waters. The Gulf of Maine/Bay of Fundy stock includes all harbor porpoise found in the waters of eastern North America south of (and including) Nova Scotia and the Bay of Fundy. To estimate the population size of harbor porpoises in the Gulf of Maine/Bay of Fundy region, eight line transect sighting surveys were conducted during the summers of 1991, 1992, 1995, 1999, 2002, 2004, 2006, and 2007. The best current abundance estimate of the Gulf of Maine/Bay of Fundy harbor porpoise stock is 79,883 (Waring et al 2013).

Harbor porpoise prey on small schooling fish, including some fish that are sought by gillnet fishermen. As a result, harbor porpoise can become entangled in gillnets and drown. Gillnets typically used in Northeast and Mid-Atlantic U.S. waters to catch groundfish, such as cod and flounder, have been one source of harbor porpoise mortality and serious injury.[24] In 1993, NMFS proposed to list the Gulf of Maine/Bay of Fundy stock of harbor porpoise under the ESA as threatened. At the time of the proposal, the listing was considered necessary based on analyses of the porpoise bycatch rate in commercial gillnet fisheries.

[23] It is important to note that the pelagic drift gillnet fishery no longer exists; therefore, this type of gear no longer poses an entanglement threat to this species.

[24] In addition to incidental takes in U.S. waters, the harbor porpoise is also vulnerable to takes in the Canadian Bay of Fundy groundfish sink gillnet and herring weir fisheries.

Following this proposal, NMFS solicited public comment and scientific review to assess questions on the sufficiency and accuracy of bycatch data used in making the "threatened" determination. Average annual estimated harbor porpoise mortality and serious injury in the Northeast sink gillnet fishery from 1994 to 1998 was 1,163. A Take Reduction Team was formed in 1996 to address incidental take of harbor porpoise in the Northeast groundfish sink gillnet and Mid-Atlantic coastal gillnet fisheries. Regulations (63 FR 66464) implementing the Harbor Porpoise Take Reduction Plan (HPTRP) to reduce harbor porpoise bycatch in U.S. Atlantic gillnets were published on December 1, 1998 and became effective January 1, 1999 (63 FR 66464). The Gulf of Maine portion of the HPTRP pertains to all fishing with sink gillnets and other gillnets capable of catching multispecies in New England waters, from Maine through Rhode Island, and includes time and area closures, some of which are complete closures. Other fisheries are closed to multispecies gillnet fishing unless pingers (sound-making devices) are used in the prescribed manner. The Mid-Atlantic portion of the HPTRP pertains to the Mid-Atlantic shore line from New York to North Carolina, and also includes time and area closures.

The total annual estimated average human-caused mortality is 927 harbor porpoises per year. This is derived from two components: 883 harbor porpoise per year from U.S. fisheries using observer and MMAP data, and 44 per year (unknown CV) from Canadian fisheries using observer data (Waring et al., 2012). Average estimated harbor porpoise mortality and serious injury in the Northeast sink gillnet fishery during 1994-1998, before the Take Reduction Plan, was 1,163 (0.11). The average annual harbor porpoise mortality and serious injury in the Northeast sink gillnet fishery from 2005 to 2009 was 559 (0.16) (Waring et al., 2012). Annual average estimated harbor porpoise mortality and serious injury from the Mid-Atlantic gillnet fishery during 1995 to 1998, before the Take Reduction Plan, was 358 (CV=0.20). The average annual harbor porpoise mortality and serious injury in the Mid-Atlantic gillnet fishery from 2005 to 2009 was 318 (0.26)(Waring et al., 2012). Annual average estimated harbor porpoise mortality and serious injury from the northeast bottom trawl fishery from 2005 to 2009 was 6.0 (0.22)(Waring et al., 2012).

A ruling to reduce harbor porpoise bycatch in U.S. Atlantic gillnets was published in the Federal Register (63 FR 66464) on December 2, 1998, and became effective January 1, 1999. The Gulf of Maine portion of the Harbor Porpoise Take Reduction Plan (HPTRP) pertains to all fishing with sink gillnets and other gillnets capable of catching regulated groundfish in New England waters, from Maine through Rhode Island. This portion of the rule includes time and area closures, some of which are complete closures; others are closed to gillnet fishing unless pingers are used in the prescribed manner. Also, the rule requires those who intend to fish to attend training and certification sessions on the use of the technology. The Mid-Atlantic portion of the plan pertains to waters west of 72º30'W longitude to the Mid-Atlantic shoreline from New York to North Carolina. This portion of the rule includes time and area closures, some of which are complete closures; others are closed to gillnet fishing unless the gear meets certain restrictions. The MMPA mandates that the take reduction teams that developed the above take reduction measures periodically meet to evaluate the effectiveness of the plan and modify it as necessary. The Harbor Porpoise Take Reduction Team was reconvened in December 2007 to discuss updated harbor porpoise abundance and bycatch information. The Team recommended modifications to the plan to further reduce harbor porpoise bycatch in commercial fisheries. As a result, the HPTRP was amended on February 19, 2010 (75 FR 7383), to expand management areas and seasons in which pingers are required, as well as to increase efforts to monitor and enforce the plan. In addition, the New England portion of the HPTRP included consequence closure areas as a management measure strategy. These areas with historically high bycatch rates will close seasonally only if bycatch rates over two consecutive management seasons exceed a specified bycatch rate. This management strategy is intended to reduce harbor porpoise bycatch and to increase compliance with HPTRP regulations. Once triggered, these areas would remain in effect until bycatch levels achieve zero mortality rate goal (ZMRG) or until new management measures are implemented in these areas (Waring et al., 2012). On October 4, 2013 NMFS published a final rule (78 FR 61821) removing the consequence closure strategy from the HPTRP. This action was necessary to prevent the improper triggering of consequence closure areas based on target harbor porpoise bycatch rates that no longer accurately reflect actual bycatch in New England sink gillnets due to fisherywide changes in fishing practices. NMFS will continue working the the Team to consider what additional management measures may be necessary to ensure compliance with the pinger requirements.

4.3.2.3 Dolphins

Pilot whales, and bottlenose, Atlantic white-sided, Risso's, striped, spotted, and common dolphins are protected dolphin species under the MMPA. This section provides further information on the range, abundance, and average annual fishery-related mortality associated with specific stocks of these species that are potentially affected by the ALWTRP.

Western North Atlantic Coastal Bottlenose Dolphin

Initially, a single stock of coastal morphotype bottlenose dolphins was thought to migrate seasonally between New Jersey (summer months) and central Florida based on seasonal patterns in strandings during a large scale mortality event occurring during 1987-1988 (Scott *et al.* 1988). However, re-analysis of stranding data (McLellan et al. 2003) and extensive analysis of genetic (Rosel et al. 2009), photo-ID (Zolman 2002), and satellite telemetry (Southeast Fisheries Science Center, unpublished data) data demonstrate a complex mosaic of coastal bottlenose dolphin stocks. Integrated analysis of these multiple lines of evidence suggests that there are five coastal stocks of bottlenose dolphins: the Northern Migratory and Southern Migratory stocks, a South Carolina/Georgia Coastal stock, a Northern Florida Coastal stock and a Central Florida Coastal stock (Waring et al., 2011).

One of the first abundance estimates for WNA coastal bottlenose dolphins was conducted in 1995. This 1995 abundance estimate was based upon results from the analyses of a combination of surveys. A new aerial survey to estimate abundance of WNA coastal bottlenose dolphins was conducted in 2002. The resulting estimates are summarized in Exhibit 4-37.

Bottlenose dolphins are known to interact with commercial fisheries and occasionally are taken in various kinds of fishing gear, including gillnets, seines, longlines, shrimp trawls, and crab traps/pots (Waring et al., 2002). Interactions are especially common in near-shore areas where dolphin densities and fishery efforts are greatest. The coastal bottlenose stocks are known to interact with the following commercial fisheries, according to the 2013 MMPA List of

Fisheries (LOF): the Mid-Atlantic gillnet, North Carolina inshore gillnet, Southeast Atlantic gillnet, Southeast Atlantic U.S. shark gillnet, Southeast Atlantic Gulf of Mexico shrimp trawl, Southeast U.S. Atlantic Gulf of Mexico stone crab trap/pot, Atlantic blue crab trap/pot, Mid-Atlantic menhaden purse seine, Mid-Atlantic haul/beach seine, and Virginia pound net.

Exhibit 4-37

ABUNDANCE ESTIMATES FOR THE WESTERN NORTH ATLANTIC COASTAL BOTTLENOSE DOLPHIN BY MANAGEMENT UNIT

Unit	Best Estimate	Coefficient of Variance	Minimum Estimate
Northern Migratory	9,604	0.36	7,147
Central Florida Coastal	6,318	0.26	5,094
Northern Florida Coastal	3,064	0.24	2,511
South Carolina-Georgia Coastal	7,738	0.23	6,399
Atlantic Southern Migratory Coastal	12,482	0.32	9,591
Source: Waring et al., 2010.			

Of the fisheries listed previously, the Mid-Atlantic coastal gillnet, Southeast Atlantic gillnet, Atlantic coastal blue crab trap/pot, and Southeastern U.S. Atlantic shark gillnet fisheries may be affected by potential revisions to the ALWTRP. The Mid-Atlantic coastal gillnet fishery accounts for the highest documented level of mortality or serious injury of coastal morphotype bottlenose dolphins.

In addition to interactions with gillnets, interactions with trap/pot gear may threaten bottlenose dolphins. Southeast Regional Marine Mammal Stranding Network data from 2004 through 2008 include 13 reports of interactions between bottlenose dolphins and confirmed blue crab pot gear with the majority of these occurring in waters from Florida to South Carolina. In addition, there were 4 interactions documented with pot gear where the fishery could not be confirmed. In these cases, the gear was confirmed to be associated with a pot or trap, but may have been from a fishery other than blue crab (e.g., whelk fisheries in Virginia) (Waring et al., 2010).

From 1995 to 2001, NMFS recognized only a single migratory stock of coastal bottlenose dolphins in the WNA, and the entire stock was listed as depleted. This stock structure was revised in 2002 to recognize both multiple stocks and seasonal management units and again in 2008 and 2009 to recognize resident estuarine stocks and migratory and resident coastal stocks. The total U.S. fishery-related mortality and serious injury for the Northern Migratory stock cannot be directly estimated because of the spatial overlap among the stocks of bottlenose dolphins that occupy waters of North Carolina. In addition, several fisheries are unobserved, and the reported mortalities are minimum estimates. The total mortality is therefore unlikely to be less than 10% of the calculated PBR, and thus cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This stock retains the depleted designation as a result of its origins from the coastal migratory stock. The species is not listed as threatened or endangered under the Endangered Species Act, but these are strategic stocks due to the depleted listing under the MMPA (Waring et al., 2010). The PBR levels and estimated 2004-2008 fisheries-related mortality for the five stocks are summarized in Exhibit 4-38.

Exhibit 4-38

ESTIMATED AVERAGE ANNUAL FISHERY MORTALITY (2004-2008) AND CURRENT PBR ESTIMATES FOR WESTERN NORTH ATLANTIC COASTAL BOTTLENOSE DOLPHINS

Stock	Estimated Mortality	Current PBR Estimates
Northern Migratory	6-8	71
Central Florida Coastal[1]	Unknown	51
Northern Florida Coastal[1]	Unknown	25
South Carolina-Georgia Coastal[1]	Unknown	64
Southern Migratory Coastal	24-55	96

Notes:
1. Three category II fisheries have the potential to interact with this stock, and observer coverage of these fisheries is limited.

Sources: Waring et al., 2010.

Other anthropogenic sources of mortality for bottlenose dolphins include pollution and habitat degradation. The nearshore habitat occupied by bottlenose dolphins is adjacent to human populations and, in the northern portion of its range, is highly industrialized. The blubber of stranded dolphins examined during a 1987-88 multiple mortality event along the Atlantic coast contained anthropogenic contaminants in levels among the highest ever recorded (Geraci, 1989).

On October 24, 2001, NMFS announced the creation of a Bottlenose Dolphin Take Reduction Team (BDTRT) and its first meeting (66 FR 53782). The BDTRT met five times before delivering consensus recommendations to NMFS on May 7, 2002. Additionally, the BDTRT met in April 2003 to review updated bottlenose dolphin abundance information and to augment original recommendations that failed to meet the statutory requirements of the MMPA. NMFS issued a final rule to implement the Bottlenose Dolphin Take Reduction Plan (BDTRP) on April 26, 2006 (71 FR 24776). The management measures implemented under the BDTRP are designed to address incidental mortality and serious injury of bottlenose dolphins in the Mid-Atlantic gillnet fishery and eight other coastal fisheries operating within the dolphin's distributional range. The BDTRP contains both regulatory and non-regulatory management measures to reduce serious injury and mortality of the Western North Atlantic coastal bottlenose dolphin stock (dolphin) (*Tursiops truncatus*), a strategic stock, in nine Category I and II commercial fisheries operating within the dolphin’s distributional range. The Western North Atlantic coastal bottlenose dolphin stock is split into seven spatial and temporal management units because of its biological complexity, and management measures in the BDTRP are applied by management unit. Both the regulatory and non-regulatory management measures are designed to meet the BDTRP’s short-term goal and provide a framework for meeting the long-term goal.

The regulatory management measures in the BDTRP include seasonal gillnet restrictions, gear proximity requirements, and gear length restrictions. The nighttime medium mesh (greater than 5–inch (12.7 cm) to less than 7–inch (17.8 cm) stretch) gillnet fishing prohibition in North Carolina state waters from November 1 through April 30, annually, was set to expire on May 26, 2009. This was extended an additional three years by a final rule issued December 19, 2008 (73 FR 77531). NMFS published a final rule on July 31, 2012 to permanently continue nighttime fishing restrictions of medium mesh gillnets operating in North Carolina coastal state waters from November 1 through April 30. NMFS also amended the BDTRP with updates, including updates recommended by the Team for non-regulatory conservation measures.

Atlantic White-Sided Dolphin

Atlantic white-sided dolphins (*Lagenorhynchus acutus*) are found in temperate and sub-polar waters of the North Atlantic, primarily on continental shelf waters out to the 100-meter depth contour. The species is distributed from central western Greenland to North Carolina, and possibly as far east as 43°00' W. There are possibly three stock units of this species: a Gulf of Maine stock, a Gulf of St. Lawrence stock, and a Labrador Sea stock (Palka et al., 1997). The Gulf of Maine stock is commonly found in continental shelf waters from Hudson Canyon to Georges Bank and into the Gulf of Maine to the Bay of Fundy. The best estimate of abundance for the western North Atlantic stock of Atlantic white-sided dolphin stock is 23,390, and the minimum estimate is 19,019 (Waring et al., 2012). The PBR for this stock is approximately 190 (Waring et al., 2012).

Atlantic white-sided dolphins have become entangled in Northeast sink gillnet, Mid-Atlantic coastal gillnet, pelagic drift gillnet, North Atlantic bottom trawl, and Atlantic squid, mackerel, and butterfish trawl fisheries. Total annual estimated average fishery-related mortality or serious injury to this stock during 2005-2009 was 245 (CV=0.12) white-sided dolphins (Waring et al., 2012). Approximately 36 of these mortalities are attributable to the Northeast sink gillnet fishery, 160 are attributed to the Northeast bottom trawl fishery; 1.9 to the Northeast mid water trawl fishery; 24 to the Mid-Atlantic mid water trawl fishery; and 23 to the Mid-Atlantic bottom trawl fishery (Waring et al., 2012). The Northeast sink gillnet fishery is currently regulated under the ALWTRP.

Risso's Dolphin

The Risso's dolphin (*Grampus griseus*) is found worldwide in tropical and temperate waters. The western North Atlantic stock occurs along the continental shelf from Cape Hatteras to Georges Bank. The best abundance estimate for Risso's dolphins is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 20,479 (CV=0.59), where the estimate from the northern U.S. Atlantic is 15,053 (CV=0.78), and from the southern U.S. Atlantic is 5,426 (CV=0.54). This joint estimate is considered best because these two surveys together have the most complete coverage of the population's habitat (Waring et al., 2012). The minimum estimate is 12,920 (Waring et al., 2012). Based on these data, the PBR for the western North Atlantic stock of Risso's dolphins is approximately 124 dolphins per year.

The total annual estimated average fishery-related mortality or serious injury to this stock during 2005-2009 was 18 Risso's dolphins (CV=0.37). The annual average combined mortality and serious injury for 2005- 2009 by fishery is as follows: 8 in the pelagic longline fishery; 3 in the Northeast sink gillnet fishery; and 7 in the Mid-Atlantic gillnet fishery (Waring et al., 2012). The Northeast sink gillnet fishery is currently regulated under the ALWTRP.

Pelagic Delphinids (Spotted Dolphin, Striped Dolphin, Pilot Whale, Offshore Bottlenose Dolphin, Common Dolphin)

The pelagic delphinid complex is made up of small odontocete species that are broadly distributed along the continental shelf edge where depths range from 200 - 400 meters. These species include the western North Atlantic stock of spotted dolphins, western North Atlantic stock of striped dolphins, western North Atlantic stock of pilot whales, the western North Atlantic offshore stock of bottlenose dolphins, and the western North Atlantic stock of common dolphins.

Spotted Dolphin

The Atlantic spotted dolphin, *Stenella frontalis*, is distributed from southern New England south through the Gulf of Mexico and the Caribbean to Venezuela (Waring et al., 2013). These dolphins are commonly found in large groups that feed on schools of fish. Spotted dolphins are known to feed on a variety of prey, including small-to-large epipelagic and mesopelagic fishes and squids, and benthic invertebrates (Perrin et al., 2002).

An abundance estimate of 26,798 (CV=0.66) Atlantic spotted dolphins was generated from a shipboard and aerial survey conducted during June–August 2011. The minimum population estimate based on the 2011 abundance estimate for the Atlantic spotted dolphin stock is 16,151 (Waring et al. 2013). Based on these data, the PBR for the Western North Atlantic stock of spotted dolphin is 162 (Waring et al., 2013).Total annual estimated average fishery-related mortality or serious injury to this stock during 2006-2010 was 0.2 (Waring et al., 2013).

Striped Dolphin

Striped dolphins (*Stenella coeruleoalba*) are found in the western North Atlantic from Nova Scotia south to at least Jamaica, in the Gulf of Mexico, and in general prefer continental slope waters offshore to the Gulf Stream (Waring et al., 2000). These dolphins, like spotted dolphins, are commonly found in large groups that feed on schools of fish. Striped dolphins feed on a variety of pelagic or benthopelagic fish and squid, and in the Northeast Atlantic primarily feed on cod (Perrin et al., 2002). The best abundance estimate for striped dolphins is the result of the 2011 survey— 46,882 (CV=0.33). The minimum population estimate for this stock is 35,763. Based on these data, the PBR for the western North Atlantic striped dolphin is 358 (Waring et al., 2013).

Bycatch has previously been observed by the NMFS Fisheries Observer Program in the pelagic drift gillnet and North Atlantic bottom trawl fisheries, but no mortalities or serious injuries have recently been documented in any U.S. fishery. Total annual estimated average fishery-related mortality to this stock during 2006-2010 was zero striped dolphins (Waring et al., 2013).

Pilot Whale

Pilot whales (*Globicephala melas* and *Globicephala macrorhynchus*) are found in the Gulf Stream and continental shelf and slope waters. Combined abundance estimates for the two pilot whale species – the long-finned and short-finned species have previously been derived from line-transect surveys. The best available abundance estimates are from surveys conducted during the summer of 2004. These survey data have been combined with an analysis of the spatial distribution of the two species based on genetic analyses of biopsy samples to derive separate abundance estimates (Garrison *et al.*, in prep.). The resulting abundance estimate is 12,619 (CV=0.37) for long-finned pilot whales in U.S. waters and 24,674 (CV=0.45) for short-finned pilot whales in U.S. waters (Waring et al., 2012). The minimum population estimate is 9,333 for long-finned pilot whales and 1,790 for short-finned pilot whales (Waring et al., 2012). PBR for long-finned pilot whales is 93 and for short-finned pilot whales is 172 (Waring et al., 2012).

Pilot whale bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet, pelagic longline, pelagic pair trawl, bluefin tuna purse seine, North Atlantic bottom trawl, Atlantic squid, mackerel, butterfish trawl, and Mid-Atlantic coastal gillnet fisheries, but no mortalities or serious injuries have been documented in the Northeast multispecies sink gillnet fishery.[25] It is not possible to partition mortality estimates between the two pilot whale species because there are very few available genetic samples from the area of overlap and season where most mortality occurs. Mortality and serious injury estimates are thus presented only for the two species combined. Total annual estimated average fishery-related mortality or serious injury during 2005-2009 was 162 pilot whales (CV=0.15) (Waring et al., 2012). The fisheries responsible for these interactions are as follows: 30 in Mid-Atlantic bottom trawl fishery; 12 in the Northeast bottom trawl fishery; 2.4 in the Mid-Atlantic mid water trawl fishery; 3 in the Northeast mid water trawl fishery; 114 in the pelagic longline fishery; and 1 in the 2005 pelagic longline experimental fishery (Waring et al., 2012).

During 2005-2009, several human and/or fishery interactions were documented in stranded pilot whales. During a UME in Dare, North Carolina, in January 2005, 6 of the 33 short-finned pilot whales which mass stranded had fishery interaction marks (specifics not given) which were healed and determined not to be the cause of death. A short-finned pilot whale stranded in May 2005 in North Carolina had net marks around the leading edge of the dorsal fin from the top to bottom, and had net marks on both fluke lobes. Two long-finned pilot whales stranded in Virginia in April 2005, 1 with a line on its fluke and another with human interactions noted but specifics not given. Of the 2006 stranding mortalities, 2 were reported as exhibiting signs of human interaction, 1 in Massachusetts and 1 in Virginia. In 2008, 1 Massachusetts stranding mortality was deemed a fishery interaction due to line markings and cut flukes. The 2 New York strandings of long-finned pilot whales were classified as human interactions. One

[25] Waring et al. (2003) note that the pelagic drift gillnet and the pelagic pair trawl fisheries no longer exist.

long-finned pilot whale that stranded in Massachusetts in 2009 was classified as a human interaction because it had a piece of monofilament line in its stomach.

