Draft Document for Public comment.

Atlantic States Marine Fisheries Commission

DRAFT Interstate Fishery Management Plan for Jonah Crab

May 2015

This draft document was approved by Management Board for public comment to solicit input on the issues contained in this document.

Draft Document for Public comment.

Interstate Fishery Management Plan for Jonah Crab

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This is a report of the Atlantic States Marine Fisheries Commission pursuant to U.S. Department of Commerce, National Oceanic and Atmospheric Administration Award No..

The Atlantic States Marine Fisheries Commission Seeks your Comment on the Management of Cancer Crab

The public is encouraged to submit comments regarding this document during the public comment period. Comments will be accepted until 5:00 PM (EST) on July 24, 2015. Regardless of when they were sent, comments received after that time will not be included in the official record. The American Lobster Board will consider public comment on this document when developing final action on the Jonah Crab Fishery Management Plan.

You may submit public comment in one or more of the following ways:

1. Attend public hearings held in your state or jurisdiction.
2. Mail, fax, or email written comments to the following address:

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If you have any questions please call Megan Ware at 703.842.0740.

AMENDMENT PROCESS AND TIMELINE

In May 2014, the American Lobster Management Board initiated the development of an interstate fishery management plan for Jonah crab. This followed a report by the Jonah Crab Work Group to the Board on the status of biological and fisheries data, as well as policy recommendations. The diagram below depicts the plan development process.

May 2014	American Lobster Board Initiates FMP
	↓
August 2014	American Lobster Board approves Draft Public Information Document for Public Comment
	↓
September 2014	Public Hearings held on Public Information Document
	↓
October 2014	American Lobster Board tasks Plan Development Team with drafting Interstate FMP
	↓
May 2015	American Lobster Board approves FMP for Public Comment
	↓
May-July 2015	Public hearing held on Draft FMP
	↓
August 2015	American Lobster Board selects options and recommends final approval for FMP; Commission approves FMP

ACKNOWLEDGMENTS

The Jonah Crab Interstate Fishery Management Plan was developed under the supervision of the Atlantic States Marine Fisheries Commission's American Lobster Management Board, chaired by Dan McKiernan of Massachusetts. Members of the Plan Development Team (PDT) included: Toni Kerns (ASMFC); Craig Weedon (MD DNR); Kathleen Reardon (ME DMR); Bob Glenn (MA DMF); Jeff Mercer (RI FW) and Jason Berthiaume (NOAA Fisheries). Additional support included Derek Perry (MA DMF), Allison Murphy (NOAA Fisheries), David Borden (Board Vice Chair), Marin Hawk (ASMFC), and Tina Berger (ASMFC).

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1. INTRODUCTION

1.1. Background Information

In May 2014, the American Lobster Management Board initiated the development of a Fishery Management Plan (FMP) for Jonah Crab, *Cancer borealis*, throughout the species range within United States waters. The development of this FMP was based on the American Lobster Board's (Board) concern for potential impacts to the status of the Jonah crab resource with recent and rapid increases in landings. Information on Jonah crab was presented to the Board by the Jonah Crab Fishery Improvement Project (FIP), a multi-stakeholder effort to improve a fishery's performance. The Jonah Crab FIP was initiated by Delhaize America (a grocery retailer) when the company found Jonah crab did not meet the criteria for sustainable harvest which they require for all seafood sold in their stores.

The FIP conducted a pre-assessment benchmark and organized a working group to evaluate potential threats to the Jonah crab resource and fishery as well as develop potential management measures to address these threats. The working group was comprised of members of various lobster industry associations, state agencies, academia, fishermen, and seafood retailers. Specific concerns of the FIP included increased targeted fishing pressure on Jonah crab, likely due to a fast growing market demand, and the long term health of the fishery. The FIP made several recommendations for management to the Commission including a minimum size, prohibiting female crab harvest, and reporting requirements.

The Board approved the Public Information Document for public comment in August 2014. Public comment was received and hearings were held during the fall of 2014. The Board tasked the Plan Development Team (PDT) with developing a Draft FMP for Jonah Crab in October 2014.

1.1.1. Statement of the Problem

Jonah crab has long been considered a bycatch of the lobster industry, but in recent years there has been increasing targeted fishing pressure and growing market demand for crab. The majority of crab are harvested by lobster fishermen using lobster traps. Since the early 2000s, landings have increased 6.48 fold. With the increase in demand for crab, a mixed crustacean fishery has emerged that can target both lobster or crab or both at different times of year based on slight legal modifications to the gear and small shifts in the areas in which traps are fished. The mixed nature of the fishery makes it difficult to manage a Jonah crab fishery completely separate from the American lobster fishery without impacting the number of vertical lines and traps capable of catching lobster in state and federal waters.

The status of the SNE lobster fishery is poor, as part of the rebuilding plan the Board has been reducing the number of traps used to fish for lobster. Additional traps targeting Jonah crab with the potential to fish for lobster could negate these trap reductions and pose management challenges. NOAA Fisheries has implemented lobster rulemaking base on the Large Whale Take Reduction Team recommendations to decrease the number of vertical lines in state and federal

waters. In order to reduce the risk of large whale entanglements by vertical lines two measures have been implemented (1) minimum number of traps in a trawl and (2) season closures.

Increasing the number of vertical lines would have a negative impact on the goals and objectives of the Large Whale Take Reduction Plan. Because the SNE lobster fishery had recently reduce the number of vertical lines through trap reductions, SNE did not have to implement a season closure or traps per trawl reduction, where GOM fishery has a 3 month closure. Managers do not want to negatively impact the number of vertical lines in SNE with potential crab traps.

A complete picture of the Jonah crab fishery in federal and state waters is difficult to ascertain due to the mixed nature of the fishery. In the absence of a comprehensive management plan and stock assessment, increased harvest of Jonah crab may compromise the sustainability of the resource. The PDT identified the following issues:

- The crab resource is not directly regulated in federal waters but is rather regulated incidentally by the American lobster regulations. There are no crab specific regulations in federal waters or permit/license requirements.
- Landings have rapidly increased in the past 10 years and, without new controls, effort could increase in an unregulated manor
- With continued unregulated harvest of Jonah crab, the long-term availability of this resource for harvest could be compromised.
- There are no minimum size protections for Jonah crab, nor are there regulations to protect spawning biomass, including restrictions on the harvest of females or egg carrying females.
- Supermarkets and other major buyers are positioning to discontinue selling processed and whole Jonah crab unless it is managed sustainably which would impact the ex-vessel price.
- A lack of universal permit and reporting requirements makes it difficult to characterize catch and effort to the full extent in order to manage the fishery
- A Jonah crab trap is not distinguishable from a lobster trap making it difficult to independently manage crab and lobster fisheries.
- Because crab traps are similar in design and function to lobster traps, but are not specifically regulated, there may be implications with the lobster fishery and marine mammal interactions compromising the effectiveness of the Large Whale Take Reduction and Lobster plans.

1.1.2. Benefits of Implementation

1.1.2.1. Social and Economic Benefits

Sustainable management practices and policies for a popular species such as Jonah crab can increase economic benefits and provide social stability in the fishing community while ensuring a fishery for future generations. Greater cooperation and uniform management measures among the states increase the likelihood that the conservation efforts of one state or group will not be undermined.

Increased targeted fishing pressure on Jonah crab, likely due to fast growing market demand, increase in effort controls in the lobster fishery, and the poor condition of the SNE lobster stock, has the potential to compromise the long-term health of the fishery. Without a comprehensive management plan and stock assessment process, harvest of Jonah crab could put the sustainability of the resource at risk, ultimately resulting in lost markets and revenue. A lack of comprehensive management plan is particularly impactful to fishermen who rely on the harvest of Jonah crab as part of their livelihoods and to the processors and dealers who have invested in processing technology and building markets for Jonah crab.

1.1.2.2. Ecological Benefits

The apex trophic level of marine ecosystems is commonly targeted by fisheries because it is usually comprised of animals that represent the highest food and commercial value. As apex predators become depleted in areas of high fishing pressure, the fishery target will shift to species of lower trophic levels, a concept known as "fishing down marine food webs." In regions where top trophic levels have been heavily harvested, Jonah crab is becoming a more desirable fishery target. Concurrently, in these areas the Jonah crab species has begun to take on the role of apex predator (Leland 2002). Where natural apex predators have become rare, Jonah crab is now primarily responsible for controlling benthic invertebrates.

Green sea urchins, a prey species of the Jonah crab, in high densities are responsible for converting kelp forests into urchin barrens. The Jonah crab and the green urchin co-occur across a wide geographic range, particularly in the Gulf of Maine. Jonah crab have a pronounced influence over the structure of benthic habitat through suppression of these herbivorous prey species. McKay and Heck Jr. (2008) found that green sea urchins grazing rates on kelp decreased by nearly 80% in the presence of the echinivorous Jonah crab, suggesting that simply the presence of Jonah crab has the potential to act as a firm control on urchin behavior. This control imposed by their presence, in addition to the consumption of urchins by Jonah crab, could initiate a trophic cascade which would positively affect the conservation of kelp forests. These forests serve as critical habitat for many fish and invertebrates.

Jonah crab are omnivorous and consume a variety of species, including snails, mussels, urchins, algae, and arthropods, among other benthic invertebrates. American lobster (Ojeda and Dearborn 1991) and fish are predators of Jonah crab, particularly at smaller sizes. There have also been several studies documenting relatively high rates of predation on Jonah crab by gulls, primarily during northern latitude summers when Jonah crab move into subtidal habitats (Good 1992; Krediet and Donahue 2009).

1.1.3. Species Life History

Jonah crab are distributed in the waters of the Northwest Atlantic Ocean primarily from Newfoundland, Canada to Florida, USA though a few specimens have been reported as far south as Bermuda (Haefner 1977; Drew 2011). Jonah crab are often confused with rock crab (*C. irroratus*) although the species are biologically and taxonomically distinct (Figure 1). This confusion is largely due to overlapping habitat and numerous regional common names attributed to both species. The two species can be distinguished in a few ways. First, rock crab have smooth

edged teeth on the edge of the carapace, whereas Jonah crabs have rough edged teeth on their carapace edge. Second, rock crab have purplish-brown spots on the carapace while Jonah crab have yellow spots. Lastly, Jonah crabs can be slightly larger than rock crabs.