An additional potential human-caused source of mortality for pilot whales is from polychlorinated biphenyls (PCBs) and chlorinated pesticides, moderate levels of which have been found in pilot whale blubber (Taruski, 1975; Muir et al., 1988; Weisbrod et al., 2000b). In addition, high levels of toxic metals, selenium, and PCBs were measured in pilot whales killed in the Faroe Islands (Nielsen et al., 2000; Dam and Bloch, 2000). The population effect of the observed levels of such contaminants is currently unknown (Waring et al., 2003).

Offshore Bottlenose Dolphin

The western North Atlantic offshore stock of bottlenose dolphins (*Tursiops truncatus*) ranges from Florida to Georges Bank along the continental slope. The best available estimate for offshore morphotype bottlenose dolphins is the sum of the estimates from the June-July 2002 aerial survey covering the continental shelf, the summer 2004 vessel survey south of Maryland, and the summer 2004 vessel and aircraft surveys north of Maryland. This joint estimate provides complete coverage of the offshore habitat from central Florida to Canada during summer months. The combined abundance estimate from these surveys is 81,588 (CV=0.17) and the minimum population estimate is 70,775 (Waring et al., 2009). Based on these data, the PBR for the stock is 566 dolphins (Waring et al., 2009). Bottlenose dolphins are among the most frequently stranded small cetaceans along the Atlantic coast. Many of these stranded animals show signs of human interaction, such as net marks and mutilation (Waring et al., 2003).[26]

Offshore bottlenose dolphin bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet, pelagic longline, pelagic pair trawl, North Atlantic bottom trawl, Northeast multispecies sink gillnet, and Mid-Atlantic coastal gillnet fisheries.[27] Total estimated mean annual fishery-related mortality for this stock during 2001-2006 is unknown; however, mortalities of offshore bottlenose dolphins were observed during this period in the Northeast Sink Gillnet and Mid-Atlantic Gillnet commercial fisheries (Waring et al., 2009).

Common Dolphin

Common dolphins (*Delphinus delphis*) may be among the most widely distributed cetacean species; they range worldwide in temperate, sub-tropical, and tropical waters. The western North Atlantic stock occurs most frequently north of Cape Hatteras along the continental shelf. The best abundance estimate for common dolphins is 67,191 animals (CV=0.29). The minimum estimate is 52,893(Waring et al., 2013). Based on these data, the PBR is 529 common dolphins (Waring et al., 2013).

[26] Average annual fishery-related mortality estimates are based on observer data between 1990 and 2001.

[27] Waring et al. (2003) note that the pelagic drift gillnet and the pelagic pair trawl fisheries no longer exist.

Common dolphin bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet, pelagic longline, pelagic pair trawl, North Atlantic bottom trawl, Atlantic squid, mackerel, butterfish trawl, Northeast multispecies sink gillnet, and Mid-Atlantic coastal gillnet fisheries.[28] Total annual estimated average fishery-related mortality or serious injury to this stock during 2006-2010 was 164 (CV=0.12) common dolphins.

Of these deaths, 30 are associated with the Northeast sink gillnet fishery; 8.4 with the Mid-Atlantic gillnet fishery; 0.6 with the Mid-Atlantic mid water trawl fishery; 20 with the Northeast bottom trawl fishery; 103 with the Mid-Atlantic bottom trawl fishery; and 1.7 with the pelagic longline fishery (Waring et al., 2013). The Northeast multispecies sink gillnet and the Mid-Atlantic coastal gillnet fisheries are currently regulated under the ALWTRP.

4.3.2.4 Seals

Harbor Seal

The harbor seal (*Phoca vitulina*) is found in all nearshore waters of the Atlantic Ocean above 30 degrees latitude (Waring et al., 2003). In the western North Atlantic they are distributed from the eastern Canadian Arctic and Greenland south to southern New England and New York, and occasionally the Carolinas (Boulva and McLaren, 1979; Gilbert and Guldager, 1998). It is believed that the harbor seals found along the U.S. and Canadian east coasts represent one population (Waring et al., 2003). Harbor seals are year-round inhabitants of the coastal waters of eastern Canada and Maine, and occur seasonally along the southern New England and New York coasts from September through late May. However, breeding and pupping normally occur only in waters north of the New Hampshire/Maine border.

Since passage of the MMPA in 1972, the observed count of seals along the New England coast has been increasing. Coast-wide aerial surveys along the Maine coast were conducted in May/June 1981, 1986, 1993, 1997, and 2001 during pupping (Gilbert and Stein 1981; Gilbert and Wynne 1983,; 1984; Kenney 1994; Gilbert and Guldager 1998; Gilbert *et al.* 2005). However, estimates older than eight years are deemed unreliable (Wade and Angliss 1997) and should not be used for PBR determinations. Therefore, there is no current abundance estimate for harbor seals. The 2001 survey, conducted in May/June, included replicate surveys and radio tagged seals to obtain a correction factor for animals not hauled out. The corrected estimate (pups in parenthesis) for 2001 was 99,340 (23,722). The 2001 observed count of 38,014 is 28.7% greater than the 1997 count. Increased abundance of seals in the Northeast region has also been documented during aerial and boat surveys of overwintering haul-out sites from the Maine/New Hampshire border to eastern Long Island and New Jersey (Payne and Selzer 1989; Rough 1995; Barlas 1999; Schroeder 2000; deHart 2002). The maximum productivity rate is assumed to be 0.12, and the recovery factor for this stock is 0.5, which is the value for stocks of unknown status. PBR for U.S. waters is undetermined (Waring et al., 2013).

For the period 2006-2010, the total human caused mortality and serious injury to harbor seals is estimated to be 337 per year. The average was derived from two components: 1) 332 (CV=0.15) from the 2006-2010 observed fishery; and 2) 5 from average 2006-2010 non-fishery-related, human interaction stranding mortalities (NMFS unpublished data) (Waring et al., 2013).

[28] Waring et al. (2003) note that the pelagic drift gillnet and the pelagic pair trawl fisheries no longer exist.

The fishery-related mortalities and serious injuries are attributed as follows: 280 to the Northeast sink gillnet fishery; 50 to the Mid-Atlantic gillnet fishery; an unknown number to the Northeast bottom trawl fishery; and 0.7 to the Northeast mid water trawl fishery (Waring et al., 2013).

Researchers and fishery observers have documented incidental mortality in several fisheries, particularly within the Gulf of Maine (see below). An unknown level of mortality also occurred in the mariculture industry (i.e., salmon farming), and by deliberate shooting (NMFS unpublished data). Between 2006 and 2010, there are 5 records of harbors seals and 3 of unidentified seals with evidence of gunshot wounds in the Northeast Regional Office Marine Mammal Stranding Network database.

Additional sources of mortality for harbor seals include boat strikes, entrainment in power plant intakes (12-20 per year; NMFS unpublished data), oil contamination, shooting (around salmon aquaculture sites and fixed fishing gear), storms, abandonment by the mother, and disease (Katona et al. 1993; NMFS unpublished data).

Gray Seal

Current estimates of the total western Atlantic gray seal population are not available; although estimates of portions of the stock are available for select time periods. The size of the Canadian population from 1993 to 2004 has been estimated from three surveys. A 1993 survey estimated the population at 144,000 animals (Mohn and Bowen 1996; DFO 2003), a 1997 survey estimated 195,000 (DFO 2003), and a 2004 survey obtained estimates ranging between 208,720 (SE=29,730) and 223,220 (SE=17,376) depending upon the model used (Trzcinski *et al.* 2005). The population at Sable Island had been increasing by approximately 13% per year for nearly 40 years (Bowen *et al.* 2003), but the most recent (2004) survey results indicated that this rate of population increase has declined to 7% (Trzcinski *et al.* 2005; Bowen *et al.* 2007). The non-Sable Island (Gulf of St Lawrence and Eastern Shore) abundance has increased from 20,900 (SE=200) in 1970 to 52,500 (SE=7,800) in 2004 (Hammill 2005).

In U.S. waters, gray seals currently pup at three established colonies: Muskeget Island, Massachusetts; Green Island, Maine; and Seal Island, Maine; as well as, more recently, at Matinicus Rock in Maine. They have been observed using the historic pupping site on Muskeget Island in Massachusetts since 1990. Pupping has taken place on Seal and Green Islands in Maine since at least the mid-1990s. Aerial survey data from these sites indicate that pup production is increasing.

Gray seals are also observed in New England outside of the pupping season. In April-May 1994, a maximum count of 2,010 was obtained for Muskeget Island and Monomoy combined (Rough 1995). Maine coast-wide surveys conducted during summer revealed 597 and 1,731 gray seals in 1993 and 2001, respectively (Gilbert *et al.* 2005). In March 1999, a maximum count of 5,611 was obtained in the region south of Maine (between Isles of Shoals, Maine and Woods Hole, Massachusetts) (Barlas 1999). No gray seals were recorded at haul-out sites between Newport, Rhode Island and Montauk Pt., New York (Barlas 1999), although, more recently several hundred gray seals have been recorded in surveys conducted off eastern Long

Island (R. DiGiovanni, pers. comm., The Riverhead Foundation, Riverhead, NY). Depending on the model used, the minimum population estimate for the Canadian gray seal population was estimated to range between 125,541 and 169,064 (Trzcinski et al. 2005). Present data are insufficient to calculate the minimum population estimate for U.S. waters (Waring et al., 2012). PBR for U.S. waters is also unknown (Waring et al., 2012).

Gray seals, like harbor seals, were hunted for bounty in New England waters until the late 1960s. This hunt may have severely depleted the stock in U.S. waters (Rough, 1995). In Canada, gray seals were hunted for several centuries by indigenous people and European settlers in the Gulf of St. Lawrence and along the Nova Scotia eastern shore, and were locally extirpated (Lavigueru and Hammill, 1993). By the mid-1900s, gray seals were considered to be rare, and in the mid-1960s, the population in eastern Canada was estimated to be 5,600 (Mansfield, 1966). Since the mid-1960s the population has been increasing. During a bounty program (1976-1983) and a culling program (1967-1983), the average annual removals were 720 and 1,000 seals, respectively (Fisheries and Oceans Canada, 2001). From 1993 through 2000, the annual kill of gray seals by hunters was: 1993 (0), 1994 (40), 1995 (364), 1996 (132), 1997 (72), 1998 (275), 1999 (98), and 2000 (342) (Waring et al., 2003). The traditional hunt continued in 2002 and 2003, with 76 and 126 gray seals taken, respectively, off the Magdalen Islands and in other areas, except Sable Island, where commercial hunting is not permitted (Fisheries and Oceans Canada, 2003).

An unknown level of mortality also occurs in the mariculture industry (*i.e.*, salmon farming) and by deliberate shooting (NMFS, unpublished data). In addition, the Cape Cod stranding network has documented several animals with netting or plastic debris around their necks in the Cape Cod/Nantucket area. Between 1997 and 2001, 197 gray seal strandings were recorded, extending from Maine (25) to North Carolina (1). Most of the strandings occurred in Massachusetts (72), followed by New York (55), and Maine (25). Twenty-three animals showed signs of human interactions: fishery (8), power plant (3), oil spill (6), shot (1), mutilated (1), boat strike (1), and other (3) (Waring et al., 2003). Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals that die or are seriously injured wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery interaction.

For the period 2006-2010, the total estimated human caused mortality and serious injury to gray seals was 5,253 per year. The average was derived from five components: 1) 853 from the 2006-2010 U.S. observed fishery; 2) 6 from average 2006-2010 non-fishery related, human interaction stranding mortalities (NMFS unpublished data); 3) 1079 from average 2006-2010 kill in the Canadian hunt; 4) 23 from DFO scientific collections; and 5) 3,292 removals of nuisance animals in Canada. The 794 annual average mortalities or serious injuries in U.S. fisheries are attributed to the Northeast sink gillnet fishery (Waring et al., 2013).

Harp Seal

The harp seal (*Phoca groenlandica*) occurs throughout much of the North Atlantic and Arctic Oceans and has been increasing off the East Coast of the United States from Maine to New Jersey. Harp seals are usually found off the U.S. from January to May, when the western stock of harp seals is at its most southern point of migration (Waring et al., 2003). Harp seals congregate on the edge of the pack ice from February through April, when breeding and pupping take place. The harp seal is highly migratory, moving north and south with the edge of the pack ice. Non-breeding juveniles will migrate the farthest south in the winter, but the entire population moves north toward the Arctic in the summer. The best estimate of abundance for western North Atlantic harp seals is 8.3 million (95% CI 7.5-8.9 million; DFO 2011, in review). Data are insufficient to calculate the minimum population estimate for U.S. waters (Waring et al., 2013). The maximum productivity rate is assumed to be 0.12, the default value for pinnipeds. The recovery factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to OSP is set at 1.0 because the population is increasing. PBR for the western North Atlantic harp seal in U.S. waters is unknown. PBR for the stock in US waters is unknown (Waring et al., 2013).

A large number of harp seals are killed in Canada, Greenland, and the Arctic. In 2008 the Canadian TAC was increased to 275,000 (268,050 commercial hunt, 4,950 for aboriginal, and 2,000 for personal use). In 2009, the TAC was 280,000, and in 2010 it was 330,000 (Waring et al., 2012).

For the period 2006- 2010, the total estimated annual human caused mortality and serious injury to harp seals was 379,672. This is derived from three components: 1) an average catch of 379,387 seals from 2006-2010 by Canada and Greenland, including bycatch in the lumpfish fishery; 2) 281 harp seals (CV=0.19) from the observed U.S. fisheries; and 3) average of 4 stranded seals from 2006-2010 with signs of non-fishery human interactions (Waring et al., 2013). The 281 mortalities or serious injuries in U.S. fisheries are distributed as follows: 218 in the Northeast sink gillnet fishery and 63 in the Mid-Atlantic gillnet fishery (Waring et al., 2013). There are 0.2 seals killed in the Northeast bottom trawl fishery.

4.3.2.5 Sea Turtles

Kemp's ridley, loggerhead, leatherback, green, and hawksbill sea turtles spend all or part of the year in the waters potentially affected by new ALWTRP regulations. Sea turtles continue to be affected by many of the original threats that prompted their ESA listing, including interactions with fishing gear, degradation of nesting beach sites, poaching, nesting predation, vessel strikes, channel dredging, and marine pollution (including ingestion of marine debris[29]) (Lutcavage et al., 1997). Few of these impacts, however, have been quantified with any degree of confidence. Observer programs implemented for dredging and some commercial fisheries have begun to measure the effects of these activities on sea turtle populations.

[29] Marine turtles have been found to ingest a wide variety of ocean debris such as plastic bags, raw plastic pellets, plastic and Styrofoam pieces, and tar ball sand balloons. Effects of debris ingestion can include direct obstruction of the gut, absorption of toxic byproducts, and reduced absorption of nutrients across the gut wall.

Kemp's Ridley Sea Turtle

Less than fifty years ago, the Kemp's ridley (*Lepidochelys kempii*) was an abundant sea turtle in the Gulf of Mexico. Since then, the Kemp's ridley has experienced one of the most dramatic population declines recorded for any animal. The Kemp's ridley was listed as endangered under the ESA on December 2, 1970. Internationally, the Kemp's ridley is considered to be the most endangered sea turtle and is protected from international trade.

The majority of Kemp's ridleys nest along a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963; NMFS and USFWS 2007c; NMFS et al. 2011). The number of nesting females in the Kemp's ridley population declined dramatically from the late 1940s through the mid-1980s, with an estimated 40,000 nesting females in a single *arribada* in 1947 and fewer than 300 nesting females in the entire 1985 nesting season (TEWG 2000; NMFS et al. 2011). Conservation efforts by Mexican and U.S. agencies have aided this species by eliminating egg harvest, protecting eggs and hatchlings, and reducing at-sea mortality through fishing regulations (TEWG 2000). Since the mid-1980s, the number of nests observed at Rancho Nuevo and nearby beaches has increased 14-16% per year (Heppell *et al.* 2005), allowing cautious optimism that the population is on its way to recovery. An estimated 5,500 females nested in the State of Tamaulipas over a three-day period in May 2007 and more than 4,000 of those nested at Rancho Nuevo (NMFS and USFWS 2007c). However, events such as the Deepwater Horizon oil release, and stranding events associated increased skimmer trawl use and poor TED compliance in the northern Gulf of Mexico which may dampen recent population growth.

A revised bi-national recovery plan was published for public comment in 2010, and in September 2011, NMFS, USFWS, and the Secretary of Environment and Natural Resources, Mexico (SEMARNAT) released the second revision to the Kemp's ridley recovery plan. As with the other sea turtle species, fishery mortality accounts for a large proportion of annual human-caused mortality outside the nesting beaches, while other significant threats facing Kemp's ridleys include degradation of nesting beach habitat from human development; marine pollution[30] and floating debris; channel dredging, and offshore oil and gas exploration operations.[31] An estimated 500 to 5,000 benthic immature and adult Kemp's ridley mortalities were attributed to shrimp trawling prior to the implementation of TED regulations (NRC, 1990).[32] Although modifications to shrimp trawls have helped to reduce mortality of Kemp's ridleys, a recent assessment by Finkbeiner et al. (2011) found that the Southeast/Gulf of Mexico shrimp trawl fishery remained responsible for the vast majority of U.S. fishery interactions (up to

[30] The impact of heavy metals and pesticides on the physiology and behavior of sea turtles is not documented. Because Kemp's ridley is a carnivore, however, the species is vulnerable to the bio-accumulation of chemicals. In addition, intensive industrial and agricultural development along the northern Gulf coast raises the potential for increased levels of chemical exposure for the species.

[31] The Gulf of Mexico is an area of high-density offshore oil extraction with chronic, low-level spills and occasional massive spills (such as the April 2010 BP Deepwater Horizon explosion). The two primary feeding grounds for adult Kemp's ridleys in the northern and southern Gulf of Mexico are both near major areas of near-shore and off-shore oil exploration and production.

[32] This compares to 75 to 750 estimated mortalities due to all other known human causes.

98%) and mortalities (more than 80%; all species combined). Kemp's ridleys are known to have been incidentally taken in other types of fishing gear as well, such as hook and line gear, gill nets, trawls, dip nets, beach and purse seines, pound nets, cast nets, butterfly nets, and crab traps/pots (Manzella et al. 1988, Marquez et al. 1989, NMFS, 2006). Stranding reports indicate that from 2008-2011, an average of approximately 430 Kemp's ridley turtles stranded annually along the Eastern U.S. coast from a variety of causes, most of which are unknown (NMFS STSSN database). For more detailed information on interactions between Kemp's ridley turtles and ALWTRP-related gear, see Chapter 9, section 9.4.2.5.

Loggerhead Sea Turtle

The loggerhead sea turtle (*Caretta caretta*) is the most abundant sea turtle in U.S. waters. The loggerhead sea turtle was listed as threatened under the ESA on July 28, 1978, but is considered endangered by the International World Conservation Union (IUCN). In 2009, a status review team identified the following nine DPSs as being discrete from other conspecific population segments and significant to the species: (1) North Pacific Ocean, (2) South Pacific Ocean, (3) North Indian Ocean, (4) Southeast Indo-Pacific Ocean, (5) Southwest Indian Ocean, (6) Northwest Atlantic Ocean, (7) Northeast Atlantic Ocean, (8) Mediterranean Sea, and (9) South Atlantic Ocean (Conant *et al.* 2009). On September 22, 2011, NMFS and USFWS issued a final rule (76 FR 58868), determining that the loggerhead sea turtle is composed of nine DPSs (as defined in Conant *et al*., 2009) that constitute the species that may be listed as threatened or endangered under the ESA. Five DPSs were listed as endangered (North Pacific Ocean, South Pacific Ocean, North Indian Ocean, Northeast Atlantic Ocean, and Mediterranean Sea), and four DPSs were listed as threatened (Northwest Atlantic Ocean, South Atlantic Ocean, Southeast Indo-Pacific Ocean, and Southwest Indian Ocean). The DPS found within this action area is the Northwest Atlantic Ocean DPS. NMFS is participating in a comprehensive research program (Atlantic Marine Assessment Program for Protected Species (AMAPPS)) to assess the distribution of marine mammals, sea turtles, and sea birds in U.S. waters of the western North Atlantic. Four species of sea turtles were documented during the 2011 surveys, including two loggerhead sea turtles in the central Gulf of Maine during the winter surveys, which is a rare sighting for the wintertime (NMFS 2011).

Loggerheads are circumglobal, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters. They commonly occur throughout the inner continental shelf from Florida through Cape Cod, Massachusetts. Loggerhead sea turtles are found in Virginia foraging areas as early as April, but are not usually found on the most northern foraging grounds in the Gulf of Maine until June. The large majority leave the Gulf of Maine by mid-September, but some may remain in Mid-Atlantic and northeast waters until late fall. During November and December, loggerheads seem to concentrate in nearshore and southerly areas influenced by warmer Gulf Stream waters off North Carolina. Summer nesting usually occurs in the lower latitudes. Primary Atlantic nesting sites are along the east coast of Florida, with additional sites in Georgia, the Carolinas, and the Gulf Coast of Florida. In the 2008 recovery plan, the Loggerhead Recovery Team designated five recovery units for the Northwest Atlantic population of loggerhead sea turtles based on nesting assemblages: (1) the Northern Recovery Unit (NRU: Florida/Georgia border through southern Virginia), (2) the Peninsular Florida Recovery Unit (PFRU: Florida/Georgia border through Pinellas County, Florida), (3) the Dry Tortugas Recovery Unit (DTRU: islands located west of Key West, Florida), (4) the Northern Gulf of Mexico Recovery Unit (NGMRU: Franklin County, Florida through Texas), and (5) the Greater Caribbean Recovery Unit (GCRU: Mexico through French Guiana, Bahamas, Lesser Antilles, and Greater Antilles).

From the beginning of Florida standardized index surveys in 1989 until 1998, the PFRU, the largest nesting assemblage in the Northwest Atlantic by an order of magnitude, had a significant increase in the number of nests. However, from 1998 through 2008, there was a 41% decrease in annual nest counts from index beaches, which represent an average of 70% of the statewide nesting activity (NMFS and USFWS 2008). From 1989-2008, the PFRU had an overall declining nesting trend of 26% (95% CI: -42% to -5%; NMFS and USFWS 2008). With the addition of nesting data through 2010, the nesting trend for the PFRU does not show a nesting decline statistically different from zero (76 FR 58868, September 22, 2011). The NRU, the second largest nesting assemblage of loggerheads in the United States, has been declining at a rate of 1.3% annually since 1983 (NMFS and USFWS 2008). The NRU dataset included 11 beaches with an uninterrupted time series of coverage of at least 20 years; these beaches represent approximately 27% of NRU nesting (in 2008). Through 2008, there was strong statistical data to suggest the NRU has experienced a long-term decline, but with the inclusion of nesting data through 2010, nesting for the NRU is showing possible signs of stabilizing (76 FR 58868, September 22, 2011). Evaluation of long-term nesting trends for the NGMRU is difficult because of changed and expanded beach coverage. However, the NGMRU has shown a significant declining trend of 4.7% annually since index nesting beach surveys were initiated in 1997 (NMFS and USFWS 2008). No statistical trends in nesting abundance can be determined for the DTRU because of the lack of long-term data. Similarly, statistically valid analyses of long-term nesting trends for the entire GCRU are not available because there are few long-term standardized nesting surveys representative of the region. Additionally, changing survey effort at monitored beaches and scattered and low-level nesting by loggerheads at many locations currently precludes comprehensive analyses (NMFS and USFWS 2008).

Significant threats to loggerhead populations in the Atlantic include commercial fisheries, coastal development and erosion of nesting beaches, pollution (including ingestion of marine debris), marine habitat degradation and vessel strikes. Specifically, loggerhead turtles are captured and injured or killed in interactions with a variety of fishing gear, including pots, gillnets, pelagic longlines, trawls, pound nets, and scallop dredges (NMFS and USFWS 2008). Stranding reports indicate that from 2008-2011, an average of approximately 1,100 loggerhead turtles stranded annually along the Eastern U.S. coast from a variety of causes, most of which are unknown (NMFS STSSN database). See Chapter 9, section 9.4.2.5 for detailed information on these interactions.

Leatherback Sea Turtle

The leatherback sea turtle (*Dermochelys coriacea*) is the largest living turtle and is distinct from other sea turtle species because of its rubber-like, flexible carapace. Like the loggerhead, the leatherback is circumglobal. In the northwestern Atlantic, the leatherback turtle's range extends from Nova Scotia, south to Puerto Rico and the U.S. Virgin Islands. Nesting occurs from February through July at sites located from Georgia to the U.S. Virgin Islands.

During the summer, leatherbacks tend to be found along the east coast of the U.S. from the Gulf of Maine south to Florida.

Listed as endangered on June 2, 1970, the leatherback population was estimated at approximately 115,000 adult females globally in 1980 (Pritchard 1982). By 1995, this global population of adult females was estimated to have declined to 34,500 (Spotila *et al.* 1996). The most recent population size estimate for the North Atlantic alone is a range of 34,000-94,000 adult leatherbacks (TEWG 2007). Thus, there is substantial uncertainty with respect to global population estimates of leatherback sea turtles. In 1979, the waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands were designated as critical habitat for the leatherback sea turtle.

The TEWG reports an increasing or stable nesting trend for five of the seven populations or groups of populations that were identified as occurring within the Atlantic, with the exceptions of the Western Caribbean and West Africa groups. The leatherback rookery along the northern coast of South America in French Guiana and Suriname supports the majority of leatherback nesting in the western Atlantic (TEWG 2007), and represents more than half of total nesting by leatherback sea turtles worldwide (Hilterman and Goverse 2004). The TEWG (2007) report indicates that a positive population growth rate was found for French Guinea and Suriname using nest numbers from 1967-2005, a 39-year period, and that there was a 95% probability that the population was growing. An analysis of Florida's index nesting beach sites from 1989-2006 shows a substantial increase in leatherback nesting in Florida during this time, with an annual growth rate of approximately 1.17 (TEWG 2007).

As with the other sea turtle species, mortality due to fisheries interactions (including trawl, gillnet, pelagic longline, and trap/pot gear) accounts for a large proportion of annual human-caused mortality outside the nesting beaches, while other activities like pollution (including ingesting marine debris), habitat destruction, and vessel strikes account for an unknown level of other anthropogenic mortality. Stranding reports indicate that from 2008-2011, an average of approximately 50 leatherback turtles stranded annually along the Eastern U.S. coast from a variety of causes, most of which are unknown (NMFS STSSN database). The effect of climate change may also effect leatherbacks in yet unknown ways. This may include changes in the distribution of prey species like jellyfish (Purcell, 2012). The long-term recovery potential of this species may be further threatened by observed low genetic diversity, even in the largest nesting groups (NMFS and USFWS 2007b). For detailed information on fishing gear interactions, see Chapter 9, section 9.4.2.5.

Green Sea Turtle

Green sea turtles (*Chelonia mydas*) are distributed circumglobally. In the western Atlantic they range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean, but are considered rare north of Cape Hatteras (Wynne and Schwartz, 1999). Green turtles were traditionally highly prized for their flesh, fat, eggs, and shell, and directed fisheries in the U.S. and throughout the Caribbean are largely to blame for the decline of the species. In the Gulf of Mexico, green turtles were once abundant enough in the shallow bays and lagoons to support a commercial fishery. However, declines in the turtle fishery throughout the Gulf of Mexico were evident by 1902 (Doughty, 1984).

In 1978, the Atlantic population of green sea turtles was listed as threatened under the ESA, except for the breeding populations in Florida and on the Pacific coast of Mexico, which were listed as endangered. As it is difficult to differentiate between breeding populations away from the nesting beaches, all green sea turtles in the water are considered endangered. The waters surrounding the island of Culebra, Puerto Rico, and its outlying keys are designated critical habitat for the green sea turtle.

By far, the most important nesting concentration for green sea turtles in the western Atlantic is in Tortuguero, Costa Rica (NMFS and USFWS 2007d). Nesting in the area has increased considerably since the 1970s, and nest count data from 1999-2003 suggest nesting by 17,402-37,290 females per year (NMFS and USFWS 2007d). In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart, 1979). Occasional nesting has been documented along the Gulf coast of Florida, at southwest Florida beaches, and at beaches on the Florida panhandle (Meylan et al., 1995). The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend since establishment of the Florida index beach surveys in 1989, perhaps due to increased protective legislation throughout the Caribbean (Meylan et al., 1995) as well as protections in Florida and throughout the United States (NMFS and USFWS 2007d). Recent population estimates for the western Atlantic area are not available.

As is the case for loggerhead and Kemp's ridley sea turtles, green sea turtles use Mid-Atlantic and northern areas of the western Atlantic coast as important summer developmental habitat. Like other marine turtle species, green turtle hatchlings initially enter the pelagic environment. After reaching a certain size, juveniles enter benthic foraging areas where they consume a primarily herbivorous diet. Along the U.S. western Atlantic coast, green turtles are found in estuarine and coastal waters as far north as Long Island Sound, Chesapeake Bay, and North Carolina (Musick and Limpus, 1997). Like loggerheads and Kemp's ridleys, green sea turtles that use northern waters during the summer must return to warmer waters when water temperatures drop, or face the risk of cold stunning.[33] Cold stunning of green turtles may occur in southern areas as well (i.e., Indian River, Florida), as these natural mortality events are dependent on water temperatures and not solely geographical location.

Green turtles face many of the same natural threats as loggerhead and Kemp’s ridley sea turtles. In addition, green turtles appear to be susceptible to fibropapillomatosis, an epizootic disease producing lobe-shaped tumors on the soft portion of a turtle’s body. Juveniles are most commonly affected. The occurrence of fibropapilloma tumors may result in impaired foraging, breathing, or swimming ability, leading potentially to death. Stranding reports indicate that from 2008-2011, an average of approximately 900 green turtles stranded annually along the Eastern U.S. coast from a variety of causes, most of which are unknown (NMFS STSSN database).

As with the other sea turtle species, fishery mortality accounts for a large proportion of annual human-caused mortality outside the nesting beaches, while other activities like dredging, pollution, and habitat destruction account for an unknown level of other mortality. Sea sampling

[33] Cold stunning refers to the condition observed in sea turtles that have been exposed to very sudden decreases in water temperature. Affected animals generally become lethargic and float to the surface. In extreme cases, death may occur.

coverage in the pelagic driftnet, pelagic longline, southeast shrimp trawl, and summer flounder bottom trawl fisheries has recorded takes of green turtles.

Hawksbill Sea Turtle

The hawksbill sea turtle (*Eretmochelys imbricata*) is relatively uncommon in the waters of the Northeast or Mid-Atlantic. Hawksbills prefer coral reefs, such as those found in the Caribbean and Central America, where they feed primarily on a wide variety of sponges and mollusks. There are accounts of small hawksbills stranded as far north as Cape Cod, Massachusetts; however, many of these strandings were observed after hurricanes or offshore storms. Stranding reports indicate that from 2008-2011, an average of approximately 20 hawksbill turtles stranded annually along the Eastern U.S. coast from a variety of causes, most of which are unknown (NMFS STSSN database). No fisheries-related takes of hawksbill sea turtles have been observed in the Northeast or Mid-Atlantic (NMFS, 2003a).

4.3.2.6 Atlantic Sturgeon

The Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) is a subspecies of sturgeon distributed along the eastern coast of North America from Hamilton Inlet, Labrador, Canada to Cape Canaveral, Florida, U.S. (Scott and Scott, 1988; ASSRT, 2007; T. Savoy, CT DEP, pers. comm.). NMFS has delineated U.S. populations of Atlantic sturgeon into five DPSs[34] (77 FR 5880 and 77 FR 5914). These are: the Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs. The results of genetic studies suggest that natal origin influences the distribution of Atlantic sturgeon in the marine environment (Wirgin and King, 2011). However, genetic data as well as tracking and tagging data demonstrate sturgeon from each DPS and Canada occur throughout the full range of the subspecies. Therefore, sturgeon originating from any of the 5 DPSs can be affected by threats in the marine, estuarine and riverine environment that occur far from natal spawning rivers.

On February 6, 2012, a notice in the *Federal Register* was published that the New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs were being listed as "endangered," and the Gulf of Maine DPS was being listed as "threatened" (77 FR 5880 and 77 FR 5914). The effective date of the listings is April 6, 2012. The DPSs do not include Atlantic sturgeon that are spawned in Canadian rivers. Therefore, Canadian spawned fish are not included in the listings.

Atlantic sturgeon are long lived (approximately 60 years), late maturing, estuarine dependent, anadromous[35] fish (Bigelow and Schroeder, 1953; Vladykov and Greeley 1963; Mangin, 1964; Pikitch *et al.*, 2005; Dadswell, 2006; ASSRT, 2007). After emigration from the natal estuary, subadults and adults travel within the marine environment, typically in waters less

[34] To be considered for listing under the ESA, a group of organisms must constitute a "species." A "species" is defined in section 3 of the ESA to include "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature."

[35] Anadromous refers to a fish that is born in freshwater, spends most of its life in the sea, and returns to freshwater to spawn (NEFSC FAQ's, available at http://www.nefsc.noaa.gov/faq/fishfaq1a.html, modified June 16, 2011).

than 50 m in depth, using coastal bays, sounds, and ocean waters (Vladykov and Greeley, 1963; Murawski and Pacheco, 1977; Dovel and Berggren, 1983; Smith, 1985; Collins and Smith, 1997; Welsh *et al.*, 2002; Savoy and Pacileo, 2003; Stein *et al.*, 2004; Laney *et al.*, 2007; Dunton *et al.*, 2010; Erickson *et al.*, 2011; Wirgin and King, 2011).

Atlantic sturgeon underwent significant range-wide declines from historical abundance levels due to overfishing in the mid to late 19th century when a caviar market was established (Scott and Crossman, 1973; Taub, 1990; Kennebec River Resource Management Plan, 1993; Smith and Clugston, 1997; Dadswell, 2006; ASSRT, 2007). Abundance of spawning-aged females prior to this period of exploitation was predicted to be greater than 100,000 for the Delaware River, and at least 10,000 females for other spawning stocks (Secor and Waldman, 1999; Secor, 2002). Historical records suggest that Atlantic sturgeon spawned in at least 35 rivers prior to this period. Currently, only 16 U.S. rivers are known to support spawning based on available evidence (i.e., presence of young-of-year or gravid Atlantic sturgeon documented within the past 15 years) (ASSRT, 2007). While there may be other rivers supporting spawning for which definitive evidence has not been obtained (e.g., in the Penobscot and York rivers), the number of rivers supporting spawning of Atlantic sturgeon are approximately half of what they were historically. In addition, only four rivers (Kennebec, Hudson, Delaware, James) are known to currently support spawning from Maine through Virginia where historical records support there used to be fifteen spawning rivers (ASSRT, 2007). Thus, there are substantial gaps in the range between Atlantic sturgeon spawning rivers amongst northern and Mid-Atlantic states which could make recolonization of extirpated populations more difficult.

Based on the best available information, NMFS has concluded that unintended catch of Atlantic sturgeon in fisheries, vessel strikes, poor water quality, water availability, dams, lack of regulatory mechanisms for protecting the fish, and dredging are the most significant threats to Atlantic sturgeon (77 FR 5880 and 77 FR 5914; February 6, 2012). While all of the threats are not necessarily present in the same area at the same time, given that Atlantic sturgeon subadults and adults use ocean waters from Labrador, Canada to Cape Canaveral, FL, as well as estuaries of large rivers along the U.S. East Coast, activities affecting these water bodies are likely to impact more than one Atlantic sturgeon DPS. In addition, given that Atlantic sturgeon depend on a variety of habitats, every life stage is likely affected by one or more of the identified threats.

Bycatch in U.S. waters is the primary threat faced by all 5 DPSs. At this time, there is an estimate of the number of Atlantic sturgeon captured and killed in sink gillnet and otter trawl fisheries authorized by Federal FMPs (NMFS 2011) in the Northeast Region but there is not a similar estimate for Southeast fisheries. Also, there is not an estimate of the number of Atlantic sturgeon captured or killed in state fisheries. At this time, the effects of other significant threats (e.g., vessel strikes, poor water quality, water availability, dams, and dredging) cannot be quantified in terms of habitat impacts or loss of individuals. While there is some information on the number of mortalities that have occurred in the past in association with certain activities (e.g., mortalities in the Delaware and James rivers that are thought to be due to vessel strikes), those numbers cannot be used to extrapolate effects throughout one or more DPSs. This is because of: (1) the small number of data points and (2) lack of information on the percent of incidences that the observed mortalities represent.

As noted above, the NEFSC prepared an estimate of the number of encounters of Atlantic sturgeon in fisheries authorized by Northeast FMPs (NEFSC 2011). The analysis prepared by the NEFSC estimates that from 2006 through 2010 there were 2,250 to 3,862 encounters per year in observed gillnet and trawl fisheries, with an average of 3,118 encounters. Mortality rates in gillnet gear are approximately 20%, with the exception of monkfish gear which has a higher mortality rate of approximately 27%. Mortality rates in otter trawl gear are believed to be lower at approximately 5%.

4.4 HABITAT

Modification of the ALWTRP may also affect essential fish habitat (EFH). Under the Magnuson-Stevens Act (MSA) (16 U.S.C. 1801), EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 U.S.C. 1802(10)). To help guide regional Fisheries Management Councils (Councils) in the implementation of EFH provisions, regulations developed by the National Marine Fisheries Service encourage Councils to identify Habitat Areas of Particular Concern (HAPCs) (50 CFR 600 Subpart J; 62 FR 66531; 67 FR 2343). HAPCs are subsets of EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPCs are not afforded any additional regulatory protection under the MSA; however, Federal projects with potential adverse impacts to HAPCs must be more carefully scrutinized.

This section has three basic objectives:

- First, it defines the EFH and HAPCs associated with the Atlantic trap/pot and anchored gillnet fisheries regulated by the ALWTRP.
- Second, it describes key components of lobster habitat in detail.
- Finally, it discusses how the ALWTRP can influence habitat, with a particular focus on potential disturbances to benthic habitat.

4.4.1 Identification of EFH

The 1996 re-authorization of the MSA requires that NMFS and the regional Fisheries Management Councils (Councils) specifically describe and identify EFH. In addition, the MSA requires that FMPs minimize, to the extent practicable, adverse effects on EFH caused by fishing activities. According to the EFH regulations found at 50 CFR 600, information necessary to identify EFH for each managed species includes its geographic range and habitat requirements by life stage; the distribution and characteristics of those habitats; and current and historic stock size as it affects occurrence in available habitats (50 CFR 600.815(a)(1)(ii)(A)). Information on the temporal and spatial distribution of each life history stage is needed to understand each species' relationship to, or dependence on, its various habitats.

Atlantic trap/pot and anchored gillnet fisheries are geographically widespread on the Atlantic coast and target a diverse array of fish and shellfish species. In the context of this EIS, EFH includes the habitat for all target species, non-target species, prohibited species, other species, and their prey. Therefore, when viewed in the aggregate, across all species, EFH is all pelagic and benthic habitat in the Atlantic EEZ. It is important to note that corals are currently not listed as EFH in the Northeast. However, they have been included as a component of EFH for managed species in the region that rely on complex hard bottom habitats where corals and other types of structure-forming organisms are found. Currently, the only deep-water reef system recognized specifically as EFH in Atlantic waters is the *Oculina* Banks ivory tree coral reef, located near the 80m depth contour approximately 15 miles off the east-central coast of Florida. The special significance of this area as spawning habitat for snapper-grouper species has been recognized and resulted in this EFH designation.

4.4.2 Identification of HAPCs

The EFH regulations developed by NMFS encourage regional Fisheries Management Councils to identify Habitat Areas of Particular Concern (HAPCs) within areas designated as EFH. The intent of this action is to help focus conservation priorities on specific habitat areas that play a particularly important role in the life cycles of federally managed fish species (Dobrzynski and Johnson, 2001).

HAPCs are defined based on the following criteria:

- the importance of the ecological function provided by the habitat;
- the extent to which the habitat is sensitive to human-induced environmental degradation;
- whether and to what extent development activities are or will be stressing the habitat; and
- the rarity of the habitat type.

As the implementation of EFH regulations is subject to the discretion of the Councils, the designation of HAPCs has been approached in various ways. The following sections summarize the HAPCs designated by the Councils for EFH in the Atlantic EEZ, as described in "Regional Council Approaches to the Identification and Protection of Habitat Areas of Particular Concern" (Dobrzynski and Johnson, 2001).

4.4.2.1 New England Fishery Management Council (NEFMC) HAPCs

The NEFMC has designated discrete geographic areas as HAPCs for two of its managed species (NEFMC Amendments, 1998): Atlantic cod and Atlantic salmon. These areas are discussed below.

Atlantic Cod

For juvenile Atlantic cod, the NEFMC has designated a gravel/cobble bottom area on the northern edge of Georges Bank as an HAPC. This area meets the first criterion for an HAPC of providing an important ecological function, in that the gravel/cobble substrate provides a place for newly settled juvenile cod to find shelter from predation, helping to decrease typically high mortality rates associated with the juvenile life stage. In addition, these areas are typically rich in important prey items. This habitat also meets the second HAPC criterion of sensitivity to human-induced environmental degradation, in that it is vulnerable to fishing practices that use mobile fishing gear.

Atlantic Salmon

The NEFMC has designated eleven rivers in Maine as HAPCs for juvenile Atlantic salmon: the Dennys, Machias, East Machias, Pleasant, Narraguagus, Ducktrap, Kennebec, Penobscot. St. Croix, Tunk Stream, and Sheepscot Rivers provide habitat for the distinct population segment of Atlantic salmon. These rivers are also extremely vulnerable to anthropogenic threats, thus fulfilling the first two criteria for designation of an HAPC: provision of an important ecological function and sensitivity to human-induced environmental degradation.

4.4.2.2 Mid-Atlantic Fishery Management Council (MAFMC) HAPCs

The MAFMC has designated HAPCs for summer flounder and tilefish. HAPCs have not been designated for other species under the MAFMC's jurisdiction due to a lack of information linking habitat type with recruitment success.

Summer Flounder

Aggregations of submerged aquatic vegetation (SAV), defined as rooted, vascular, flowering plants that, except for some flowering structures, live and grow beneath the surface, have been identified as HAPCs for summer flounder. More specifically, this designation includes all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations used by adults and juveniles. These HAPCs meet the first criterion of an important ecological function, in that they provide both shelter from predators and sources of prey for the juvenile and larval stages of summer flounder (MAFMC 1998).

Tilefish

Clay outcrop (or "pueblo village") habitats in four submarine canyons on the outer continental shelf at depths between 100 and 300 meters (MAFMC 2008). (This habitat type is also referred to as a "pueblo village" – see Offshore Lobster Habitat, section 4.4.3.2). The four canyons are Norfolk, Veatch, Lydonia, and Oceanographer canyons. These HAPCs meet three of the criteria required for designation: 1) they provide shelters for tilefish, which live in burrows that they dig in the clay; 2) this habitat type is rare, occurring only in areas on the outer continental shelf like the canyons where Pleistocene clay deposits are exposed; and 3) they are highly susceptible to damage and loss from any type of disturbance, such as that caused by mobile, bottom-tending fishing gear. In addition, these four canyons have been added to the National System of Marine Protected Areas (see Section 12.13).

4.4.2.3 Atlantic Highly Migratory Species (HMS) HAPCs

Sandbar Sharks

HAPCs for Atlantic highly migratory species have been identified only for sandbar sharks. A general lack of information detailing HMS-habitat associations has prohibited the designation of HAPCs for other species in this management group. The Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (NMFS 1999) has identified HAPCs for sandbar sharks in important nursery and pupping grounds found in shallow areas and the mouth of the Great Bay, NJ; lower and middle Delaware Bay; lower Chesapeake Bay; and near the Outer Banks, NC in areas of Pamlico Sound adjacent to and offshore of Hatteras and Ocracoke Islands. This habitat fulfills the first HAPC criterion of providing an important ecological function.