The life cycle of Jonah crab is poorly described, and what is known is largely compiled from a patchwork of studies that have both targeted and incidentally documented the species. Female crab (and likely some males) are documented moving into the nearshore and even subtidal habitats during the late spring and summer (Krouse 1980). Motivations for this inshore migration are unknown, but maturation, spawning, and molting have all been postulated. It is also widely accepted these migrating crab move back offshore in the fall and winter, though this phenomenon has not been quantified. Due to the lack of a widespread and well-developed aging method for crustaceans, age and growth of Jonah crab is poorly described. The largest recorded Jonah crab was a male caught in Canada and measured 222 mm (8.7"); females generally do not exceed 150 mm (5.9") (Robichaud et al. 2000). Sea sampling of commercial fishing gear conducted in Maine on 7,131 crabs (Table 2b; Reardon, 2003) and Southern New England on 8,392 crabs (Table 2c; CFRF, unpublished data) indicate similar size distributions with only 2-4% of females and 69-71% of males captured greater than 5"

There is a lack of Jonah crab maturity data in U.S. waters. What little is known comes from unpublished documents and published studies with low sample sizes. Wenner et al (1992) determined that 46 of 66 female Jonah crabs inspected from the continental slope off the Southeastern U.S. had mature ovaries. The carapace width of mature female crabs ranged from 89 mm (3.5") to 132 mm (5.2"), with a mean of 105 mm (4.1"). In an unpublished master's thesis, Carpenter (1978) found the size at maturity to be between 90 and 100 mm (3.5 and 3.9") for males, and 85 mm (3.4") for females in Norfolk Canyon, off the mouth of Chesapeake Bay. An unpublished study conducted by Ordzie and Satchwill (1980) on 154 females and 94 male crabs collected from Southern New England waters used gonad color, presence of sperm in spermathecae, and width of sixth abdominal segment as indicators of sexual maturity in females and gonad color and presence of spermatozoids in spermatophores as indicators of maturity in males. Examination of the data suggests that both sexes reach near 100% maturity by 90mm (3.5").

Moriyasu et al. (2002) reported 50% of male Jonah crabs had mature gonads at 68.5 mm (2.7") and reached morphometric maturity at 128 mm (5") on the Scotian Shelf. Morphometric maturity is determined by a change in allometric relationships, in the case of Jonah crabs, the relationship between chela height and width. Moriyasu et al. (2002) cautioned that gonads of most brachyuran crabs can be classified as mature before they reach functional maturity, which should be considered when establishing limits for commercial harvest. Functional maturity is determined by the presence of mating scars on the claws of male crabs, eggs on a female, or other evidence of successful mating. Females as small as 94 mm (3.7") have been recorded as carrying eggs by commercial fishermen participating in the Lobster/Jonah Crab Research Fleet Pilot Program administered through the Commercial Fisheries Research Foundation.

Like other Cancer species, Jonah crab consume a variety of prey including snails, arthropods, algae, mussels, and polychaetes (Donahue et al. 2009). Donahue et al. (2009) found that over 50% of stomach contents of wild-sampled crabs were blue mussels, (*Mytilus edulis*) along the

coast of Maine. Jonah crabs found in the soft sediments of the New York Bight commonly ate polychaetes and mollusks (Stehlik 1993).

1.1.4. Stock Assessment Summary

The status of the Jonah crab resource is relatively unknown. There is no range wide stock assessment.

1.1.5. Abundance and Present Condition

Massachusetts, Rhode Island, Maine, and New Hampshire conduct inshore state water trawl surveys which are primarily focused on finfish and encounter Jonah crab infrequently, therefore providing only minimal data. NOAA Fisheries conducts a trawl survey in federal waters which collects data on Jonah crab abundance and distribution, distinguished by species; however, this data has not yet been fully analyzed. Inferred high amounts of undocumented catch, along with spatial and temporal inconsistencies in reported landings make abundance difficult to estimate.

The Massachusetts Division of Marine Fisheries has conducted seasonal spring (May) and fall (September) bottom trawl surveys in state waters since 1978. Information on the number, weight, size, gender and distribution are collected. North of Cape Cod Jonah crabs are frequently caught in the survey; however, south of Cape Cod Jonah crabs are infrequently caught as the crabs prefer deeper, cooler waters in this area and the survey is restricted to shallower areas. Survey trends for males and females in both the spring and fall have been declining in recent years (Figure 2).

The Northeast Fisheries Science Center conducts a spring (generally March to May) and fall survey (generally conducted in September and October). Jonah crab stratified mean number per tow are given by region (Georges Bank, Gulf of Maine, and Southern New England) in Figure 3. The spring 2014 survey showed record high abundance in the Georges Bank and Gulf of Maine regions, the 2014 data points are extreme positive outliers from the rest of the time series. The spring survey in Southern New England has been fairly stable, hovering near the time-series median. The fall survey shows a declining trend in Georges Bank since reaching record high abundance in the early 2000's. The Gulf of Maine has been fairly stable in the fall since 2000, staying generally above the time-series median. The fall survey has shown a recent increase in abundance in Southern New England.