4.4.2.4 South Atlantic Fishery Management Council (SAFMC) HAPCs

Unlike other Councils, the SAFMC has designated HAPCs for all of the species covered under a given fishery management plan (FMP), rather than for individual species. HAPCs have been designated broadly under SAFMC's EFH Comprehensive Amendment (SAFMC, 1998), including both general habitat types and specific areas of ecological importance identified in the appropriate FMP. HAPC criteria are not specified for individual habitats, but the designations are justified as enabling the Council to effectively protect EFH and take timely action to manage fisheries in HAPCs, when needed. HAPCs have been designated by the SAFMC for species under a number of FMPs, as discussed below.

Penaeid Shrimp

HAPCs for penaeid shrimp include all coastal inlets; all state-designated nursery habitats of particular importance to shrimp; and state-identified overwintering areas.

Red Drum

HAPCs identified for red drum include all state-designated nursery habitats of particular importance to red drum; documented sites of spawning aggregations in NC, SC, GA, and FL described in the Habitat Plan; other spawning areas identified in the future; and SAV-identified areas.

Snapper-Grouper Management Unit

For the fish species in the snapper-grouper management unit, the SAFMC has identified the following HAPCs: medium to high profile offshore hard bottoms where spawning normally occurs; areas of known or likely spawning aggregations; nearshore hard bottom area; the Point; the Ten Fathom Ledge; Big Rock; the Charleston Bump; mangrove habitat; seagrass habitat; oyster/shell habitat; all coastal inlets; all state-designated nursery habitats of particular importance to snapper/grouper; pelagic and benthic *Sargassum*; Hoyt Hills for wreckfish; the Oculina Bank Habitat Area of Particular Concern; all hermatypic (involved in reef formation) coral habitats and reefs; Manganese outcroppings on the Blake Plateau; and Council-designated Artificial Reef Special Management Zones (SMZs).

Coastal Migratory Pelagic Species

HAPCs for Southeast coastal migratory pelagic species include the sandy shoals of Cape Lookout, Cape Fear, and Cape Hatteras from the shore to the ends of the respective shoals; the Point; the Ten-Fathom Ledge; Big Rock; the Charleston Bump; Hurl Rocks; the Point off Jupiter Inlet; Worm reefs off the central east coast of Florida; nearshore hard bottom south of Cape Canaveral; the Hump off Islamorada, FL,; the Marathon Hump off Marathon, FL; The Wall off the Florida Keys; pelagic *Sargassum*; and Atlantic coast estuaries with abundant Spanish mackerel and cobia, including Bogue Sound, New River, and Broad River.

Spiny Lobster

For spiny lobster, the SAFMC has identified the following HAPCs: Florida Bay; Biscayne Bay; Card Sound; and all coral/hard bottom habitat from Jupiter Inlet, FL through the Dry Tortugas, FL.

The HAPCs designated by the SAFMC include a wide and varying range of habitats. Therefore, more detailed descriptions of some of the prominent HAPCs found in the Southeast region are provided below:

Charleston Bump and Gyre

The coastal region southeast of Charleston, South Carolina is known as the Charleston Bump. In this productive area, the depth of the seafloor rises abruptly from 700 to 300 meters within the short distance of about 20 kilometers. In the same area, the cyclonic Charleston Gyre is a permanent oceanographic feature of the South Atlantic Bight induced by the reflection of rapidly moving Gulf Stream waters. The Charleston Gyre is considered essential nursery habitat for some offshore reef fishes. It produces a large area of upwelling nutrients that contributes significantly to primary and secondary production, and is consequently important to some ichthyoplankton.

Ten Fathom Ledge and Big Rock

The Ten Fathom Ledge and Big Rock areas are located south of Cape Lookout, North Carolina. The Ten Fathom Ledge is located at 34^{o} 11' N and 76^{o} 07' W in 95 to 120 meter depth on the Continental Shelf in Onslow Bay, North Carolina. This area encompasses numerous patch reefs of coral-algal-sponge growth on rock outcroppings distributed over 136 square miles of ocean floor. The substrate consists of oolithic calcarenites and coquina forming a thin veneer over the underlying Yorktown formation of silty sands, clays, and calcareous quartz sandstones.

The Big Rock area encompasses 36 square miles of deep drowned reef around the 50 to 100 meter isobath on the outer shelf and upper slope approximately 36 miles south of Cape Lookout. Hard substrates at the Big Rock area are predominately algal limestone and calcareous sandstone.

Unique bottom topography at both sites produces oases of productive bottom relief with diverse and productive epifaunal and algal communities surrounded by a generally monotonous and relatively unproductive sand bottom. Approximately 150 reef-associated species have been documented at the two sites.

Shelf Break Area from North Carolina to Florida

The bottom area between 100 and 300 meters deep from Cape Hatteras to Cape Canaveral constitutes essential deep reef fish habitat. Series of troughs and terraces are composed of bioeroded limestone and carconate sandstone (Newton et al., 1971), and exhibit vertical relief ranging from less than half a meter to more than 10 meters. Ledge systems formed by rock outcrops and piles of irregularly sized boulders are common.

Overall, the deep reef fish community probably consists of fewer than 50 species. Parker and Ross (1986) observed 34 species of deepwater reef fishes (representing 17 families) from submersible operations off North Carolina in waters 98 to 152 meters deep.

Gray's Reef National Marine Sanctuary

Gray's Reef National Marine Sanctuary is located 17.5 nautical miles east of Sapelo Island, Georgia, and 35 nautical miles Northeast of Brunswick, Georgia. Gray's Reef encompasses nearly 32 square kilometers at a depth of about 22 meters (Parker et al., 1994). The Sanctuary contains extensive but patchy hardbottoms of moderate relief (up to two meters). Rock outcrops, in the form of ledges, are often separated by wide expanses of sand, and are subject to weathering, shifting sediments, and slumping, which create a complex habitat including caves, burrows, troughs, and overhangs (Hunt, 1974). Parker et al. (1994) described the habitat preference of 66 species of reef fish distributed over five different habitat types. Numbers of species and fish densities were highest on the ledge habitat, intermediate on live bottom, and lowest over sand.

Nearshore Hard Bottom of Southeast Florida

The nearshore hard bottom areas extending semi-continuously from Cape Canaveral, FL ($28^{o}30'$ N) to at least Boca Raton, FL (26^{o} 20' N) also meet the HAPC criteria. In terms of ecological function, several studies suggest that nearshore hard bottom reefs may serve as nursery habitat. Many species utilize these habitats during both newly settled and older juvenile life stages, suggesting that nearshore hard bottom can facilitate both inshore and offshore migrations during differing ontogenetic stages of some species. In southeast Florida waters, natural hard bottom areas with substantial three-dimensional structure are lacking. Absence of nursery structure can result in increased predation and lowered growth.

Corals and Coral Reefs

Coral is a living substrate that has been defined as a type of HAPC. Coral is a common name for a number of diverse invertebrate species within the phylum Coelenterata. The Alcyonarian soft corals are of interest because they can provide additional structure for habitat and have a potentially long life span. Soft corals can be bush or treelike in shape. Species found in this form attach to hard substrates such as rock outcrops or gravel. These species can range in size from a few millimeters to several meters, and the trunk diameter of large specimens can exceed 10 centimeters. Other Alcyonarians found in this region include sea pens and sea pansies (Order Pennatulacea), which are found in a wider range of substrate types. In their survey of Northeastern U.S. shelf macrobenthic invertebrates, Theroux and Wigley (1998) found Alcyonarians (including soft corals *Alcyonium sp*., *Acanella sp*., *Paragorgia arborea*, *Primnoa reseda* and sea pens) in limited numbers in waters deeper than 50 meters, and mostly at depths from 200 to 500 meters. Alcyonarians were present in each of the geographic areas identified in the study (Nova Scotia, Gulf of Maine, Southern New England Shelf, Georges Slope, Southern New England Slope) except Georges Bank. However, *Paragorgia* and *Primnoa* have been reported in the Northeast Peak region of Georges Bank (Theroux and Grosslein, 1987). Alcyonarians were most abundant by weight in the Gulf of Maine, and by number on the Southern New England Slope (Theroux and Wigley, 1998). Theroux and Wigley (1998) also found stony corals (*Astrangia danae* and *Flabellum sp*.) in the Northeast region, but they were uncommon. In similar work on the Mid-Atlantic shelf, the only Alcyonarians encountered were sea pens (Wigley and Theroux, 1981). The stony coral *Astrangia danae* was also found, but its distribution and abundance were not discussed, and are assumed to be minimal.

Gorgonian corals are upright, hard coral species. They are colonies of animals composed of individual polyps, which deposit a tree or fanlike skeleton that supports the colony. In the Atlantic EEZ, gorgonian corals, particularly members of the genera *Paragoria* and *Primnoa* (red tree coral), may be especially valuable as fish habitat due to their longevity and large size (they can grow up to three meters high and seven meters wide). Some species of gorgonians may live to be over 100 years old (Risk et al., 2001; Andrews et al., 2002). Large *Primnoa* colonies may be hundreds of years old; a recent study using isotope dating concluded that a five-centimeter specimen of *Primnoa reseda* from Nova Scotia, Canada, was approximately 500 years old (Risk et al., 1998). The habitat created by these gorgonians may be occupied by communities with high biodiversity and may provide shelter for fish (Risk et al., 1998; Fossa et al., 1999). Given their size and longevity, gorgonian corals may be especially vulnerable to fishing impacts and may take over 100 years to recover (Andrews et al., 2002). Although scientists have limited understanding of its importance as fish habitat, deep water coral clearly provides vertical structure for fish to use for protection and cover.

4.4.3 American Lobster Habitats

The American lobster fishery accounts for the majority of affected vessels and gear regulated by the ALWTRP. Because lobster habitat may be influenced by the proposed ALWTRP modifications, this section examines the unique aspects of lobster habitat in greater detail.

The American lobster (*Homarus americanus*) is distributed throughout the Northwest Atlantic Ocean from Newfoundland to Cape Hatteras, North Carolina. Juvenile and adult American lobsters occupy a wide variety of benthic habitats from the intertidal zone to depths of 700 meters. They are most abundant in relatively shallow coastal waters.

The following description of lobster habitats in the Northeast region of the U.S. (Maine to North Carolina) is based primarily on a report prepared by Lincoln (1998) from a variety of primary source documents. This information has been supplemented by the addition of some more recent research results. Exhibit 4-39 summarizes information on lobster densities by habitat type.

4.4.3.1 Inshore Lobster Habitats

Estuaries represent one key component of inshore lobster habitat, and encompass the following environments:

- **Mud Base with Burrows**: These habitats occur primarily in harbors and quiet estuaries with low currents. Lobster shelters are formed from excavations in soft substrate. This is an important habitat for juveniles and densities can be very high, reaching 20 animals per square meter.

- **Rock, Cobble and Gravel**: Juveniles and adolescents have been reported on shallow bottom with gravel and gravely sand substrates in the Great Bay Estuary, NH; on gravel/cobble substrates in outer Penobscot Bay, ME (Steneck and Wilson, 1998); and in rocky habitats in Narragansett Bay, RI (Lawton and Lavalli, 1985). Densities in Penobscot Bay exceeded 0.5 juveniles and 0.75 adolescents/m^2. According to unpublished information cited by Lincoln (1998), juvenile lobsters in Great Bay prefer shallow bottoms with gravely sand substrates.

- **Rock/Shell**: Adult lobsters in the Great Bay Estuary utilize sand and gravel habitats in the channels, but appear to prefer a rock/shell habitat more characteristic of the high temperature, low salinity regimes of the central bay.

Exhibit 4-39

SUMMARY OF AMERICAN LOBSTER HABITATS AND DENSITIES

Habitat Category	Habitat Subtypes	Lobster Densities (number/ square meter)	Lobster Sizes	Source
Estuaries	Mud base with burrows	Up to 20	Small juveniles	Cooper and Uzmann, 1980
		< 0.01	Adults	Cooper and Uzmann, 1980
	Rock, cobble & gravel	> 0.5	Juveniles	Steneck and Wilson, 1998
		> 0.75	Adolescents	Steneck and Wilson, 1998
	Rock/shell	N.A.		
Inshore Rock Types	Sand base with rock	3.2	Avg. 40 mm carapace length	Cooper and Uzmann, 1980
	Boulders overlaying sand	0.09-0.13		Cooper and Uzmann, 1980
	Cobbles	Up to 16		Cooper and Uzmann, 1980
	Bedrock base with rock and boulder overlay	0.1-0.3		Cooper and Uzmann, 1980
	Mud-shell/rock substrate	0.15		Cooper and Uzmann, 1980
Submarine Canyons	Canyon rim and walls	0-0.0002	Adolescents and adults	Cooper et al., 1987
	Canyon walls	Up to 0.001	Adolescents and adults	Cooper et al., 1987
	Rim and head of canyons and at base of walls	0.0005-0.126	Adolescents and adults	Cooper et al., 1987
	Pueblo villages	0.0005-0.126	Adolescents and adults	Cooper et al., 1987
Other	Peat	Up to 5.7		Barshaw and Lavalli, 1988
	Kelp beds	1.2-1.68	Adolescents	Bologna and Steneck, 1993
	Eel grass	<0.04	Juveniles and adolescents	Barshaw and Lavalli, 1988
		0.1	80% adolescents	Short et al., 2001
	Sand base with rock	N.A.		
	Clay base with burrows and depressions	Minimum 0.001		Cooper and Uzmann, 1980
	Mud-clay base with anemones	Minimum 0.001	50-80 mm carapace length in depressions	Cooper and Uzmann, 1980

Inshore rock areas make up another important category of lobster habitat. These include the following:

- **Sand Base with Rock**: This is the most common inshore rock type in depths greater than 40 meters. It consists of sandy substrate overlain by flattened rocks, cobbles, and boulders. Lobsters are associated with abundant sponges, Jonah crabs, and rock crabs. Shelters are formed by excavating sand under a rock to form U-shaped, shallow tunnels. Densities of sub-adult lobsters are fairly high in these areas.

- **Boulders Overlaying Sand**: This habitat type is relatively rare in inshore New England waters. Compared to other inshore rocky habitats, lobster densities are low.

- **Cobbles**: Lobsters occupy shelters of varying size in the spaces between rocks, pebbles, and boulders. Densities as high as 16 lobsters/m^2 have been observed, making this the most densely populated inshore rock habitat for lobsters in New England.

- **Bedrock Base with Rock and Boulder Overlay**: This rock type is relatively common inshore, from low tide to depths of 15 to 45 meters. Shelters are formed by rock overhangs or crevices. Encrusting coralline algae and attached organisms such as anemones, sponges, and mollusks cover exposed surfaces. Green sea urchins and starfish are common. Cunner, tautog, sculpin, sea raven, and redfish are the most abundant fish. Lobster densities generally are low.

- **Mud-Shell/Rock Substrate**: This habitat type is usually found where sediment discharge is low and shells make up the majority of the bottom. It is best described off the Rhode Island coast. Lobster densities generally are low.

Other lobster habitat types are significant. For example, kelp beds represent another form of lobster habitat. Kelp beds in New England consist primarily of *Laminaria longicruris* and *L. saccharina*. Lobsters were attracted to transplanted kelp beds at a nearshore study site in the mid-coast region of Maine, reaching densities almost ten times higher than in nearby control areas (Bologna and Steneck, 1993). Lobsters did not burrow into the sediment, but sought shelter beneath the kelp. Only large kelp (greater than 50 cm in length) was observed sheltering lobsters and was used in the transplant experiments.

Lobster shelters also are formed from excavations cut into peat. Reefs form from blocks of salt marsh peat that break and fall into adjacent marsh creeks and channels and appear to provide moderate protection for small lobsters from predators (Barshaw and Lavalli, 1988). Densities are high (up to 5.7/m^2) in these areas.

Lobsters have been associated with eelgrass beds in the lower portion of the Great Bay Estuary in New Hampshire (Short et al., 2001). Eighty percent of the lobsters collected from eelgrass beds were adolescents. Average density was $0.1/m^2$, higher than reported by Barshaw and Lavalli (1988). In mesocosm experiments, Short et al. reported that lobsters showed a clear preference for eelgrass over bare mud. This research showed that adolescent lobsters burrow in eelgrass beds, utilize eelgrass as an overwintering habitat, and prefer eelgrass to bare mud.

Finally, research in Maine has demonstrated the presence of early settlement, postlarval, and juvenile lobsters in the lower intertidal zone (Cowan, 1999). Two distinct size classes were consistently present: three to 15 mm and 16 to 40 mm. Monthly mean densities during a five-year period ranged from zero to 8.6 individuals/m^2 at 0.4 meters below mean low water. Preliminary results indicate that areas of the lower intertidal zone serve as nursery grounds for juvenile lobster.

4.4.3.2 Offshore Lobster Habitats

Offshore areas supply several types of lobster habitat. First, more than 15 submarine canyons cut into the shelf edge on the south side of Georges Bank. These canyons were first surveyed in the 1930s, but were not fully explored until manned submersibles were used extensively in the 1980s. Detailed information on canyon habitats for American lobster are available primarily for Oceanographer Canyon, but this information is generally applicable to other major canyons on Georges Bank. Concentrations of adolescents and adult lobsters are substantially greater in submarine canyons than in nearby areas that are occupied mostly by adults (Cooper et al., 1987; Cooper and Uzmann, 1980). These canyons present a diverse group of habitat types:

- **Canyon Rim and Walls**: Sediments consist of sand or semi-consolidated silt with less than five percent overlay of gravel. The bottom is relatively featureless. Burrowing mud anemones are common but lobster densities are low.

- **Canyon Walls**: Sediments consist of gravely sand, sand, or semi-consolidated silt with more than five percent gravel. The bottom is relatively featureless. Burrowing mud anemones are common, as are Jonah crabs, ocean pout, starfish, rosefish, and squirrel hake. Lobster densities are somewhat higher than in substrates that contain less gravel (see above).

- **Rim and Head of Canyons at Base of Walls**: Sand or semi-consolidated silt substrate is overlain by siltstone outcrops and talus up to boulder size. The bottom is very rough and is eroded by animals and current scouring. Lobsters are associated with rock anemones, Jonah crabs, ocean pout, tilefish, starfish, conger eels, and white hake. Densities are highly variable, but reach as high as 0.13 lobsters/m^2.

- **Pueblo Villages**: This habitat type exists in the clay canyon walls and extends from the heads of canyons to middle canyon walls. It is heavily burrowed and excavated. Slopes range from five to 70 degrees, but are generally between 20 and 50 degrees. Juvenile and adult lobsters and associated fauna create borings up to 1.5 meters in width, one meter in height, and two meters or more in depth. Lobsters are associated with Jonah crabs, tilefish, hermit crabs, ocean pout, starfish, and conger eels. This habitat may well contain the highest densities of lobsters found offshore.

In addition to canyons, lobster are associated with several other offshore habitat types, including the following:

- **Sand Base with Rocks**: Although common inshore (see above), this habitat is rather restricted in the offshore region except along the north flank of Georges Bank.

- **Clay Base with Burrows and Depressions**: This habitat is common on the outer continental shelf and slope. Lobsters excavate burrows up to 1.5 meters long. There are also large, bowl-like depressions that range in size from one to five meters in diameter and may shelter several lobsters at a time. Minimum densities of 0.001 lobsters/m^2 have been observed in summer.

- **Mud-Clay Base with Anemones**: This is a common habitat for lobsters on the outer shelf or upper slope. Forests of mud anemones (*Cerianthus borealis*) may reach densities of three or four per square meter. Depressions serve as shelter for relatively small lobsters at minimum densities of 0.001/m^2.

- **Mud Base with Burrows**: This habitat occurs offshore mainly in the deep basins, in depths up to 250 meters. This environment is extremely common offshore. Lobsters occupy this habitat, but no density estimates are available.

4.4.4 Impact of Fishing on EFH

The environmental impact analysis presented later in this EIS includes a discussion of how the ALWTRP may affect fishing gear and fishing practices, and subsequently influence marine habitat. Experts believe that fixed fishing gear (pots/traps and anchored gillnets) has a more direct impact on benthic habitat than on non-benthic (water column) habitat because it generally comes in contact with the sea floor. Therefore, the sections below review how fixed-gear fishing can affect habitat, with a primary focus on benthic habitat. The potential effects examined include:

- Alteration of physical structure;
- Mortality of benthic organisms;
- Changes to the benthic community and ecosystem;

- Sediment suspension; and
- Chemical modifications.

4.4.4.1 Alteration of Physical Structure

Any type of fishing gear that is towed, dragged, or dropped on the seabed will disturb the sediment and the resident community to varying degrees. The intensity of disturbance is dependent on the type of gear, how long the gear is in contact with the bottom, sediment type, sensitivity of habitat features in contact with the gear, and frequency of disturbance. Physical effects of fishing gear, such as ploughing, smoothing of sand ripples, removal of stones, and turning of boulders, can act to reduce the heterogeneity of the sediment surface. For example, boulder piles, crevices, and sand ripples can provide fish and invertebrates hiding areas and a respite from currents and tides. Removal of taxa, such as worm tubes, corals, and gorgonians that provide relief, and the removal or shredding of submerged vegetation, can also occur, thereby reducing the number of structures available to biota as habitat.

Most studies on habitat damage due to fishing gear focus on the effects of bottom trawls and dredges. It has been noted by Rogers et al. (1998) that the reason there are few accounts of static gear (e.g. traps/pots) having measurable effects on benthic biota may be because the area of seabed affected by such gear is almost insignificant when compared to the widespread effects of mobile gear. Although there has been relatively little research conducted to document the impacts to physical structure from trap/pot gear, it is possible that benthic structures (both living and non-living) could be affected as traps/pots are dropped or dragged along the bottom. For example, Eno et al. (2001) observed and evaluated the effects of crab and lobster pots/traps on attached epibenthic megafauna (sponges, bryozoans, ascidians, soft corals, and tube worms) at three locations in Great Britain, and conducted three experiments to assess sea pen recovery and survival following dragging, uprooting, and smothering by lobster pots/traps. Sea pens underneath traps/pots were bent over and some were even uprooted when traps/pots were dragged over mud sediments, but they fully recovered within 72 to 144 hours after pots/traps were removed. When traps/pots were dragged over the bottom, they left tracks, but four weeks of simulated commercial trap/pot fishing had no negative effects on the abundance of attached benthic epifauna. In fact, sponges increased in abundance in the experimental plots. Therefore, the study concluded that the use of pots/traps had no lasting effects on the three different habitat types observed.