1.2. Description of the Fishery

1.2.1. Commercial Fishery

The commercial fishery is described using data from ACCSP. These data are limited to dealer reports. Some aspects of these data may not represent a full picture of the fishery due to confidential data, lack of reporting requires by dealers, or mis-classification of rock and Jonah crab.

The value of Jonah crab has increased recently, resulting in higher landings. Landings fluctuated between approximately 2 and 3 million pounds throughout the 1990's (Table 1). By 2005, landings increased to over 7 million pounds and then to over 17 million pounds in 2014. Landings in 2014 predominately came from Massachusetts (70.05%), followed by Rhode Island (24.23%), New Hampshire and Maine (4.33%). Connecticut, New Jersey, and Maryland accounted for a combined 1.38% of landings.

Massachusetts and Rhode Island combine for 94.29% of all U.S. Jonah crab landings. Statistical area 537 accounts for 71.5% of all crabs landed in these two states, followed by area 526 (10.5%) and 525 (9.9%) (Figure 4). The monthly landing trends for Massachusetts and Rhode Island are given in figures 5 and 6. There has been a change in the timing of peak landings in Massachusetts. From 2005 through 2011 the lowest landings occurred from August through December. Since 2012, landings have peaked in September and October. Rhode Island has not had an obvious change in the seasonality of their landings and continues to land most of their Jonah crab from December through March.

The Massachusetts Division of Marine Fisheries began a Jonah crab port sampling program in late 2013 and has since collected data on 6,464 crabs (Table 2). Carapace width of crabs ranged from 82 mm (3.2") to 171 mm (6.7"), with an average size of 143 mm (5.6"). Only 0.2% of observed crabs were females and only one had eggs.

Jonah crab are taken in pots and traps and have long been taken as bycatch or more recently as a secondary target in the lobster fishery. Since 1990 on average 95% of the landings have come from pots and traps (Table 3, Figure 7). On average, less than 1% of the catch are identified to come from dredges and trawls. Since 1990 there were only two years where more than 2% of the catch was from trawls and dredges, 2001(2.6%) and 2009 (2.12%). In 2013, less than 1% of the catch was from trawls and dredges.

In the early 1990s ex-vessel values were approximately $1 to $1.5 million dollars (Table 4). Ex-vessel value increased in 2005 to $3.5 million. From 2007 to 2011 ex-vessel value fluctuated from $4.5 to $5.6 million dollars, and reached an estimated $12.7 million in 2013.

The practice of declawing the Jonah crab while fishing lobster traps and pots occurs in the Atlantic Ocean off the Delmarva Peninsula (Delaware/Maryland and Virginia). The Jonah crab is a bycatch species in the American Lobster Fishery, and some (est. < 5) fishing vessels (F/V) remove the claws of the large Jonah crab, which are most likely male, and return the crab to the ocean alive. The F/Vs that declaw Jonah crab typically do not retain whole crabs because they have local dockside customers that prefer only the claws. Declawing is typically conducted in LCMA5 within the EEZ, and those landings are less than 1% of the total Jonah crab fishery. The majority (>90%) of the Jonah crab landings in the Delmarva Peninsula, specifically Ocean City Maryland were caught in lobster traps in LCMA3 and landed as whole crab in the last 5 years.

1.2.2. Recreational Fishery

The magnitude of recreational landings is unknown, but are expected to be minimal.

There is little information on the Jonah crab fishery available due to the difficulty distinguishing Jonah crab from other crabs.

1.2.3. Subsistence Fishery

No known subsistence fishery exists for Jonah crab.

1.2.4. Non-Consumptive Factors

No non-consumptive factors were identified to Jonah crab.

1.2.5. Interactions with Other Fisheries, Species, or Users

Jonah crab are most often associated with American lobster fishing, due to overlapping range, shared habitat, and recruitment to similar gears. In some states (e.g., Maine), commercial lobster licenses are sold together with a crab license that most often is applied to Jonah crab (Table 5). Several Canadian Lobster Fishing Areas (LFAs) and the state of Maine have experimented with specific Jonah crab fishing permits in an effort to evaluate the development of a dedicated Jonah crab fishery (in some cases with trap modifications that greatly reduce any lobster bycatch and target Jonah crab). However, these efforts have largely been abandoned and Jonah crab harvest has returned to its close harvest relationship with American lobster.

1.3. Habitat Considerations

1.3.1. Habitat Important to the Stocks

1.3.1.1. Description of the Habitat

Jonah crab likely have spatial and temporal variability in habitat use; some of this seasonality has been hinted at in the current literature, but the overall description of habitat use remains severely lacking in specifics. Large adult Jonah crab are most frequently caught in rocky offshore habitats. It is widely thought that during spring in northern latitudes Jonah crab migrate to shallower waters where they remain until returning to deeper water in the fall and winter. This shallow-water residence period has been studied primarily in the context of predation by gulls (Krediet and Donahue 2009) and in documentation of microhabitat (Jeffries 1966; Krouse 1980). Both Jeffries and Krouse suggest Jonah crab are associated with rockier, deeper sites with cover/crevices, but Wenner et al. (1992) used a submersible and found the crabs to be common in softer sediments along the continental slope. Most studies that report optimal temperature for Jonah crab are consistent in reporting a range of roughly 8–12°C.