Chuenpagdee et al. (2003) compared the effects of different gear types on benthic habitat and also found the physical habitat impacts of traps/pots and bottom gill nets to be moderate. The biological habitat impacts of these gears were found to be low. Habitat impacts caused by bottom trawls and dredges were considered to be much higher. A similar conclusion was reached by a panel of experts that evaluated the habitat impacts of commercial fishing gears used in the Northeast region of the U.S. (Maine to North Carolina). Bottom-tending static gear (e.g. traps/pots) was found to have a minimal effect on benthic habitats when compared to the physical and biological impacts caused by bottom trawls and dredges (NMFS 2002f). Furthermore, the vulnerability of benthic EFH for all managed species in the region to the impacts of pots/traps and bottom gill nets is considered to be low (NMFS 2004c).

4.4.4.2 Mortality of Benthic Organisms

In addition to effects on physical habitat, fishing gear can cause direct mortality to emergent epifauna. In particular, erect, foliose fauna or fauna that build reef-like structures have the potential to be destroyed by towed gear, longlines, or traps/pots (Hall, 1999). Physical structure of the biota sometimes determines their ability to withstand and recover from the physical impacts of fishing gear. For example, thinner shelled bi-valves and seastars often suffer higher damage than solid shelled bi-valves (Rumohr and Krost, 1991). Animals that can retract below the penetration depth of the fishing gear and those that are more elastic and can bend upon contact with the gear also fare much better than those that are hard and inflexible (Eno et al., 2001).

4.4.4.3 Changes to Benthic Communities and Ecosystems

The mortality of benthic organisms as a result of interaction with fishing gear can alter the structure of the benthic community, potentially causing a shift in the community from low-productive long-lived species (k-selected species) to highly-productive, short-lived, rapidly-colonizing species (r-selected species). For example, motile species that exhibit high fecundity and rapid generation times will recover more quickly from fishery-induced disturbances than non-mobile, slow-growing organisms, which may lead to a community shift in chronically fished areas (Levin, 1984).

Increased fishing pressure in a certain area may also lead to changes in species distribution. Changes (e.g., localized depletion) could be evident in benthic, demersal, and even pelagic species. Scientists have also speculated that mobile fishing may lead to increased populations of opportunistic feeders in chronically fished areas.

4.4.4.4 Sediment Suspension

Resuspension of sediment can occur as fishing gear is pulled or dragged along or immediately above the seafloor (NMFS, 2002c). Although resuspension of sediment is typically associated with mobile fishing gear, it also can occur with gear such as traps/pots.

Chronic suspension of sediments and resulting turbidity can affect aquatic habitat by reducing available light for photosynthesis, burying benthic biota, smothering spawning areas, and causing negative effects on feeding and metabolic rates. If it occurs over large areas, resuspension can redistribute sediments, which has implications for nutrient budgets (Messieh et al., 1991; Black and Parry, 1994; Mayer et al., 1991; and Pilskaln et al., 1998).

Species’ reaction to turbidity depends on the particular life history characteristics of the organism. Effects are likely to be more significant in waters that are normally clear as compared to areas that typically experience high naturally induced turbidity (Kaiser, 2000). Mobile organisms can move out of the affected area and quickly return once the turbidity dissipates (Coen, 1995). Even if species experience high mortality within the affected area, those with high levels of recruitment or high mobility can re-populate the affected area rapidly. However, sessile or slow-moving species would likely be buried and could experience high mortality. Furthermore, if effects are protracted and occur over a large area, recovery through recruitment or immigration will be hampered. Additionally, chronic resuspension of sediments may lead to shifts in species composition by favoring those species that are better suited to recover or those that can take advantage of the additional nutrient supply as the nutrients are released from the seafloor to the euphotic zone (Churchill, 1989).

4.4.4.5 Chemical Modifications

Disturbances associated with fishing gear also can cause changes in the chemical composition of the water column overlying affected sediments. In shallow water, the impacts may not be noticeable relative to the mixing effects caused by tidal surges, storm surges, and wave action. However, in deeper, calmer areas with more stable waters, the changes in chemistry may be more evident (NMFS, 2002c). Increases in ammonia content, decreases in oxygen, and pulses of phosphate have been observed in North Sea waters, although it is not clear how these changes affect fish populations. Increased incidence of phytoplankton blooms could occur during seasons when nutrients are typically low. The increase in primary productivity could have a positive effect on zooplankton communities and on organisms up the food chain.

Eutrophication, often considered a negative effect, could also occur. However, it is important to note that these releases of nutrients to the water act to recycle existing nutrients and, thereby, make them available to benthic organisms rather than add new nutrients to the system (ICES, 1992). This recycling is thought to be less influential in the eutrophication process than the input of new nutrients from rivers and land runoff.

4.5 REFERENCES

Agler, B.A., R.L. Schooley, S.E. Frohock, et al., Reproduction of Photographically Identified Fin Whales, *Balaenoptera physalus*, from the Gulf of Maine, *J. Mamm*. 74:577-587, 1993.

Andrews, A.H., E.E. Cordes, M.M. Mahoney, K. Munk, K.H. Coale, G.M. Cailliet, and J. Heifetz, Age, grow th, and radiometric age validation of a deep-sea, habit-forming gorgonian (*Primnoa resedaeformis*) from the Gulf of Alaska, *Hydrobiologia*, 471:101-110, 2002.

ASSRT (Atlantic Sturgeon Status Review Team). Status review of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). National Marine Fisheries Service. February 23, 2007. 188 pp. 2007.

Atlantic States Marine Fisheries Commission (ASMFC). American Lobster Stock Assessment for Peer Review 09-01 (Supplemental), March 2009. 316 pp. 2009

Atlantic States Marine Fisheries Commission (ASMFC), Addendum I to the Spiny Dogfish Fishery Management Plan (draft for public comment), July 2005.

Atlantic States Marine Fisheries Commission, "American Lobster" viewed online at http://www.asmfc.org/Programs/Fish%20Mgnt/2002%20Factsheets%20PDF/American%20Lobster.pdf, August 19, 2003.

Atlantic States Marine Fisheries Commission (ASMFC), ASMFC Approves the Interstate Fishery Management Plan for Spiny Dogfish – Plan Implementation Slated for May 1, 2003, News Release, November 21, 2002.

Barco, S.G., W.A. McLellan, J. Allen, R. Asmutis, R. Mallon-Day, E. Meagher, D.A. Pabst, J. Robbins, R. Seton, R.M. Swingle, M.T. Weinrich, and P. Clapham, Population identity of humpback whales in the waters of the U.S. mid-Atlantic states, *J. Cetacean Res. Manage*. 4:135-141, 2002.

Barlas, M.E. The distribution and abundance of harbor seals (*Phoca vitulina concolor)* and gray seals (*Halichoerus grypus*) in southern New England, winter 1998-summer 1999. M.A. thesis. Graduate School of Arts and Sciences Boston University, Boston, MA. 52 pp, 1999.

Barlow, J., and P.J. Clapham, A new birth-interval approach to demographic parameters of humpback whales, *Ecology*, 78:535-546, 1997.

Barshaw, D.E. and K.L. Lavalli, Predation upon postlarval lobsters *Homarus americanus* by cunners *Tautogolabrus adspersus* and mud crabs *Neopanope sayi* on three different substrates: eelgrass, mud, and rock, *Mar. Ecol. Progr.*, Ser. 48:119-123, 1988.

Bérubé, M., A. Aguilar, D. Dendanto, F. Larsen, G. Notarbartolo di Sciara, R. Sears, J. Sigurjónsson, J. Urban-Ramirez, and P.J. Palsbøll, Population genetic structure of North

Atlantic and Mediterranean Sea fin whales, *Balaenoptera physalus* (Linnaeus 1758): analysis of mitochondrial and nuclear loci, and comparison to the Sea of Cortez fin whale population. *Molec. Ecol.* 15:585-599, 1998.

Best, P.B., J.L. Bannister, R.L. Brownell, Jr., and G.P. Donovan, (ed.), Report of the workshop on status and trends of western North Atlantic right whales. *J. Cetacean Res. Manage.* (Special Issue) 2:61-87, 2001.

Bigelow, H.B. and W.C. Schroeder, Fishes of the Gulf of Maine, *Fishery Bulletin of the Fish and Wildlife Service*, Vol. 53, Contribution number 592, Woods Hole Oceanographic Institution, 1953.

Black, K.P. and G.D. Parry, "Sediment transport rates and sediment disturbance due to scallop dredging in Port Phillip Bay," *Mem. Queensl. Mus*., 36:327-341, 1994.

Blaylock, R.A., J.W. Hain, L.J. Hansen, D.L. Palka, and G.T. Waring, U.S. Atlantic and Gulf of Mexico marine mammal stock assessments, NOAA Tech. Memo. NMFS-SEFSC-363. U.S. Department of Commerce, Washington, D.C., 1995.

Bologna, P.A. and R.S. Steneck, Kelp beds as habitat for American lobster *Homarus americanus*, *Mar. Ecol. Progr*., Ser. 100:127-134, 1993.

Boulva, J. and I.A. McLaren, Biology of the harbor seal, *Phoca vitulina,* in eastern Canada, *Bull. Fish. Res. Bd. Can.* 200:1-24, 1979.

Bowen, W.D., J. McMillan and R. Mohn. Sustained exponential population growth of grey seals at Sable Island, Nova Scotia. ICES J. Mar. Sci. 60: 1265-1274, 2003.

Bowen, W.D., J.I. McMillan and W. Blanchard. Reduced population growth of gray seals at Sable Island: Evidence from pup production and age of primiparity. Mar. Mamm. Sci. 23: 48-64, 2007.

Branstetter, Steve, NMFS Southeast Regional Office, personal communication, March 20, 2006.

Brown, M.B., O.C. Nichols, M.K. Marx, and J.N. Ciano, Surveillance of North Atlantic right whales in Cape Cod Bay and adjacent waters. Final report to the Division of Marine Fisheries, Commonwealth of Massachusetts. 29 pp., September 2002.

Carr, A.R. Panspecific reproductive convergence in *Lepidochelys kempi*. Ergebnisse der Biologie 26:298-303, 1963.

Caulfield, R.A., Aboriginal subsistence whaling in Greenland: the case of Qeqertarsuaq municipality in West Greenland, *Arctic* 46:144-155, 1993.

CETAP, A characterization of marine mammals and turtles in the mid- and north Atlantic areas of the USA outer continental shelf. Cetacean and Turtle Assessment Program, University of Rhode Island. Final Report #AA551-CT8-48 to the Bureau of Land Management, Washington, DC, 538 pp., 1982.

Chuenpagdee, R., L.E. Morgan, S.M. Maxwell, E.A. Norse, and D. Pauly, Shifting gears: assessing collateral impacts of fishing methods in US waters, *Frontiers in Ecology and the Environment*, 1(10):517-524, 2003.

Churchill, J.H., The effect of commercial trawling on sediment resuspension and transport over the Middle Atlantic Bight continental shelf, *Continental Shelf Research*, 9(9):841-864, 1989.

Clapham, P.J., Age at attainment of sexual maturity in humpback whales, *Megaptera novaeangliae, Can. J. Zool.*, 70:1470-1472, 1992.

Clapham, P.J., L.S. Baraff, C.A. Carlson, M.A. Christian, D.K. Mattila, C.A. Mayo, M.A. Murphy, and S. Pittman, Seasonal occurrence and annual return of humpback whales in the southern Gulf of Maine, *Can. J. Zool.* 71:440-443, 1993.

Clapham, P.J. and C.A. Mayo, Reproduction and recruitment of individually identified Humpback whales, *Megaptera novaeangliae*, observed in Massachusetts Bay, 1979-1985, *Can. J. Zool*. 65(12):2853-2863, 1987.

Clapham, P.J. and C.A. Mayo, Reproduction of humpback whales *(Megaptera novaeangliae)* observed in the Gulf of Maine, *Rep. Int. Whal. Commn.* Special Issue 12:171-175, 1990.

Clapham, P.J., L.S. Baraff, C.A. Carlson, M.A. Christian, et al., Seasonal Occurrence and Annual Return of Humpback Whales, *Megaptera novaeangliae*, In the Southern Gulf of Maine, *Can. J. Zool.*, 71:440-443, 1993.

Clapham, P.J., S.B. Young, and R.L. Brownell, Baleen whales: Conservation issues and the status of the most endangered populations, *Marine Mammal Rev.* 29(1):35-60, 1999.

Clapham, P.J., S. Brault, H. Caswell, M. Fujiwara, S. Kraus, R. Pace, and P. Wade. Report of the working group on survival estimation for North Atlantic right whales. September 27, 2002.

Clapham, P.J., J. Barlow, T. Cole, D. Mattila, R. Pace, D. Palka, J. Robbins, and R. Seton, Stock definition, abundance, and demographic parameters of humpback whales from the Gulf of Maine, *J. Cetacean Res. Manage.*, 5:13-22, 2003.

Clark, C.W., Application of U.S. Navy underwater hydrophone arrays for scientific research on whales, *Reports of the International Whaling Commission* 45:210-212, 1995.

Clarke, R., Open boat whaling in the Azores: the history and present methods of a relic history, *Discovery Rep.* 26:281-354, 1954.

Coen, L.D., A review of the potential impacts of mechanical harvesting on subtidal and intertidal shellfish resources, Unpublished Report, South Carolina Department of Natural Resources, Marine Resources Research Institute, 1995.

Collette, B.B. and MacPhee, G., eds., Bigelow and Schroeder's fishes of the Gulf of Maine, 3rd edition, Smithsonian Institution Press, Washington, D.C., 2002.

Collins, M. R., and T. I. J. Smith. Distribution of shortnose and Atlantic sturgeons in South Carolina. North American Journal of Fisheries Management 17: 995-1000, 1997.

Committee for Whaling Statistics, International Whaling Statistics, 1959-1983.

Conant, T.A., P.H. Dutton, T. Eguchi, S.P. Epperly, C.C. Fahy, M.H. Godfrey, S.L. MacPherson, E.E. Possardt, B.A. Schroeder, J.A. Seminoff, M.L. Snover, C.M. Upite, and B.E. Witherington. Loggerhead sea turtle (*Caretta caretta*) 2009 status review under the U.S. Endangered Species Act. Report of the Loggerhead Biological Review Team to the National Marine Fisheries Service, August 2009. 222 pp, 2009.

Cooper, R.A. and J.R. Uzmann, Ecology of juvenile and adult *Homarus americanus*, pp. 97-142 in: *The Biology and Management of Lobsters* (J.S. Cobb and B.F. Phillips, eds.), Vol. II. Academic Press, N.Y., 1980.

Cooper, R.A., P. Valentine, J.R. Uzmann, and R.A. Slater, Submarine Canyons, pp. 53-63 in: *Georges Bank* (R.H. Backus, ed.), MIT Press, Cambridge, MA, 1987.

Cowan, D.F., Method for assessing relative abundance, size distribution, and growth of recently settled and early juvenile lobsters (*Homarus americanus*) in the lower intertidal zone. *J. Crust. Biol.*, 19(4):738-751, 1999.

DFO 2011. Updated status of Northwest Atlantic harp seals, (Pagophilus groenlandicus). Department of Fisheries and Oceans. DFO Can. Sci. Advis. Sec. Sci. Rep. 2011/050. 16 pp.

Dadswell, M. A review of the status of Atlantic sturgeon in Canada, with comparisons to populations in the United States and Europe. Fisheries 31: 218-229, 2006

Dam, M., and D. Bloch, Screening of mercury and persistent organochlorine pollutants in long-finned pilot whale (*Globicephala melas*) in the Faroe Islands, *Marine Pollution Bulletin* 40:1090-1099, 2000.

deHart, P.A.P. The distribution and abundance of harbor seals (*Phoca vitulina concolor)* in the Woods Hole region. M.A. thesis. Graduate School of Arts and Sciences, Boston University, Boston, MA. 88 pp, 2002.

Dobrzynski, T., and K. Johnson, Regional Council Approaches to the Identification and Protection of Habitat Areas of Particular Concern, NMFS Office of Habitat Conservation, Silver Spring, MD, 16 pp., 2001.

Donovan, G.P., A Review of IWC Stock Boundaries, *Reports of the International Whaling Commission*, Special Issue 13:39-68, 1991.

Doughty, R.W., Sea turtles in Texas: a forgotten commerce, *Southwestern Historical Quarterly* 88:43-70, 1984.

Dovel, W. L. and T. J. Berggren. Atlantic sturgeon of the Hudson River Estuary, New York. New York Fish and Game Journal 30: 140-172, 1983.

Dunton, K.J., A. Jordaan, K.A. McKown, D.O. Conover, and M.J. Frisk. Abundance and distribution of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) within the Northwest Atlantic Ocean, determined from five fishery-independent surveys. Fishery Bulletin 108:450-465, 2010.

Erickson, D. L., A. Kahnle, M. J. Millard, E. A. Mora, M. Bryja, A. Higgs, J. Mohler, M. DuFour, G. Kenney, J. Sweka, and E. K. Pikitch. Use of pop-up satellite archival tags to identify oceanic-migratory patterns for adult Atlantic Sturgeon, *Acipenser oxyrinchus oxyrinchus* Mitchell, 1815. J. Appl. Ichthyol. 27: 356–365, 2011.

Ehrhart, L.M., A survey of marine turtles nesting at Kennedy Space Center, Cape Canaveral Air Force Station, North Brevard County, Florida, unpublished report to the Div. of Mar. Fish., St Pete., FL, Flor. Dept. of Nat. Res., 1979.

Eno, N.C., D.S. MacDonald, J.A.M. Kinnear, S.C. Amos, C.J. Chapham, R.A. Clard, F.P.D. Bunker, and C. Munro, Effects of crustacean traps on benthic fauna, *ICES Journal of Marine Science*, 58:11-20, 2001.

Fay, C., M. Bartron, S. Craig, A. Hecht, J. Pruden, R. Saunders, T. Sheehan, and J. Trial, Status Review for Anadromous Atlantic Salmon (*Salmo salar*) in the United States, Report to the National Marine Fisheries Service and U.S. Fish and Wildlife Service, 294 pp., 2006.

Finkbeiner, E.M., B.P. Wallace, J.E. Moore, R.L. Lewison, L.B. Crowder, and A.J. Read. 2011. Cumulative estimates of sea turtle bycatch and mortality in USA fisheries between 1990 and 2007. Biological Conservation 144(11): 2719-2727.

Fisheries and Oceans Canada, Atlantic seal hunt: 2001 management plan, Available from Canadian Department of Fisheries and Oceans, Ottawa, Ontario, Canada, K1A OE6, Resource Management – Atlantic, 2001.

Fisheries and Oceans Canada, Atlantic seal hunt: 2003-2005 management plan, Available from Canadian Department of Fisheries and Oceans, Ottawa, Ontario, Canada, K1A OE6, Resource Management – Atlantic, 2003.

Fossa, J.H., D.M. Furevik, P.B. Mortensen, and M. Hovland, Effects of bottom trawling on Lophelia deep water coral reefs in Norway, Poster presented at ICES meeting on Ecosystem Effects of Fishing, March 1999.

Frasier, T.R. Integrating genetic and photo-identification data to assess reproductive success in the North Atlantic right whale (*Eubalaena glacialis*). PhD thesis. McMaster University, Hamilton, Ontario, 2005.

Frasier, T.R., B.A. McLeod, R.M. Gillett, M.W. Brown and B.N. White. Right Whales Past and Present as Revealed by Their Genes. Pp 200-231. *In*: S.D. Kraus and R.M. Rolland (eds) *The Urban Whale*. Harvard University Press, Cambridge, Massachusetts, London, England. vii-xv + 543pp, 2007.

Froese, R. and D. Pauly (eds.), FishBase, available online at www.fishbase.org, June 16, 2003 version.

Fujiwara, M. and H. Caswell, Demography of the endangered North Atlantic right whale, *Nature* 414:537-541, 2001.

Gambell, R., International management of whales and whaling: a review of the regulation of commercial and aboriginal subsistence whaling, *Arctic* 46:97-107, 1993.

Geraci, J.R., Clinical investigation of the 1987-88 mass mortality of bottlenose dolphins along the U.S. central and south Atlantic coast, Final Report to the National Marine Fisheries Service, U.S. Navy, Office of Naval Research, and Marine Mammal Commission, Washington, D.C., 1989.

Geraci, J.R., D. Anderson, R. Timperi, D. St. Aubin, G. Early, J. Prescott, and C. Mayo, Humpback whales (*Megaptera novaeangliae*) fatally poisoned by dinoflagellate toxin, *Can. J. Fish. Aquatic Sci*., 46(11):1895-1898, 1989.

Gilbert, J.R. and N. Guldager, Status of harbor and gray seal populations in northern New England, Final Report to NMFS, NEFSC, Woods Hole, MA, Coop. Agree. 14-16-009-1557, 13 pp., 1998.

Gilbert, J.R. and K.M. Wynne. Harbor seal populations and marine mammal-fisheries interactions, 1982. Contract NA-80-FA-C-00029 NMFS, Northeast Fisheries Science Center, Woods Hole, MA. 43 pp, 1983.

Gilbert, J.R. and K.M. Wynne. Harbor seal populations and marine mammal fisheries interactions, 1983. Contract NA-80-FA-C-00029. Third annual report. NMFS, Northeast Fisheries Science Center, Woods Hole, MA. 52 pp, 1984.

Gilbert, J.R., and K.M. Wynne, Harbor seal populations and fisheries interactions with marine mammals in New England, Interim report, NOAA NA-84-EAC-00070, NMFS, NEFSC, Woods Hole, MA, 15 pp., 1985.

Gilbert, J.R., and K.M. Wynne, Marine mammal interactions with New England gillnet fisheries, Final Report Contract No. NA-84-EAC-00070, NMFS, NEFSC, Woods Hole, MA, 21 pp., 1987.