1.3.1.2. Identification and Distribution of Habitat and Habitat Areas of Particular Concern

Habitat Areas of Particular Concern (HAPCs) are defined by the Atlantic States Marine Fisheries Commission as areas within the species habitat which satisfy one or more of the following criteria: (1) provide important ecological function, (2) are sensitive to human-induced

environmental degradation, (3) are susceptible to coastal development activities, or (4) are considered to be rarer than other habitat types.

While overall habitat descriptions are incomplete, spawning locations in particular are not known, which might be of particular importance or concern toward biology and management.

1.3.1.3. Present Condition of Habitats and Habitat Areas of Particular Concern

Unknown.

1.4. Impacts of the Fishery Management Program

1.4.1. Biological and Environmental Impacts

Direct biological and environmental impacts of a coastwise management program on Jonah crab are largely unknown based on the limited initial information on the species and any potential stocks. Studies from maritime Canadian waters suggest little fishing effort/harvest was enough to remove virgin biomass and if the commercial fishery continued harvest levels would need to be lowered. Without any population assessment and inconsistent catch rate data from a species with unknown migration patterns, it is impossible to know what the immediate biological impacts of management will be.

1.4.2. Social Impacts

Regulatory changes in fisheries have social impacts. When regulations are created or made more restrictive on a fishery, e.g. area closures, or season closures, ultimately the dynamic of the fishing regimen will change. For instance, areas once fished by locals and tourists alike may close, causing a shift in fishing location and thus a shift in lodging, fuel purchases, food consumption at local restaurants, etc., away from that economy. Regulatory changes can have positive social impacts, though often these impacts are seen in the future and not immediately. Regulations are put in place so a fishery may continue to be sustainable or recover to a sustainable level. This in turn increases fishing opportunities into the future and may bring people into these local areas, benefitting the economy.

The development of an FMP for Jonah crab will address some issues that have been raised concerning the sustainability of the resource, which in turn will impact the marketability of Jonah crab in the future. Jonah crab was evaluated in June 2014 as a food source by the Monterey Bay Aquarium Seafood Watch program, a program initiated to recommend responsible and sustainable seafood options to consumers. The Seafood Watch Program currently lists Jonah crab as a seafood to avoid for the following reasons; A) little is known about species abundance and stock status, and B) bycatch risk exists for endangered marine mammals. In addition, Supermarkets and other major buyers are positioning to discontinue selling processed and whole Jonah crab unless it is managed sustainably which could impact the ex-vessel price.

Implementation and regulation of fishing strategies that are designed to reduce bycatch will address the risk to marine mammals. Periodic stock assessments and regulated reporting of

harvest will develop understanding of stock status. The development of an FMP will elucidate the conditions surrounding Jonah crab harvest and develop knowledge to responsibly utilize the species.

There is very little information on fishermen, fishing-dependent businesses, or communities that depend on the Jonah crab fisheries. In order to understand the impact that any new rules and regulations may have on participants in the any fishery, in-depth community profiles need to be developed that will aid in the description of communities, both present and historical, involved in a fishery. Until more research is completed, and in-depth community profiles are developed for sample communities, it is not possible to fully describe the possible impacts of any change in fishing regulations on any fishery.

1.4.2.1. Recreational Fishery

Establishment of the Jonah Crab FMP would not be expected to significantly impact the social aspects of the recreational sector at this time. Since landings are expected to be insignificant, any social impacts are expected to be minor.

1.4.2.2. Commercial Fishery

In the past, several Canadian Lobster Fishing Areas and the state of Maine all experimented with directed fishing for Jonah crab. Although interest and effort were initially high, ongoing issues with Jonah crab value, handling, and gear expenses (among other reasons) ultimately led to substantial declines in participation. The Canadian Jonah crab fisheries took place over a long enough time period to document the decline, whereas the work in Maine was only documented over a few years. The work in Maine included a socio-economic survey highlighting the reasons fishermen did not invest more effort into targeting Jonah crab. It is also worth noting from Reardon's (2006) socio-economic survey during the EFP, that 67% of active permit holders (n=35) were in favor of some type of Jonah crab management. Non-active permit holders (n=65) were much less enthusiastic about the potential for Jonah crab management, at < 20% support.

1.4.2.3. Subsistence Fishery

No subsistence fisheries were identified for Jonah crab.

1.4.2.4. Non-consumptive Factors

No non-consumptive factors were identified that were of significance to the Jonah crab resource.

1.4.3. Economic Impacts

1.4.3.1. Recreational Fishery

The economic impact of the recreational fishery is unknown due to the lack of information concerning the magnitude of harvest in the Jonah crab fishery. However, because landings are expected to be insignificant, any economic impacts are expected to be minor.

1.4.3.2. Commercial Fishery

Jonah crab claws are relatively large and can be an inexpensive substitute for stone crab claws. With only a handful of processors specializing in this fishery, the quality of Jonah crabmeat is very consistent. While the ex-vessel prices for other popular crabs such as Dungeness have soared, fishermen have seen their boat prices for Jonah crab rise only modestly from about $0.50 per pound to $0.70 per pound from 2009 to 2012 (ACCSP Data Warehouse, September 2013). That's largely because there is only a small live market for Jonah crab and only a handful of plants process Jonah crabmeat and claws, limiting price competition for the catch. Prices of Jonah crab products, on the other hand, have increased as more buyers look for an alternative to much higher priced blue and Dungeness crabmeat. With Dungeness meat now selling for $18 per pound, the price of Jonah crabmeat is varies from $13-$15 per pound.

Sustainable management practices will maximize economic benefits to affected communities and ensure that these sources of income will remain stable far into the future. Uniformity among state management measures will afford fair and equitable use by fishermen across state borders, and will ensure that conservation measures are soundly established by all parties for maximal effect.

1.4.3.3. Subsistence Fishery

No subsistence factors were identified that were significant to the Jonah crab resource.

1.4.3.4. Non-consumptive Factors

No non-consumptive factors were identified that were of significance to the Jonah crab resource.

1.4.4. Other Resource Management Efforts

1.4.4.1. Artificial Reef Development/Management

No active development or management is occurring.

1.4.4.2. Bycatch

Bycatch is very minimal but can include bottom dwelling finfish and invertebrate species which can be entrapped with Jonah crab in lobsters pots both inshore and offshore fisheries.

1.4.5. Law Enforcement Assessment Document

The Commission's Law Enforcement Committee has developed a guidelines document for evaluation of potential management measures in Commission FMPs. This document will be used to provide recommendations to the American Lobster Board concerning the enforceability of proposed measures.

2. GOALS AND OBJECTIVES

2.1. History and Purpose of the Plan

2.1.1. History of Prior Management Actions

Jonah crab is managed differently from state to state, and management is absent in federal waters. Table 5 provides a summary of regulations in state waters for Jonah crab. Regulations in state waters can include license requirements, seasons, minimum sizes, trap limits, harvest limits, and restrictions to protect spawning females.

2.1.2. Purpose and Need for Action

As described in the statement of the problem, harvest has increased 6.48 fold since 2000 as the market for Jonah crab has increased (Table 1 and 4). As a result, the species has experienced increased fishing pressure to keep up with the demand of the market and a mixed use fishery has emerged between lobster and crab. As described in the statement of the problem, the mixed nature of the fishery makes it difficult to manage a Jonah crab fishery completely separate from the American lobster fishery without impacting the number of vertical lines and traps capable of catching lobster in state and federal waters, thus potentially impacting the effectiveness of the lobster industry's conservation measures to reduce traps and avoid interactions with large whales.

In Canada, the Jonah crab has quickly showed downward trends (both fishery independent and dependent data) after increased fishing pressure, indicating it may be important for managers to respond quickly to increases in harvest in US waters (see section 1.1.1 statement of the problem). Jonah crab fisheries have developed in Atlantic Canada and despite a prohibition on landing females, minimum legal sizes, and a TAC, several LFAs in Canada have reported declining catch of Jonah crabs (Pezzack et al. 2011, Robichaud et al. 2006). An assessment of offshore Canadian Jonah crabs in LFA 41 determined fishing effort was not sustainable despite a prohibition on landing females, a minimum size set at the size of maturity (128 mm), and a TAC of 920 tons (Pezzack et al. 2011). CPUE of the commercial fishery and fisheries independent data both showed declining trends after only a few years of directed fishing (Pezzack et al. 2011).

The status of the Jonah crab fishery in federal or state waters is relatively unknown. In the absence of a comprehensive management plan and stock assessment, harvest of Jonah crab may compromise the sustainability of the resource. The following are main reasons why and how an interstate fishery management plan with complementary federal regulations would benefit the fishery:

1. There is sporadic information gathered on the species, making stock assessments difficult.
2. There is lack of consistent state-to-state as well as state to federal regulations and goals;
3. An interstate FMP establishes a framework to address future concerns or changes in the fishery or population.

4. An interstate FMP establishes a framework to address future concerns or changes in other species regulations, e.g. Lobster FMP or Large Whale Take Reduction Plan

2.2. Goals

To support and promote the development and implementation, on a continual basis, of a unified coastal management program for Jonah crab, which is designed to promote conservation, to reduce the possibility of recruitment failure, and to allow full utilization of the resource by the United States industry. The management program should be sensitive to the need to minimize social, cultural and economic dislocation.

2.3. Objectives

1) Protect, increase or maintain, as appropriate, the brood stock abundance at levels which would minimize risk of stock depletion and recruitment failure
2) Optimize yield from the fishery while maintaining harvest at a sustainable level
3) Implement uniform collection, analysis, and dissemination of biological and economic information; improve understanding of the status of the stock and the economics of harvest
4) Promote economic efficiency in harvesting and use of the resource
5) Ensure that changes in geographic exploitation patterns do not undermine success of the management program
6) To successfully manage Jonah crab in a manner that is compatible with ASMFC's management of American lobster and in harmony with state and federal management of other trust resources.

2.4. Specification of Management Unit

The management unit for Jonah crab is the entire Northwest Atlantic Ocean and its adjacent inshore waters where Jonah crabs are found, from Maine through Virginia. The FMP is written to provide for the management of Jonah crab throughout their range. The FMP is designed to specify a uniform program regardless of lines that separate political jurisdictions, to the extent possible.