Gilbert, J.R., G.T. Waring, K.M. Wynne and N. Guldager. Changes in abundance and distribution of harbor seals in Maine, 1981-2001. Mar. Mamm. Sci. 21: 519-535, 2005.

Goodyear, J.D., Significance of Feeding Habitats of North Atlantic Right Whales Based on Studies of Diel Behaviour, Diving, Food Ingestion Rates, and Prey, A thesis presented to the Faculty of Graduate Studies of the University of Guelph in partial fulfillment of requirements for the degree of Doctor of Philosophy, 1996.

Gulf of Mexico Fishery Management Council (GMFMC) and South Atlantic Fishery Management Council (SAFMC). Fishery Management Plan, Final Environmental Impact Statement, Regulatory Review. Final Regulations for the Coastal Migratory Pelagic Resources (Mackerels). Gulf of Mexico Fishery Management Council, Lincoln Ctr., Suite 881, 5401 West Kennedy Blvd., Tampa, FL, South Atlantic Fishery Management Council, 1 Southpark Circle, Suite 306, Charleston, SC, 1983.

Hain, J.H.W., G.R. Carter, S.D. Kraus, C.A. Mayo, and H.E. Winn, Feeding behavior of the humpback whale, *Megaptera novaeangliae,* in the western North Atlantic, Fish Bull., U.S. Fish. Wildl. Serv., 80:259-268, 1982.

Hain, J.H.W., M.J. Ratnaswamy, R.D. Kenney, and H.E. Winn, "The fin whale, *Balaenoptera physalus,* in waters of the northeastern United States continental shelf," *Reports of the International Whaling Commission* 42:653-669, 1992.

Hall, S.J., The effects of fishing on marine ecosystems and communities, Blackwell Science, Oxford, 274 pp., 1999.

Hammill, M.O. Abundance of Northwest Atlantic grey seals in the Gulf of St. Lawrence and along the Nova Scotia Eastern Shore. DFO Research Document 2005/036. Canadian Department of Fisheries and Oceans. Ottawa, Ontario. 11 pp, 2005. http://www.dfo-mpo.gc.ca/csas/Csas/Publications/ResDocs-DocRech/2005/2005_036_e.

Hamilton, P.K., and C.A. Mayo, Population characteristics of right whales *(Eubalaena glacialis)* observed in Cape Cod and Massachusetts Bays, 1978-1986, *Reports of the International Whaling Commission,* Special Issue No. 12:203-208, 1990.

Hamilton, P.K., M.K. Marx, and S.D. Kraus, Scarification analysis of North Atlantic right whales *(Eubalaena glacialis)* as a method of assessing human impacts. Final report to the Northeast Fisheries Science Center, NMFS, Contract No. 4EANF-6-0004, 1998.

Hartley, D., A. Whittingham, J. Kenney, T. Cole, and E. Pomfret, Large Whale Entanglement Report 2001. Report to the National Marine Fisheries Service, updated February 2003. 2003.

Haycock, C.R. and S.N. Mercer, Observations and notes on the abundance and distribution of cetaceans in the Eastern Bay of Fundy near Brier Island, Nova Scotia, in August and September 1984, Unpublished report, 1984.

Hilterman, M.L. and E. Goverse. Annual report of the 2003 leatherback turtle research and monitoring project in Suriname. World Wildlife Fund - Guianas Forests and Environmental Conservation Project (WWF-GFECP) Technical Report of the Netherlands Committee for IUCN (NC-IUCN), Amsterdam, the Netherlands, 21p, 2004.

Hoese, H.D., and R.H. Moore, Fishes of the Gulf of Mexico, Texas, Louisiana, and adjacent waters. Texas A & M Press. 327 pp., 1977.

Holsbeek, L., C.R. Joiris, V. Debacker, I.B. Ali, P. Roose, J-P. Nellissen, S. Gobert, J-M. Bouquegneau, and M. Bossicart, Heavy metals, organochlorines, and polycyclic aromatic hydrocarbons in sperm whales stranded in the southern North Sea during the 1994/1995 winter, *Marine Pollution Bulletin*, 38(4):304-313, 1999.

Hunt, J.L., Jr., The geology of Gray's Reef, Georgia continental shelf, M.S. thesis, Univ. Georgia, Athens, 83 pp., 1974.

ICES, Report of the Study Group on Ecosystem Effects of Fishing Activities, Copenhagen, 7-14 April, 1992, International Council for the Exploration of the Sea, Study Group on Ecosystem Effects of Fishing Activities, ICES CM 1992/G:11, 144 pp., 1992.

International Whaling Commission (IWC), Report of the Special Meeting on Sperm Whale Biology and Stock Assessments, *Reports of the International Whaling Commission*, 21:40-50, 1971.

International Whaling Commission (IWC), Right whales: past and present status, *Reports of the International Whaling Commission*, Special Issue No. 10; Cambridge, England, 1986.

International Whaling Commission (IWC), Report of the comprehensive assessment special meeting on North Atlantic fin whales. *Reports of the International Whaling Commission* 42:595-644, 1992.

Johnson, A.J., G.S. Salvador, J.F. Kenney, J. Robbins, S.D. Kraus, S.C. Landry, and P.J. Clapham, Fishing gear involved in entanglements of right and humpback whales, *Marine Mammal Science* 21(4):635-645, 2005.

Kaiser, M.J., The implications of the effects of fishing on non-target species and habitats, pp. 383-392, in M.J. Kaiser and S.J. de Groot, *The Effects of Fishing on Non-target Species and Habitats*, Blackwell Science, 2000.

Katona, S.K., J.A. Beard, Population Size, Migrations, and Feeding Aggregations of the Humpback Whale *(Megaptera novaeangliae)* in the Western North Atlantic Ocean, *Reports of the International Whaling Commission*, Special Issue 12:295-306, 1990.

Katona, S.K., V. Rough and D.T. Richardson, A field guide to whales, porpoises, and seals from Cape Cod to Newfoundland, *Smithsonian Institution Press*: Washington, DC, 316 pp., 1993.

Kennebec River Resource Management Plan. Kennebec River resource management plan: balancing hydropower generation and other uses. Final Report to the Maine State Planning Office, Augusta, ME. 196 pp, 1993.

Kenney, J., and D. Hartley, Draft Large Whale Entanglement Summary 1997-2001, Large Whale Entanglement Report 2002. Report to the National Marine Fisheries Service, updated October 2001. 2001.

Kenney, M.K. Harbor seal population trends and habitat use in Maine. M.S. thesis. University of Maine, Orono, ME. 55 pp, 1994.

Kenney, R.D., Are right whales starving? Electronic newsletter of the Center for Coastal Studies, posted at www.coastalstudies.org/entanglementupdate/kenney1.html on November 29, 2000.

Kenney, R.D., G.P. Scott, T.J. Thompson and H.E. Winn. Estimates of prey consumption and trophic impacts of cetaceans in the USA northeast continental shelf ecosystem. J. Northwest Fish. Sci. 22: 155-171, 1997.

Kenney, R.D., North Atlantic, North Pacific, and Southern hemisphere right whales, pp. 806-813 in: W.F. Perrin, B. Wursig, and J.G.M. Thewissen (eds.), *Encyclopedia of Marine Mammals*. Academic Press, CA. 2002.

Kenney, R.D., M.A.M. Hyman, R.E. Owen, G.P. Scott, and H.E. Winn, Estimation of prey densities required by Western North Atlantic right whales, *Mar. Mamm. Sci.* 2(1):1-13, 1986.

Knowlton, A.R., J. Sigurjonsson, J.N. Ciano, and S.D. Kraus, Long-distance movements of North Atlantic right whales *(Eubalaena glacialis)*, *Mar. Mamm. Sci.* 8(4):397-405, 1992.

Knowlton, A.R., S.D. Kraus and R.D. Kenney. Reproduction in north Atlantic right whales (*Eubalaena glacialis*). Can. J. Zool. 72:1297-1305. 1994.

Knowlton, A.R. and S.D. Kraus, "Mortality and serious injury of northern right whales *(Eubalaena glacialis)* in the western North Atlantic Ocean," *J. Cetacean Res. Manage.*, 2001.

Knowlton, A.R., M.K. Marx, H.M. Pettis, P.K. Hamilton, and S.D. Kraus. Analysis of scarring on North Atlantic right whales *(Eubalaena glacialis)*: monitoring rates of entanglement interaction. Final contract report to the National Marine Fisheries Service. 18 pp. October 2003.

Knowlton, A.R., M.K. Marx, H.M. Pettis, P.K. Hamilton and S.D. Kraus.
Analysis of scarring on North Atlantic right whales (Eubalaena glacialis): monitoring rates of entanglement interaction 1980-2002. National Marine Fisheries Service. Contract #43EANF030107. Final Report. 2005.

Knowlton, A.R., P.K. Hamilton, M.K. Marx, H.M. Pettis, and S.D. Kraus. Monitoring North Atlantic right whale *Eubalaena glacialis* entanglement rates: a 30 yr retrospective. Marine Ecology Progress Series 466: 293-302. 2012.

Kraus, S.D., Rates and Potential Causes of Mortality in North Atlantic Right Whales *(Eubalaena glacialis), Mar. Mamm. Sci.* 6(4):278-291, 1990.

Kraus, S.D., M.J. Crone, and A.R. Knowlton. The North Atlantic right whale, in: W.E. Chandler (ed.), *The Audubon Wildlife Report 1988/1989*. Academic Press, N.Y. 1988.

Kraus, S.D., P.K. Hamilton, R.D. Kenney, A.R. Knowlton, and C.K. Slay. Reproductive parameters of the North Atlantic right whale. *J. Cetacean Res. Manage*. (Special Issue) 2:231-236. 2001.

Kraus, S.D., M.W. Brown, H. Caswell, C.W. Clark, M. Fujiwara, P.K. Hamilton, R.D. Kenney, A.R. Knowlton, S. Landry, C.A. Mayo, W.A. McLellan, M.J. Moore, D.P. Nowacek, D.A. Pabst, A.J. Read and R.M. Rolland. (2005). North Atlantic right whales in crisis. Science 309:561-562

Kraus, S.D., R.M. Pace III, and T.R. Frasier. High investment, low return: the strange case of reproduction in *Eubalaena glacialis*. *in* Kraus, S.D. and R. M. Rolland, Eds. The Urban Whale: North Atlantic Right Whales at the Crossroads. Harvard University Press. Cambridge, Massachusetts p172-199, 2007.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, M. Podesta, Collisions between ships and whales, *Marine Mammal Science* 17(1):35- 75, 2001.

Laney, R.W., J.E. Hightower, B.R. Versak, M.F. Mangold, W.W. Cole Jr., and S.E. Winslow. 2007. Distribution, habitat use, and size of Atlantic sturgeon captured during cooperative winter tagging cruises, 1988–2006. Pages 167-182. *In*: J. Munro, D. Hatin, J. E. Hightower, K. McKown, K. J. Sulak, A. W. Kahnle, and F. Caron, (editors), Anadromous sturgeons: habitats, threats, and management. Am. Fish. Soc. Symp. 56, Bethesda, MD.

Laviguer, L. and M.O. Hammill, Distribution and seasonal movements of grey seals, *Halichoerus grypus*, born in the Gulf of St. Lawrence and eastern Nova Scotia shore, *Can. Field-Nat*., 107:329-340, 1993.

Lawton, P. and K.L. Lavalli, Postlarval, juvenile, adolescent, and adult ecology, pp. 47-88 in: Biology of the Lobster *Homarus americanus* (J.R. Factor, ed.), Academic Press, NY, 1985.

Leatherwood, S., and R.R. Reeves, *The Sierra Club handbook of whales and dolphins*, Sierra Club Books, San Francisco, California, 1983.

Levin, L.A., Life history and dispersal patterns in a dense infaunal polychaete assemblage: community structure and response to disturbance, *Ecology*, 65(4):1185-1200, 1984.

Lincoln, D., Lobsters on the edge-essential lobster habitats in New England, Report prepared for Greenlite Consultants, Newton Highlands, MA, 1998.

Lutcavage, M.E., P. Plotkin, B. Witherington, and P.L. Lutz, Human impacts on sea turtle survival, pp. 387-409, in: P.L. Lutz and J.A. Musick, (eds.), *The Biology of Sea Turtles*, CRC Press, Boca Raton, FL, 432 pp., 1997.

Malik, S., M.W. Brown, S.D. Kraus, and B.N. White, Analysis of DNA diversity within and between North and South Atlantic right whales, *Mar. Mammal Sci.* 16:545-558, 2000.

Mangin, E. Croissance en Longueur de Trois Esturgeons d'Amerique du Nord: *Acipenser oxyrhynchus*, Mitchill, *Acipenser fulvescens*, Rafinesque, et *Acipenser brevirostris* LeSueur. Verh. Int. Ver. Limnology 15: 968-974, 1964.

Mansfield, A.W., The grey seal in eastern Canadian waters, *Can. Audubon Mag.*, 28:161-166, 1966.

Manzella, S.A., C.W. Caillouet, Jr. and C.T. Fontaine, Kemp's ridley sea turtle, *Lepidochelys kempi*, head-start tag recoveries: distribution, habitat and method of recovery, *Mar. Fish. Rev.* 50(3):24-32, 1988.

Marquez, R., Status report of the Kemp's ridley turtle, in Ogren, L., F. Berry, K. Bjorndal, H. Kumpf, R. Mast, G. Medina, H. Reichart, and R. Witham (eds.), Proceedings of the 2nd Western Atlantic Turtle Symposium, NOAA Technical Memorandum NMFS-SEFC-226, 1989.

Mate, B.M., S.L. Nieukirk, and S.D. Kraus, Satellite-monitored movements of the North Atlantic right whale, *J. Wildl. Manage.*, 61:1393-1405, 1997.

Mayer, L.M., D.F. Schick, R.H. Findlay, and D.L. Rice, Effects of commercial dragging on sedimentary organic matter, *Mar. Environ. Res.* 31:249-261, 1991.

Mayo, C. and M. Marx, Surface Foraging Behaviour of the North Atlantic Right Whale, *Eubalaena glacialis*, and Associated Zooplankton Characteristics, *Canadian Journal of Zoology*, 68:2214-2220, 1990.

McLellan, W. M., A. S. Friedlaender, J. G. Mead, C. W. Potter and D. A. Pabst. 2003. Analysing 25 years of bottlenose dolphin (*Tursiops truncatus*) strandings along the Atlantic coast of the USA: Do historic records support the coastal migratory stock hypothesis? J. Cetacean Res. Manage. 4: 297-304.

Messieh, S.N., T.W. Rowel, D.L. Peer, and P.J. Cranford, The effects of trawling, dredging and ocean dumping on the eastern Canadian continental shelf seabed, *Continental Shelf Research*, 11(8-10):1237-1263, 1991.

Meylan, A., B. Schroeder, and A. Mosier, Sea turtle nesting activity in the state of Florida, *Fla. Mar. Res. Publ.* 52:1-51, 1995.

Mid-Atlantic Fishery Management Council (MAFMC), Amendment 12 to the Summer Flounder, Scup, Black Sea Bass Fishery Management Plan, Dover: MAFMC, 1998.

Mid-Atlantic Fishery Management Council (MAFMC), Proposed and Final Federal Commercial Management Measures, 2003.

Mid-Atlantic Fishery Management Council (MAFMC) Amendment 1 to the Tilefish Fishery Management Plan, Volume 1. Mid-Atlantic Fishery Management Council, December 2008.

Mitchell, E., Present status of the northwest Atlantic fin and other whale stocks, pp. 108-169 in W.E. Schevill (ed.) *The whale problem: a status report*. Harvard University Press, Cambridge, Massachusetts, 1974.

Mitchell, E.D., Winter Records of the Minke Whale *(Balaenoptera acutorostrata* Lacepede 1804) in the Southern North Atlantic, *Rep. Int. Whal. Commn.*, 41:455-457, 1991.

Mitchell, E. and D.G. Chapman, Preliminary assessment of stocks of northwest Atlantic sei whales (*Balaenoptera borealis*), *Rep. Int. Whal. Comm*. Special Edition 1:117-120, 1977.

Mizroch, S.A. and A.E. York, "Have pregnancy rates of Southern Hemisphere fin whales, *Balaenoptera physalus*, increased?" *Reports of the International Whaling Commission*, Special Issue No. 6:401-410, 1984.

Mohn, R. and W.D. Bowen. Grey seal predation on the eastern Scotian Shelf: Modeling the impact on Atlantic cod. Can. J. Fish. Aquat. Sci 53: 2722-2738, 1996.

Muir, D.C.G., R. Wagemann, N.P. Grift, R.J. Norstrom, M. Simon, and J. Lien, Organochlorine Chemical and Heavy-Metal Contaminants in White-Beaked Dolphins (*Lagenorhynchus albirostris*) and Pilot Whales (*Globicephala melaena*) from the Coast of Newfoundland, Canada, *Archives of Environmental Contamination and Toxicology*, 17(5):613-629, September 1988.

Murawski, S.A. and A.L. Pacheco. Biological and fisheries data on Atlantic sturgeon, *Acipenser oxyrhynchus* (Mitchill). National Marine Fisheries Service Technical Series Report 10: 1-69, 1977.

Murphy, M., South Atlantic Fishery Management Council, Charleston, SC, personal communication to Jennifer Kassakian, Industrial Economics, Inc., Cambridge, MA, September 16, 2003.

Murphy, Margaret A., Occurrence and group characteristics of minke whales, *Balaenoptera acutorostrata*, in Massachusetts Bay and Cape Cod Bay, *Fishery Bulletin*, 93:577-585, 1995.

Musick, J.A. and C.J. Limpus, Habitat utilization and migration in juvenile sea turtles, pp. 137-164 in: Lutz, P.L. and J.A. Musick, eds., *The Biology of Sea Turtles*. CRC Press, New York, 432 pp., 1997.

National Research Council (NRC), *Decline of the sea turtles: Causes and prevention*, National Academy Press, Washington, D.C., 1990.

New England Fishery Management Council (NEFMC), Final Amendment 11 to the Northeast Multispecies Fishery Management Plan, Amendment 9 to the Atlantic Sea Scallop Fishery Management Council, Amendment 1 to the Monkfish Fishery Management Plan, Components of the Proposed Atlantic Herring Fishery Management Plan for Essential Fish Habitat: Incorporating the Environmental Assessment, Newburyport: NEFMC, 1998.

New England Fishery Management Council (NEFMC), Fishery Management Plan for Deep-Sea Red Crab, March 2002.

New England Fishery Management Council (NEFMC), "Frequently Asked Questions about the Groundfish Fishery," as viewed online at http://www.nefmc.org/faqs/gf_facts.PDF on June 20, 2003a.

New England Fishery Management Council (NEFMC), Final Amendment 13 to the Northeast Multispecies Fishery Management Plan, Newburyport, Massachusetts, December 2003b.

New England Fishery Management Council (NEFMC), "Species Managed by the NEFMC," as viewed online at http://www.nefmc.org/overview/text_species.htm on June 19, 2003c.

Newton, J.G., O.H. Pilkey, and J.O. Blanton, An oceanographic atlas of the Carolina and continental margin, North Carolina Dept. of Conservation and Development, Raleigh, 57 pp., 1971.

Nielsen, J.B., F. Nielsen, P-J. Jørgensen, and P. Grandjean, Toxic metals and selenium in blood from pilot whales (*Globicephala melas*) and sperm whales (*Physeter catodon*), *Mar. Pollut. Bull.*, 40:348-351, 2000.

NMFS, Final recovery plan for the North Atlantic right whale *(Eubalaena glacialis)*, Prepared by the Right Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland, 1991a.

NMFS, Final recovery plan for the humpback whale (*Megaptera novaeangliae)*, Office of Protected Resources, November 1991b.

NMFS, Harvesting the Value-added Potential of Atlantic Hagfish, April 1996.

NMFS, Draft recovery plans for the fin whale (*Balaenoptera physalus*) and sei whale (*Balaenoptera borealis*), Prepared by R.R. Reeves, G.K. Silber, and P.M. Payne for the National Marine Fisheries Service, Silver Spring, Maryland, July 1998a.

NMFS, Recovery plan for the blue whale (*Balaenoptera musculus*), Prepared by R.R. Reeves, P.J. Clapham, and R.L. Brownell, Jr. for the National Marine Fisheries Service, Silver Spring, Maryland, 1998b.

NMFS, Recovery Plan for Pacific Populations of the Olive Ridley Turtle, Prepared by the Pacific Sea Turtle Recovery Team, 1998c.

NMFS, Final Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks, Vol. II, Washington, DC: NMFS, 1999.

NMFS, Stock structure of coastal bottlenose dolphins along the Atlantic coast of the U.S. NMFS/SEFSC Report prepared and reviewed for the Bottlenose Dolphin Take Reduction Team. Available from NMFS-Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149, 2001a.

NMFS, Reinitiation of Consultation on the Federal Lobster Management Plan in the Exclusive Economic Zone, Biological Opinion, Consultation No. F/NER/2001/00651, Northeast Region Protected Resources Division, June 2001b.

NMFS, Small Entity Compliance Guide, October 10, 2002a.

NMFS in conjunction with the Maine Department of Marine Resources. EA for a Jonah Crab Experimental Fishery in EEZ Nearshore (Lobster) Management Area 1, May 2002b.

NMFS, Restricted Access Management Program (RAM), The IFQ Program: Report to the Fleet, February, 2002c.

NMFS, Northeast Dealer Weighout Database, Coastal Fisheries Logbook Program, Sustainable Fisheries Division, Southeast Fisheries Science Center, Miami, FL, 2002d.

NMFS, Southeast Logbook Database, Coastal Fisheries Logbook Program, Sustainable Fisheries Division, Southeast Fisheries Science Center, Miami, FL, 2002e.

NMFS, Workshop on the Effects of Fishing Gear on Marine Habitats off the Northeastern United States, October 23-25, 2001, Boston, Massachusetts, Northeast Fisheries Science Center Reference Document 02-01, Northeast Region Essential Fish Habitat Steering Committee, February, 2002f.

NMFS, Summary of Selected Federal Trap/Pot and Gillnet Fisheries managed by Fishery Management Plans developed in accordance with the Magnuson-Stevens Act and/or the Atlantic Coastal Fisheries Cooperative Management Act. Unpublished report of the Protected Resources Division, Northeast Regional Office, National Marine Fisheries Service, Gloucester, MA, 2003a.

NMFS-Northeast Fisheries Science Center,"Status of Fisheries Resources off Northeastern United States-Scup," viewed on-line at http://www.nefsc.noaa.gov/sos/spsyn/og/scup/ on 8/14/2003b.

NMFS-Northeast Fisheries Science Center, "Status of Fisheries Resources off Northeastern United States-Black Sea Bass," viewed on-line at http://www.nefsc.noaa.gov/ sos/spsyn/og/seabass/ on 8/14/2003c.

NMFS, Annual Commercial Landing Statistics. Available at: http://www.st.nmfs.gov/st1/ commercial/landings/annual_landings.html, March 25, 2012.

NMFS, Biological Opinion on the Continued Operation of Atlantic Shark Fisheries (commercial shark bottom longline and drift gillnet fisheries and recreational shark fisheries) Under the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (HMS FMP) and the Proposed Rule for Draft Amendment 1 to the HMS FMP, 2003e.

NMFS, Sea Turtle Conservation Measures for the Pound Net Fishery in Virginia Waters of the Chesapeake Bay, Biological Opinion, Consultation No. F/NER/2003/01596, Northeast Region Protected Resources Division, 2004a.

NMFS, Northeast Region, Sustainable Fisheries Division, 2004b.

NMFS, Characterization of the Fishing Practices and Marine Benthic Ecosystems of the Northeast U.S. Shelf, and an Evaluation of the Potential Effects of Fishing on Essential Fish Habitat, NOAA Technical Memorandum NMFS-NE-181, January, 2004c.

NMFS, A Message from the NOAA Assistant Administrator for Fisheries, NMFS's Report on the Status of the U.S. Fisheries for 2004, 2005. Available at: http://www.mafmc.org/mid-atlantic/StatusReport2004.pdf.

NMFS, Olive Ridley Sea Turtle (*Lepidochelys oliveacea*), Office of Protected Resources. Available at: http://www.nmfs.noaa.gov/pr/species/turtles/olive.html, February 16, 2006.

NMFS (National Marine Fisheries Service) and USFWS (U.S. Fish and Wildlife Service). Kemp's ridley sea turtle *(Lepidochelys kempii*) 5 year review: summary and evaluation. Silver Spring, Maryland: National Marine Fisheries Service. 50 pp. , 2007c.

NMFS and USFWS. Leatherback sea turtle (*Dermochelys coriacea*) 5 year review: summary and evaluation. National Marine Fisheries Service, Silver Spring, Maryland. 79 pp, 2007b.

NMFS (National Marine Fisheries Service) and USFWS (U.S. Fish and Wildlife Service). Green sea turtle (*Chelonia mydas*) 5 year review: summary and evaluation. Silver Spring, Maryland: National Marine Fisheries Service. 102 pp., 2007d.

NMFS (National Marine Fisheries Service). Biennial Report to Congress on the Recovery Program for Threatened and Endangered Species, October 1, 2008 – September 30, 2010. Washington, D.C.: National Marine Fisheries Service. 194 pp. 2011.

NMFS (National Marine Fisheries Service). 2011 Annual Report to the Inter-Agency Agreement: A Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US Waters of the western North Atlantic Ocean. Northeast and Southeast Fisheries Science Center.

NMFS (National Marine Fisheries Service) and USFWS (U.S. Fish and Wildlife Service). Recovery plan for the Northwest Atlantic population of the loggerhead turtle (*Caretta caretta*), Second revision. Washington, D.C.: National Marine Fisheries Service. 325 pp. 2008.

NMFS and U.S. Fish and Wildlife Service, Guide to the Listing of a Distinct Population Segment of Atlantic Salmon as Endangered, November 2000.

Northeast Fisheries Science Center, 30th Stock assessment workshop report, Woods Hole, MA, April 2000, NMFS-NEFSC, Ref. Doc. 00-03, 2000.

Palka, D., A. Read and C. Potter, Summary of knowledge of white-sided dolphins (*Lagenorhynchus acutus*) from the U.S. and Canadian North Atlantic waters, *Rep. Int. Whal. Comm.*, 47:729-734, 1997.

Palka, D.L. Summer abundance estimates of cetaceans in US North Atlantic Navy Operating Areas. Northeast Fish. Sci. Cent. Ref. Doc. 06-03. 41 pp., 2006. http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0603/crd0603.pdf

Palsboll, P.J., J. Allen, M. Berube, et al., Genetic Tagging of Humpback Whales, *Nature*, 388:767-769, 1997.

Parker, R.O., Jr., and S.W. Ross, Observing reef fishes from submersibles off North Carolina, *Northeast Gulf Sci*., 8:31-49, 1986.

Parker, R.O., Jr., A.J. Chester, and R.S. Nelson, A video transect method for estimating reef fish abundance, composition, and habitat utilization at Gray's Reef National Marine Sanctuary, Georgia, *Fish. Bull*., 92:787-799, 1994.

Payne, P.M., D.N. Wiley, S.B. Young, S. Pittman, P.J. Clapham, and J.W. Jossi, Recent fluctuations in the abundance of baleen whales in the southern Gulf of Maine, *Fish. Bull*. 88 (4):687-696, 1990.

Payne, P.M., J.R. Nicholas, L. O'Brien, and K.D. Powers, The Distribution of the Humpback Whale, *Megaptera novaeangliae*, on Georges Bank and in the Gulf of Maine in Relation to Densities of the Sand Eel, *Ammodytes americanus, Fish. Bull., U.S.* 84:271-277, 1986.

Payne, P.M. and L.A. Selzer. The distribution, abundance and selected prey of the harbor seal, *Phoca vitulina concolor*, in southern New England. Mar. Mamm. Sci. 5(2): 173-192, 1989.

Perrin, W.F., B. Wursig, and J.G.M. Thewissen, Encyclopedia of Marine Mammals, Academic Press: San Diego, 2002.

Perry, S.L., D.P. DeMaster, and G.K. Silber, The great whales: and status of six species listed as endangered under the U.S. Endangered Species Act of 1973, *Mar. Fish. Rev.* Special Edition. 61(1):59-74, 1999.

Pikitch, E.K., P. Doukakis, L. Lauck, P. Chakrabarty, and D.L. Erickson. Status, trends and management of sturgeon and paddlefish fisheries. Fish and Fisheries 6: 233–265, 2005.

Pilskaln, C.H., J.H. Churchill, and L.M. Mayer, Resuspension of sediment by bottom trawling in the Gulf of Maine and potential geochemical consequences, *Conserv. Biol.* 12:1223-1229, 1998.

Pritchard, P.C.H. Nesting of the leatherback turtle, *Dermochelys coriacea*, in Pacific, Mexico, with a new estimate of the world population status. Copeia 1982:741-747, 1982.

Purcell, J. Jellyfish and ctenophore blooms coincide with human proliferations and environmental perturbations. Annual Review of Marine Science 4:209:235, 2012.

Reeves, R., R. Rolland, and P.J. Clapham, Causes of Reproductive Failure in North Atlantic Right Whales: New Avenues of Research, Report of a Workshop Held 26-28 April 2000, Falmouth, Massachusetts, Northeast Fisheries Science Center, Reference Document 01-016, 2001.

Reeves, R., and Mitchell, E., History of whaling in and near North Carolina. NOAA Tech. Rep. NMFS 65:28pp., 1988.

Risk, M.J., D.E. McAllister, and L. Behnken, 1998, Conservation of cold- and warm-water seafans: Threatened ancient gorgonian groves, *Sea Wind*, 10(4):20-22, in National Marine Fisheries Service, 2001.

Robbins, J. Scar-based inference into the Gulf of Maine humpback whale entanglement: 2003-2006. Report to National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA. NOAA Contract #EA133F04SE0998. 2009.

Robbins, J. and D. Mattila. Monitoring entanglement scars on the caudal peduncle of Gulf of Maine humpback whales. Report to the National Marine Fisheries Service. Order No. 40EANF80028. 15 pp., 1999.

Robbins, J. and D.K. Mattila, Gulf of Maine Humpback Whale Entanglement Scar Monitoring Results, 1997-1999, Final report to the U.S. National Marine Fisheries Service (unpublished), available from the Center for Coastal Studies, Box 1036, Provincetown MA 02657, 2000.

Rogers, S.I., M.J. Kaiser, and S. Jennings, Ecosystem effects of demersal fishing: a European perspective, pp. 68-78 *in*: Effect of Fishing Gear on the Sea Floor of New England, E.M.

Dorsey and J. Pederson (editors), Conservation Law Foundation, Boston, Massachusetts, 160 pp., 1998.

Rough, V., Gray seals in Nantucket Sound, Massachusetts, winter and spring, 1994, Final report to Marine Mammal Commission, Contract T10155615, 28 pp. NTIS Pub. PB95-191391, 1995.

Rosenbaum, H.C., M.G. Egan, P.J. Clapham, R.L. Brownell, Jr., M.W. Brown, B.N. White, S. Malik, P.D. Walsh, and R. DeSalle. (2000). Utility of North Atlantic right whale museum specimens in assessing changes in genetic diversity. Cons. Biol. 14 (6): 1837-1842.

Rosel, P. E., L. Hansen and A. A. Hohn. Restricted dispersal in a continuously distributed marine species: Common bottlenose dolphins *Tursiops truncatus* in coastal waters of the western North Atlantic. Mol. Ecol. 18: 5030–5045, 2009.

Rumohr, H., and P. Krost, Experimental evidence of damage to benthos by bottom trawling with special reference to *Arctica islandica, Meeresforschung*, 33(4):340-345, 1991.

Sainsbury, J., Commercial Fishing Methods: An Introduction to Vessels and Gears, Surrey: London, 1971.

Savoy, T., and D. Pacileo. Movements and important habitats of subadult Atlantic sturgeon in Connecticut waters. Transactions of the American Fisheries Society. 132: 1-8, 2003.

Schaeff, C.M., S.D. Kraus, M.W. Brown, J.S. Perkins, R. Payne, and B.N. White, Comparison of genetic variability of North and South Atlantic right whales *(Eubalaena)* using DNA fingerprinting, *Can. J. Zool.* 75:1073-1080, 1997.

Schevill, W.E., W.A. Watkins, and K.E. Moore, Status of *glacialis* off Cape Cod, *Reports of the International Whaling Commission*, Special Issue No. 10:79-82, 1986.

Schroeder, C.L. Population status and distribution of the harbor seal in Rhode Island waters. M.S. thesis. University of Rhode Island, Kingston, RI. 197 pp, 2000.

Scott, G.P., D.M. Burn, and L.J. Hansen, The dolphin die off: long term effects and recovery of the population. Proceedings: Oceans ’88, IEEE Cat. No. 88-CH2585, Vol. 3:819-823, 1988.

Scott, W.B. and E.J. Crossman. Freshwater fishes of Canada. Fisheries Research Board of Canada. Bulletin 184. pp. 80-82, 1973.

Sears, R., F.W. Wenzel, and J.M. Williamson, Behavior and distribution observations of Cetacea along the Quebec north shore (Mingan Islands), summer-fall 1981, Unpublished report, Mingan Island Cetacean Study, Montreal, 72 pp., 1981.

Secor, D. H. Atlantic sturgeon fisheries and stock abundances during the late nineteenth century. Pages 89-98 *In*: W. Van Winkle, P. J. Anders, D. H. Secor, and D. A. Dixon, (editors) Biology, management, and protection of North American sturgeon. American Fisheries Society Symposium 28, Bethesda, Maryland, 2002.

Secor, D.H. and J.R. Waldman. Historical abundance of Delaware Bay Atlantic sturgeon and potential rate of recovery. American Fisheries Society Symposium 23: 203-216, 1999.

Seipt, I., P.J. Clapham, C.A. Mayo, and M.P. Hawvermale, Population characteristics of individually identified fin whales, *Balaenoptera physalus*, in Massachusetts Bay, *Fish. Bull*. 88:271-278, 1990.

Serchuk, F.M. and R.L. Wigley, Deep-sea red crab, *Geryon quinquedens*, in: M.D. Grosslein and T.R. Azarovitz (eds.), Fish distribution. MESA New York Bight Atlas Monograph 15. NY Sea Grant Institute, Albany, NY, 1982.

Short, F.T., K. Matso, H.M. Hoven, J. Whitten, D.M. Burdick, and C.A. Short, Lobster use of eelgrass habitat in the Piscataqua River on the New Hampshire/Maine border, USA, *Estuaries* 24(2):277-284, 2001.

Sigurjonsson, J., On the Life History and Autecology of North Atlantic Rorquals, in: A.S. Blix, L. Walloe, and O. Ulltang (ed.), *Whales, Seals, Fish and Man*, Elsevier Science, pp. 425-441, 1995.

Smith, T.I.J. The fishery, biology, and management of Atlantic sturgeon, *Acipenser oxyrhynchus*, in North America. Environmental Biology of Fishes 14(1): 61-72, 1985.

Smith, T.I.J. and J.P. Clugston. Status and management of Atlantic sturgeon, *Acipenser oxyrinchus*, in North America. Environmental Biology of Fishes 48: 335-346, 1997.

Smith, T.D., J. Allen, P.J. Clapham, P.S. Hammond, S. Katona, F. Larsen, J. Lien, D. Mattila, P.J. Palsboll, J. Sigurjonsson, P.T. Stevick and N. Oien. An ocean-basin-wide mark-recapture study of the North Atlantic humpback whale (*Megaptera novaeangliae*). Mar Mamm. Sci. 15(1): 1-32, 1999.

South Atlantic Fishery Management Council (SAFMC), Final Comprehensive Amendment Addressing Essential Fish Habitat in the Fishery Management Plans of the South Atlantic Region: Amendment 3 to the Shrimp Fishery Management Plan; Amendment 1 to the Red Drum Fishery Management Plan; Amendment 10 to the Snapper Grouper Fishery Management Plan; Amendment 10 to the Coastal Migratory Pelagics Fishery Management Plan; Amendment 1 to the Golden Crab Fishery Management Plan; and Amendment 4 to the Coral, Coral reefs, and Live/Hard Bottom Habitat Fishery Management Plan (Including Final ES/SEIS, RIR, & SIA/FIS), Charleston, SAFMC, 1998.

South Atlantic Fishery Management Council (SAFMC), Report of Black Sea Bass Stock Assessment Workshop, Beaufort, NC, February 14, 2003.

Spotila, J.R., A.E. Dunham, A.J. Leslie, A.C. Steyermark, P.T. Plotkin and F.V. Paladino. Worldwide population decline of *Dermochelys coriacea*: are leatherback turtles going extinct? Chelonian Conservation and Biology 2: 209-222, 1996.

Stein, A.B., K.D. Friedland, and M. Sutherland. Atlantic sturgeon marine bycatch and mortality on the continental shelf of the Northeast United States. North American Journal of Fisheries Management 24: 171-183, 2004.

Steneck, R.S. and C. Wilson, Why are there so many lobsters in Penobscot Bay?, pp. 72-75 in: *Rim of the Gulf – Restoring Estuaries in the Gulf of Maine* (D.D. Platt, ed.), The Island Institute, Rockland, ME, 1998.

Stevick, P.T., J. Allen, P.J. Clapham, N. Friday, S.K. Katona, F. Larsen, J. Lien, D.K. Mattila, P.J. Palsbøll, R. Sears, J. Sigurjónsson, T.D. Smith, G. Vikingsson, J. Øien, and P.S. Hammond, Trends in abundance of North Atlantic humpback whales, 1979-1993, Paper SC/53/NAH2 presented to the International Whaling Commission Scientific Committee, Available from IWC, 135 Station Road, Impington, Cambridge, UK, 2001.

Stevick, P., N. Oien and D.K. Mattila. Migration of a humpback whale between Norway and the West Indies. *Mar. Mammal Sci.* 14:162-166, 1998.

Swingle, W.M., S.G. Barco, T.D. Pitchford, W.A. McLellan, and D.A. Pabst, Appearance of juvenile humpback whales feeding in the nearshore waters of Virginia, *Mar. Mamm. Sci.* 9:309-315, 1993.

Taruski, A.G., C.E. Olney and H.E. Winn, Chlorinated hydrocarbons in cetaceans, *J. Fish. Res. Bd. Can*. 32(11):2205-9, 1975.

Taub, S.H. 1990. Interstate fishery management plan for Atlantic sturgeon. Fisheries Management Report No. 17. Atlantic States Marine Fisheries Commission, Washington, D.C. 73 pp.

Theroux, R.B. and M.D. Grosslein, Benthic fauna, in R.H. Backus and D.W. Bourne, eds., *Georges Bank*, pp. 283-295, MIT Press, Cambridge, MA, 1987.

Theroux, R.B. and R.L. Wigley, Quantitative composition and distribution of the macrobenthic invertebrate fauna of the continental shelf ecosystems of the northeastern United States, NOAA Tech. Rep., NMFS 140, 240 pp., 1998.

Trzcinski, M.K., R. Mohn and W.D. Bowen. Estimation of grey seal population size and trends at Sable Island. DFO Research Document 2005/067. Canadian Department of Fisheries and Oceans. Ottowa, Ontario. 10 pp. , 2005. http://www.dfo-mpo.gc.ca/csas/Csas/Publications/ResDocs-DocRech/2005/2005_067_e.htm

Turtle Expert Working Group, Assessment Update for the Kemp's Ridley and Loggerhead Sea Turtle Populations in the Western North Atlantic, U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-SEFSC-444, 2000.

TEWG (Turtle Expert Working Group). 2007. An assessment of the leatherback turtle population in the Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-555, 116 pp.

U.S. Fish and Wildlife Service, Economic Assessment of the Atlantic Coast Horseshoe Crab Fishery, April 7, 2000.

USASAC (United States Atlantic Salmon Assessment Committee). 2008. Annual Report of the U.S. Atlantic Salmon Assessment Committee Report No. 20 – 2007 Activities. Annual Report 2007/20. Portland, ME – March 11013, 2008. 77pp. and appendices

Vladykov, V.D. and J.R. Greeley. Order Acipenseroidei. In: Fishes of Western North Atlantic. Sears Foundation. Marine Research, Yale Univ. 1 630 pp, 1963.

Wade, P.R., and R.P. Angliss, Guidelines for assessing marine mammal stocks: Report of the GAMMS Workshop, April 3-5, 1996, Seattle, Washington. NOAA Technical Memorandum NMFS-OPR-12. U.S. Dept. of Commerce, Washington, DC. 93 pp., 1997.

Ward, Nathalie, Stellwagen Bank: A Guide to the Whales, Sea Birds, and Marine Life of the Stellwagen Bank National Marine Sanctuary, pp. 157-158, Down East Books, Camden, ME, 1995.

Waring, G.T., C.P. Fairfield, C.M. Ruhsam, and M. Sano, Sperm whales associated with Gulf Stream features off the northeastern USA shelf. *Fish. Oceanogr.* 2(2):101-105, 1993.

Waring, G.T., E. Josephson, C.P. Fairfield, and K. Maze-Foley (eds.), U.S. Atlantic and Gulf of Mexico marine mammal stock assessments – 2005, NOAA Technical Memorandum NOAA-NE-194, 2006.

Waring, G.T., J.M. Quintal, S.L. Swartz (eds.), U.S. Atlantic and Gulf of Mexico marine mammal stock assessments – 2000, NOAA Technical Memorandum NMFS-NE-168, 2000.

Waring, G.T., J.M. Quintal, and C.P. Fairfield (eds.), U.S. Atlantic and Gulf of Mexico marine mammal stock assessments – 2002, NOAA Technical Memorandum NOAA Fisheries-NE-169, 2002.

Waring, G.T., R.M. Pace, J.M. Quintal, C.P. Fairfield, and K. Maze-Foley (eds.), U.S. Atlantic and Gulf of Mexico marine mammal stock assessments – 2003, NOAA Technical Memorandum NOAA-NE-182, 2003.

Waring, G.T., E. Josephson, C.P. Fairfield, and K. Maze-Foley (eds.), U.S. Atlantic and Gulf of Mexico marine mammal stock assessments – 2005, NOAA Technical Memorandum NOAA-NE-194, 2006.

Waring GT, Josephson E, Fairfield-Walsh CP, Maze-Foley K, editors. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2007. NOAA Tech Memo NMFS NE 205; 415 , 2007.

Waring GT, Josephson E, Fairfield-Walsh CP, Maze-Foley K, editors. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2008. NOAA Tech Memo NMFS NE 210; 440 p. 2009

Waring GT, Josephson E, Maze-Foley K, Rosel, PE, editors.. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2010. NOAA Tech Memo NMFS NE 219; 598 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026. 2011

Waring GT, Josephson E, Maze-Foley K, Rosel, PE, editors. 2013. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2012. NOAA Tech Memo NMFS NE 223; 419 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/nefsc/publications/

Watkins, W.A., and W.E. Schevill, Aerial observation of feeding behavior in four baleen whales: *Eubalaena glacialis*, *Balaenoptera borealis*, *Megaptera novaeangliae*, and *Balaenoptera physalus*, *J. Mamm*. 60:155- 163, 1979.

Watkins, W.A., and W.E. Schevill, Observations of right whales *(Eubalaena glacialis)* in Cape Cod waters, *Fish. Bull.* 80(4):875-880, 1982.

Weinrich, M.T., M.R. Schilling, and C.R. Belt, Evidence of acquisition of a novel feeding behaviour: lobtail feeding in humpback whales, *Megaptera novaeangliae*, *Anim. Behav.*, 44:1059-1072, 1992.

Weisbrod, A.V., D. Shea, M.J. Moore, and J.J. Stegeman, Organochlorine exposure and bioaccumulation in the endangered Northwest Atlantic right whale *(Eubalaena glacialis)* population, *Environmental Toxicology and Chemistry*, 19(3):654-666, 2000a.

Weisbrod, A.V., D. Shea, M.J. Moore, and J.J. Stegeman, Bioaccumulation patterns of polychlorinated biphenyls and chlorinated pesticides in northwest Atlantic pilot whales, *Environ. Toxicol. Chem.*, 19:667-677, 2000b.