2.4.1. Management Areas

The management area shall be the entire Atlantic coast distribution of the resource from Maine through Virginia.

2.5. Definition of Overfishing

As no coastwide stock assessment has yet to be performed, there is no definition of overfishing for Jonah crab. A definition of overfishing along with absolute values may be established, following a stock assessment, through adaptive management.

2.6. Stock Rebuilding Program

The status of the Jonah crab population is unknown, and therefore a specific rebuilding program and schedule cannot be determined. Once a stock assessment is conducted a rebuilding program may be established, if necessary, through adaptive management.

3. MONITORING PROGRAM SPECIFICATIONS/ELEMENTS

Parts of this section will be updated once a technical committee has been approved and can make recommendations for monitoring programs.

The Jonah Crab Technical Committee will meet as necessary to review the stock assessment, once available, for Jonah crab and all other relevant data pertaining to stock status. The Advisory Panel will forward its report and any recommendations to the Management Board.

The Jonah Crab Advisory Panel will meet annually, or as necessary, to review state management program changes, developments in the fishery, or other changes or challenges in the fishery. The Jonah Crab Stock Assessment Subcommittee will generally meet every five years to review and update or perform a benchmark stock assessment on the Jonah crab stock. This schedule may be modified as needed to incorporate new information and consideration of the Jonah crab biology.

The Jonah Crab Plan Review Team (PRT) will annually review implementation of the management plan and any subsequent adjustments (addenda), and report to the Management Board on any compliance issues that may arise. The PRT will also prepare the annual Jonah Crab FMP Review and coordinate the annual update and prioritization of research needs (see Section 6.2).

3.1. Assessment of Annual Recruitment

Currently, no data exist on recruitment of juvenile Jonah crab. Because abundance and annual migrations are poorly documented, there is no information on spawning location or movement of early life stages of Jonah crab. Krouse (1980) reported that Jonah crab do not use inshore areas as nursery habitat, though this issue warrants further study.

3.2. Assessment of Spawning Stock Biomass

While size at maturity information for Jonah crab in the mid-Atlantic and male crab on the Scotian Shelf (Moriyasu et al. 2002) has been studied, no information exists on the size at maturity for male and female crabs where most of the U.S. Jonah crab fishery is conducted. The absence of maturity data makes it impossible to estimate spawning stock biomass and the stock's reproductive potential, which undermines our ability to set biological reference points and conduct a stock assessment.

3.3. Assessment of Fishing Mortality Target and Measurement

No assessment of fishing mortality has taken place. Exploratory Canadian Jonah crab fisheries have established TAC; however, these values were largely based on historic landings and not mortality. Reardon (2006) estimated Z (0.53–0.71) from an experimental Maine Jonah crab fishery; however, two concerns exist with this estimate. First, it was only with a small part of the Jonah crab distribution and what was taking place in select Maine waters may not be indicative of coastwise patterns of mortality. Secondly, (if accepting her model assumptions) it did not partition F and M, and thus no estimate of F can be made other than F < Z. It was noted that all estimated F values were less than Fmax in a yield per recruit analysis.

3.4. Summary of Monitoring Programs

3.4.1. Catch, Landings, and Effort Information

Landings of Jonah crab in state waters are variable in reporting. In addition to the high variability in gear restrictions, size limits, closed seasons, and other regulatory measures, it is unknown to what degree landings are recorded. Additionally, no central repository of state landings data exists from which to estimate coastwise catch or landings. Although some states require a license to recreationally fish Jonah crab, others do not and it is unlikely that any reliable reporting takes places for recreational landings.

In addition, Jonah crab are also caught as bycatch in the lobster fishery. It is necessary for states to submit this bycatch information so it can be used in future stock assessments.

Fishery-Dependent Data Collections Options

Option 1: Monthly Reporting

This options applies to harvester reporting of catch, landings and effort data. Fishermen with a federal vessel trip reporting (VTR) requirement must fill out the VTR for all trips.

The Plan Development Team recommends that the following data elements be recorded daily by fishermen harvesting Jonah crab (directed or non-directed) and reported to the states on at least a monthly basis:

1. Total number of traps hauled by NMFS statistical area
2. Total number of pounds landed by NMFS statistical area
3. Total number of days fished
4. Trap soak time

Option 2: Coastwide mandatory reporting

This option would apply to dealer and harvester reporting of catch, landings and effort data.

1. 100% mandatory dealer and X % harvester reporting.
   To determine the percentage of harvester reporting the Board would choose from the below options:
   Sub-Option 1: 100%
   Sub-Option 2: 75%
   Sub-Option 3: 50%

Sub-Option 4:10%

2. Two-ticket system to establish a check and a balance: Harvester reports trip data and catch estimates (in pounds) and dealer reports landing weights (in pounds).

a. Harvester reports include: a unique trip id (link to dealer report), vessel number, trip start date, location (NMFS stat area), traps hauled, traps set, quantity (lbs), trip length, soak time in hours and minutes, target species,

b. Dealer reports include: unique trip id (link to harvester report), species, quantity (lbs), state and port of landing, market grade and category, areas fished and hours fished, price per pound

Option 3: Coastwide mandatory reporting and fishery dependent sampling

This option would apply to dealer and harvester reporting of catch, landings and effort data and state staff to conduct port-side sampling.