Welsh, S. A., S. M. Eyler, M. F. Mangold, and A. J. Spells. Capture locations and growth rates of Atlantic sturgeon in the Chesapeake Bay. Pages 183-194 *In*: W. Van Winkle, P. J. Anders, D. H. Secor, and D. A. Dixon, (editors), Biology, management, and protection of

North American sturgeon. American Fisheries Society Symposium 28, Bethesda, Maryland, 2002.

Whittingham, A., D. Hartley, J. Kenney, T. Cole, and E. Pomfret, Large Whale Entanglement Report 2002. Report to the National Marine Fisheries Service, updated March 2005. 2005a.

Whittingham, A., M. Garron, J. Kenney, and D. Hartley, Large Whale Entanglement Report 2003. Report to the National Marine Fisheries Service, updated June 2005. 2005b.

Wigley, R.L. and R.B. Theroux, “Atlantic continental shelf and slope of the United States – macrobenthic invertebrate fauna of the middle Atlantic bight region – faunal composition and quantitative distribution,” Geol. Surv. Prof. Pap. 529-N, 198 pp., 1981.

Wiley, D.N., R.A. Asmutis, T.D. Pitchford, and D.P. Gannon, “Stranding and mortality of humpback whales, *Megaptera novaeangliae,* in the Mid-Atlantic and southeast United States, 1985-1992,” *Fish. Bull.,* U.S. 93:196-205, 1995.

Wilson, C., Maine State Department of Marine Resources, West Boothbay Harbor, ME, personal communication to Jennifer Kassakian, Industrial Economics, Inc., Cambridge MA, September 24, 2003.

Winn, H.E., C.A. Price, and P.W. Sorensen, The distribution of the right whale *(Eubalaena glacialis)* in the western North Atlantic, *Reports of the International Whaling Commission*, Special Issue No. 10:129-138, 1986.

Wirgin, I. and T.L. King. Mixed stock analysis of Atlantic sturgeon from coastal locales and a non-spawning river. Presentation of the 2011 Sturgeon Workshop, Alexandria, VA, February 8-10, 2011.

Wynne, K. and M. Schwartz, Guide to marine mammals and turtles of the U.S. Atlantic and Gulf of Mexico, Rhode Island Sea Grant, Narragansett, 115 pp., 1999.

Zolman, E. S. Residence patterns of bottlenose dolphins (*Tursiops truncatus*) in the Stono River Estuary, Charleston County, South Carolina. Mar. Mamm. Sci. 18: 879-892, 2002.

Appendix 4-A

SPECIES LANDED WITH TRAP/POT GEAR IN 2011

Exhibit 4A-1

TOTAL LANDINGS CAUGHT WITH TRAP/POT GEAR IN 2011

Region	Species	Pounds Landed[2]
Northeast (ME to VA)	LOBSTER	123,536,609
	CRAB, BLUE	73,199,765
	CRAB, JONAH	8,996,326
	CRAB, RED	3,597,848
	CRAB, ROCK	1,975,715
	SHRIMP (PANDALID)	1,866,334
	WHELK, CHANNELED	1,488,493
	CATFISH,CHANNEL	1,466,015
	HAGFISH	1,350,801
	EEL, AMERICAN	1,078,906
	CATFISH, BLUE	959,821
	SCUP	778,951
	CONCHS	689,760
	CATFISH(SEA)	454,168
	SEA BASS, BLACK	444,825
	DOGFISH SPINY	317,030
	WHELK, KNOBBED	285,314
	CRAB, NK	221,333
	SPOT	201,295
	TURTLE, SNAPPER	137,235
	OTHER FISH	112,798
	HERRING, ATLANTIC	106,323
	CRAB, GREEN	106,120
	WHELK, WAVED	97,532
	CATFISH (FRESHWATER)	85,979
	PERCH, WHITE	60,911
	TAUTOG	57,787
	CROAKER, ATLANTIC	55,159
	TOADFISH, OYSTER	49,156
	FLOUNDER, SUMMER	28,207
	MINNOW	25,136
	PUFFER, NORTHERN	24,679
	CRAB, HORSESHOE	23,563
	MENHADEN	22,416
	BULLHEADS	21,156
	EEL, CONGER	20,037
	BASS, STRIPED	19,337
	CATFISH,FLATHEAD	16,201
	HAKE, RED	16,136
	COD	13,991
	PERCH, YELLOW	12,953
	HAKE, SILVER	12,592
	BLUEFISH	9,194
	SCALLOP, SEA	9,102
	GIZZARD SHAD	9,052
	ANGLER	8,770

Exhibit 4A-1

TOTAL LANDINGS CAUGHT WITH TRAP/POT GEAR IN 2011

Region	Species	Pounds Landed[2]
	POLLOCK	7,604
	CUNNER	6,717
	SEA RAVEN	5,224
	SKATE, WINTER(BIG)	4,445
	TRIGGERFISH	3,756
	CARP	2,594
	FLOUNDER, WINTER	2,244
	BUTTERFISH	2,048
	HAKE, WHITE	1,904
	HARVEST FISH	1,744
	QUAHOG	1,397
	SQUID (LOLIGO)	1,330
	WHITING, KING	777
	POUT, OCEAN	764
	MACKEREL, SPANISH	707
	CLAM, SOFT	649
	MACKEREL, ATLANTIC	487
	OYSTERS	447
	ALEWIFE	437
	SHAD, AMERICAN	392
	FLOUNDER, SOUTHERN	391
	CRAB, SPIDER	374
	PERIWINKLES	346
	OTHER SHELLFISH	325
	SHRIMP,BROWN	324
	MOLLUSKS NK	270
	FLOUNDER, YELLOWTAIL	261
	TURTLE, TERRAPIN	237
	DOLPHINFISH	203
	FLOUNDER, WITCH	185
	SHARK, MAKO SHORTFIN	183
	SWORDFISH	168
	DOGFISH SMOOTH	159
	WEAKFISH, SQUETEAGUE	159
	STRIPED MULLET	156
	SCALLOP, BAY	147
	PUFFER	145
	HAKE, OFFSHORE	118
	COBIA	112
	TILEFISH, BLUELINE	99
	HALIBUT, ATLANTIC	88
	CRAPPIE	82
	WEAKFISH, SPOTTED	77
	SUNFISHES	74
	TILEFISH (NK)	74
	OTHER FISH	54
	REDFISH	53
	HADDOCK	49
	TARPON	40

Exhibit 4A-1 TOTAL LANDINGS CAUGHT WITH TRAP/POT GEAR IN 2011		
Region	**Species**	**Pounds Landed**[2]
	BARRELFISH	39
	GARFISH	31
	BONITO	30
	OCTOPUS	30
	GROUPER	25
	SCULPINS	25
	PORGY, RED	24
	DRUM, BLACK	22
	SHEEPSHEAD	22
	SKATES	21
	WRECKFISH	20
	BLUE RUNNER	20
	FLOUNDER, AM. PLAICE	19
	SHAD, HICKORY	18
	CUSK	17
	NEEDLEFISH, ATLANTIC	14
	MUMMICHOG	14
	MUSSELS	14
	SPADEFISH	13
	TUNA, BLACKFIN	11
	MULLETS	10
	FLOUNDER, SAND-DAB	9
	PIGFISH	8
	CUTLASSFISH,ATLANTIC	7
	POMPANO, COMMON	3
	TILEFISH, SAND	3
	CRAB, HERMIT	3
	DRUM, RED	2
	TILEFISH, GOLDEN	2
	SEA ROBINS	1
Southeast (NC to FL)	LOBSTER, SPINY	2,758,000
	CRAB, GOLDEN	613,00
	CRAB,STONE (UNC CLAWS)	597,000
	SEA BASS, ATLANTIC,BLACK,UNC	318,000
	TRIGGERFISHES	8,000
	SNAPPER,MUTTON	7,000
	GRUNTS	6,000
	PORGY,JOLTHEAD	3,000
	GROUPER, BLACK	1,000
	HOGFISH	1,000
	BANDED RUDDERFISH	<1,000
	BLUE RUNNER	<1,000
	COBIA	<1,000
	CREVALLE	<1,000
	DOLPHINFISH	<1,000
	DRUM,RED	<1,000
	GROUPER,GAG	<1,000
	GROUPER,RED	<1,000
	GRUNT,TOMTATE	<1,000

Exhibit 4A-1

TOTAL LANDINGS CAUGHT WITH TRAP/POT GEAR IN 2011

Region	Species	Pounds Landed[2]
	GRUNT,WHITE	<1,000
	HIND,RED	<1,000
	HIND,ROCK	<1,000
	LOBSTER,SLIPPER(BULLDOZER)	<1,000
	MACKREL,KING AND CERO	<1,000
	MARGATE	<1,000
	PORGY,KNOBBED	<1,000
	PORGY, RED,UNC	<1,000
	SCAMP	<1,000
	SCUPS ORPORGIES,UNC	<1,000
	SEA BASS,BANK	<1,000
	SEA BASS,ROCK	<1,000
	SHEEPSHEAD, ATLANTIC	<1,000
	SNAPPER, GRAY AT (MANGROVE)	<1,000
	SNAPPER, LANE	<1,000
	SNAPPER,RED	<1,000
	SNAPPER, VERMILION	<1,000
	SNAPPER, YELLOWTAIL	<1,000
	TILEFISH,BLUELINE	<1,000

Sources:
NMFS, 2002d.
NMFS, 2002e.
SEFSC Commercial ACL Dataset (Jul 2012)

Notes:

[1] Potentially affected gillnet fisheries include Atlantic croaker, spot, striped bass, bluefish, skate, and weakfish. Catch of these species by ALWTRP affected gear types is relatively small; therefore, NMFS did not include an Exhibit to demonstrate total landings caught with gillnet gear in 2011.

[2]The landings figures represent total pounds landed with trap/pot gear and include landings from coastal waters that are exempt from ALWTRP regulations. Southeast landings do not include landings by state-permitted-only vessels. Southeast landings are rounded to the nearest 1,000 pounds to preserve confidentiality.

Appendix 4-B

NORTHEAST MULTISPECIES FISHERY COMPLEX: SPECIES INFORMATION

Exhibit 4B-1

NAME, DISTRIBUTION, BIOLOGY AND COMMERCIAL USES OF SPECIES COMPRISING THE NORTHEAST MULTISPECIES FISHERY COMPLEX

Photo ID	Common Name	Scientific Name	Distribution In Western Atlantic	Biology	Maximum Weight; Age	Commercial Uses
1	American plaice	*Hippoglossoides platessoides*	Southern Labrador in Canada and western Greenland to Rhode Island in U.S.	Lives on soft bottoms. Feeds on invertebrates and small fishes.	6.4 kg; 30 years	Marketed fresh and frozen.
2	Atlantic cod	*Gadus morhua*	Ungava Bay to Cape Hatteras along the North American coast.	Oceanic, this species is widely distributed in a variety of habitats from the shoreline to well down the continental shelf. Omnivorous, the cod feeds at dawn or dusk on invertebrates and fish, including young cod. Forms schools during the day. Spawns once a year.	96 kg; 25 years	Marketed fresh, dried/salted, smoked and frozen.

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Photo ID	Common Name	Scientific Name	Distribution In Western Atlantic	Biology	Maximum Weight; Age	Commercial Uses
3	Atlantic halibut	*Hippoglossus hippoglossus*	Southwestern Greenland and Labrador in Canada to Virginia in the U.S.	Benthic but occasionally caught pelagically. Feeds mainly on other fishes (cod, haddock, pogge, sand-eels, herring, capelin), but also takes cephalopods, large crustaceans and other bottom-living animals. Growth rate varies according to density, competition and availability of food. Slow growth rate and late onset of sexual maturity.	320 kg; 50 years	Utilized fresh/dried/salted, smoked and frozen.
4	Haddock	*Melanogrammus aeglefinus*	From Strait of Belle Isle to Cape May, New Jersey.	Feeds mainly on small bottom-living organisms including crustaceans, mollusks, echinoderms, worms and fishes.	16.8 kg; 20 years	Sold fresh, chilled as fillets, frozen, smoked and canned. Also utilized for fish meal and animal feeds.
5	Ocean pout	*Macrozoarces americanus*	Labrador in Canada to Delaware in U.S. (rarely to Virginia; doubtfully to North Carolina).	Occurs from intertidal zone to more than 180 m depth.	5.4 kg; NA	NA

Exhibit 4B-1

NAME, DISTRIBUTION, BIOLOGY AND COMMERCIAL USES OF SPECIES COMPRISING THE NORTHEAST MULTISPECIES FISHERY COMPLEX

Photo ID	Common Name	Scientific Name	Distribution In Western Atlantic	Biology	Maximum Weight; Age	Commercial Uses
6	Offshore hake	*Merluccius albidus*	Georges Bank, New England to Surinam and French Guiana.	An offshore species that inhabits the outer part of the continental shelf and upper part of the slope. Feeds at night, when it comes up towards the surface. Food consists primarily of fishes (particularly lantern fishes, sardines and anchovies) and, to a lesser extent, crustaceans and squid.	4.1 kg; NA	Marketed fresh, frozen, and smoked.

Exhibit 4B-1

NAME, DISTRIBUTION, BIOLOGY AND COMMERCIAL USES OF SPECIES COMPRISING THE NORTHEAST MULTISPECIES FISHERY COMPLEX

Photo ID	Common Name	Scientific Name	Distribution In Western Atlantic	Biology	Maximum Weight; Age	Commercial Uses
7	Pollock	*Pollachius virens*	Southern Nova Scotia, straying to the Gulf of St. Lawrence, to North Carolina.	An active, gregarious fish occurring in inshore and offshore waters. Usually enters coastal waters in spring and returns to deeper waters in winter. Smaller fish in inshore waters feed on small crustaceans (copepods, amphipods, euphausiids) and small fish, while larger fish prey predominantly upon fishes. Migrations for spawning are known to occur. Also long-distance north-south migrations for Europe and the U.S.	32 kg; 25 years	Utilized fresh, dried/salted, smoked, canned and frozen.

Exhibit 4B-1

NAME, DISTRIBUTION, BIOLOGY AND COMMERCIAL USES OF SPECIES COMPRISING THE NORTHEAST MULTISPECIES FISHERY COMPLEX

Photo ID	Common Name	Scientific Name	Distribution In Western Atlantic	Biology	Maximum Weight; Age	Commercial Uses
8	Red hake	*Urophycis chuss*	From North Carolina to southern Nova Scotia, straying to the Gulf of St. Lawrence.	Found on soft muddy and sandy bottoms, but never on rocks, gravel or shells. Juveniles live along the coasts at shallow depths (4-6 m); adults migrate to deeper waters, generally to between 110 and 130 m, and in some instances to over 550 m. Juveniles live in scallops (*Placopecten magellanicus*) and remain close to scallop beds until they mature. Feed on shrimp, amphipods and other crustaceans, also on squid and herring, flatfish, mackerel and others.	3.6 kg; NA	Utilized fresh, dried/salted and frozen; small fish are also used for fishmeal.
9	Redfish	*Sebastes faciatus*	Iceland to New Jersey.	Inhabits deep water. Bears live young. Gregarious throughout life. Feeds on euphausiids, decapods, mysids, small mollusks and fishes. Ovoviviparous.	NA; NA	NA

Exhibit 4B-1

NAME, DISTRIBUTION, BIOLOGY AND COMMERCIAL USES OF SPECIES COMPRISING THE NORTHEAST MULTISPECIES FISHERY COMPLEX

Photo ID	Common Name	Scientific Name	Distribution In Western Atlantic	Biology	Maximum Weight; Age	Commercial Uses
10	White hake	*Urophycis tenuis*	Labrador and the Grand Banks of Newfoundland to the coast of North Carolina. Straying to Iceland in the east and Florida in the south.	Found on soft, muddy bottoms of the continental shelf and upper slope. It is mostly found at 180 m. Mature fish migrate inshore in the northern Gulf of Maine in summer, disperse in autumn, and move into deepest areas in winter. Feeds on small crustaceans, squid and small fish.	21 kg; 10 years	Utilized fresh, smoked or frozen.
11	Silver hake (whiting)	*Merluccius bilinearis*	Coast of Canada and U.S. from Belle Isle Channel to the Bahamas; most common from southern Newfoundland to South Carolina.	Abundant on sandy grounds and strays into shallower waters. A voracious predator with cannibalistic habits. Individuals over 40 cm TL prey on fishes such as gadoids and herring, while smaller ones feed on crustaceans, i.e. euphausiids and pandalids. Exhibits seasonal onshore-offshore migration.	2.3 kg; 12 years	Marketed fresh, smoked and frozen; fresh fish are exported to European markets.

Exhibit 4B-1

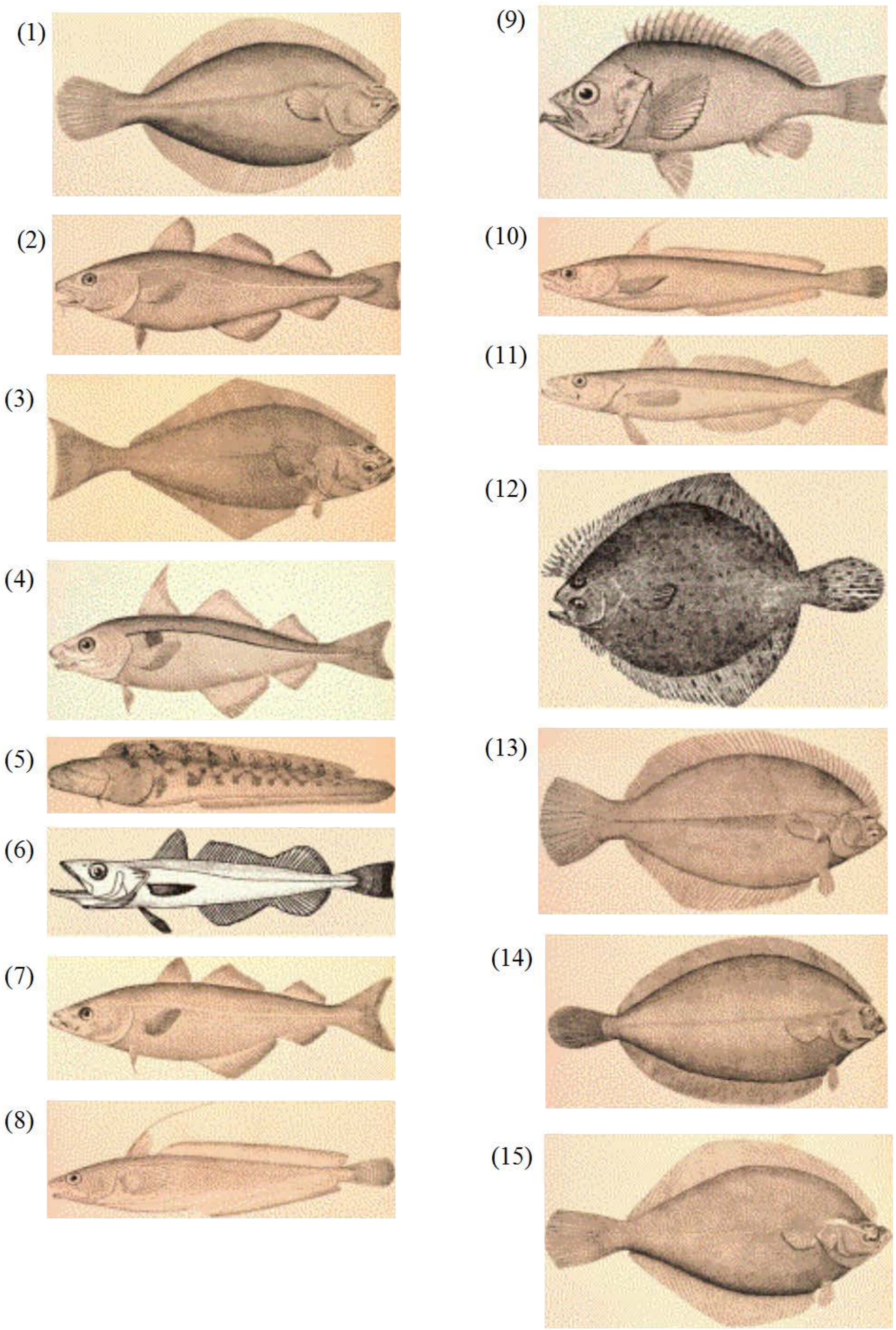
NAME, DISTRIBUTION, BIOLOGY AND COMMERCIAL USES OF SPECIES COMPRISING THE NORTHEAST MULTISPECIES FISHERY COMPLEX

Photo ID	Common Name	Scientific Name	Distribution In Western Atlantic	Biology	Maximum Weight; Age	Commercial Uses
12	Windowpane flounder	*Scophthalmus aquosus*	Gulf of St. Lawrence in Canada to northern Florida in U.S.	Occurs from shore to 45 m depth, occasionally in deeper water.	NA; NA	NA
13	Winter flounder	*Pseudopleuronectes americanus*	Labrador in Canada to Georgia in U.S.	Feed predominantly in daytime on organisms living in, on or near the bottom: shrimp, amphipods, crabs, sea urchins and snails.	3.6 kg; NA	Marketed fresh or frozen.
14	Witch flounder	*Glyptocephalus cynoglossus*	Gulf of St. Lawrence and Grand Banks in Canada to North Carolina in U.S.	Inhabits soft mud bottoms in fairly deep water. Feeds on crustaceans, polychaetes and brittle stars.	2.5 kg; 25 years	Marketed fresh or frozen.
15	Yellowtail flounder	*Pleuronectes ferruginea*	Southern Labrador in Canada to Chesapeake Bay in U.S.	Inhabits sandy to muddy bottoms. Prefers depths of 37 to 82 m at temperatures of 3-5°C. Feeds mainly on polychaete worms and amphipods, shrimp, isopods and other crustaceans, and occasionally on small fish such as sand lance and capelin.	1.5 kg; 12 years	Marketed fresh or frozen.

Sources: NMFS, 2004b. List of species taken from NEFMC, 2003c. Species information taken from Froese, R. and D. Pauly (eds.), 2003, and Collette and MacPhee, 2002.

Exhibit 4B-2

IMAGES, NORTHEAST MULTISPECIES FISHERY COMPLEX



Source: NEFMC, 2003c.