1. 100% mandatory dealer and X% harvester reporting
   To determine the percentage of harvester reporting the Board would choose from the below options:
   Sub-Option 1: 100%
   Sub-Option 2: 75%
   Sub-Option 3: 50%
   Sub-Option 4:10%

2. Two-ticket system to establish a check and a balance: Harvester reports trip data and catch estimates (in pounds) and dealer reports landing weights (in pounds).

a. Harvester reports include: a unique trip id (link to dealer report), vessel number, trip start date, location (NMFS stat area), traps hauled, traps set, quantity (lbs), trip length, soak time in hours and minutes, target species,

b. Dealer reports include: unique trip id (link to harvester report), species, quantity (lbs), state and port of landing, market grade and category, areas fished and hours fished price per pound

Characterization of the fishery is essential to conduct stock assessments. At minimum state and federal agencies shall conduct port/sea sampling to collect the following types of information on landings, where possible: (*The information to be collected will be recommended by the Crab TC, once formed, and updated for the type of sampling program that is conducted*).

Shell condition
Bait type
Trap type
Traps per trawl
Soak time
Vent size
Number of vents

This information would be included in annual compliance reports submitted to the Commission.

3.4.2. Biological Information

The ACCSP has set standards for how biological data should be collected and managed for commercial, recreational, and for-hire fisheries. Trained field personnel, known as port agents or field samplers, should obtain biological samples. Information should be collected through direct observation or through interviews with fishermen. Detailed fishery statistics and/or biological samples should be collected at docks, unloading sites, and fish houses. Biological sampling includes species identification of fish and shellfish; extraction of hard parts including spines and otoliths; and tissue samples such as gonads, stomachs, and scales.

Key biological information for Jonah crab will help inform a future stock assessment of the species. Given the data poor nature of Jonah crab, the Plan Development Team recommends that the technical committee, once formed, recommend data elements for both sea and port sampling programs.

Fishery-Independent Data Collection Options

There is currently little information concerning fishery-independent data collection. A list of surveys that sample Jonah crab needs to be obtained to determine the feasibility of fishery-independent monitoring. Key information that should be obtained in fishery-independent monitoring is size distribution, sex composition (if possible) and ovigerous condition. *The Plan Development Team recommends that the technical committee, once formed, recommend data elements for fishery independent sampling programs*:

Social and Economic Data
The ACCSP collects economic information concerning Jonah crab with the reports submitted by fishermen and dealers. Since 2002, the cancer crab fishery has increased from an ex-vessel value of 2 million dollars to over 8 million dollars. This information should continue to be collected. Each state should describe the number of participants, economic impacts of the fishery and total value of landings in annual compliance reports. It is important to collect this information for future management actions to determine how a fishery management plan impacts the economics.

3.5. Stocking Program

No current stocking program for Jonah crab is currently underway.

3.6. Bycatch Reduction Program

No known bycatch reduction program exists.

3.7. Habitat Program

Studies exist highlighting the importance of the sub-tidal area (Richards and Cobb 1986; Good 1992; Donahue et al. 2009) all the way to the continental slope (Haefner 1977; Wenner et al.

1992). Unfortunately, less is known about these habitat types during specific times of the year and for different demographic groups. It is likely that certain patterns of habitat use would become clear with more data, particularly as it applies to spawning habitat and early life stage requirements. If Jonah crab study becomes a priority, habitat use should be a primary focus.

4. PROPSED MANAGEMENT PROGRAM IMPLEMENTATION

4.1. Commercial Fisheries Management Measures

Issue 1: Permits
If left open access, a crab only permit will have the potential to increase the number of traps in both state and federal waters. A limited access crab only permit, will constrain proliferation in traps fished attributable to non-lobster trap fishing.

Option 1: ***Status Quo***. No new permit requirements are established by this plan but states/agencies must maintain their current permit requirements for lobsters and crabs. If this option is selected, crab fishermen in federal waters would be required to possess a lobster license and lobster tags or, in the absences of a lobster license and lobster tags, an individual would be allowed to fish for crabs without a permit and set an unlimited number of traps. Any individual fishing in federal waters would also be required to adhere to the state of landing permit requirements.

Option 2: ***Discretionary state permitting with recommendations for new federal permitting***. Permit requirements may be instituted at the discretion of each state, for fishing or landing crabs, and would not be standardized; however, it is recommended that NOAA Fisheries require a new federal permit to fish for and retain Jonah crabs taken from federal waters by any gear.

Option 3: ***New crab license to participate in either a State or Federal Jonah crab fishery.*** State and Federal agencies would issue a new crab-only permit which would allow the participant to fish in State and/or Federal waters. Permits would be open access and not limit the participants in the number of traps that can be set. Note: If this option were approved, the Board may consider future crab trap specifications (e.g. trap size, vents, trap limits, trap tags) through a subsequent addendum

Option 4: ***New crab license to participate in either a State or Federal Jonah crab fishery (#3 above) but trap fishery would require use of an approved trap design that minimizes lobster catch.*** State and Federal agencies would issue a new crab-only permit which would allow the participant to fish in State and or Federal waters. Permits would be open access and not limit the participants in the number of traps that can be set. These permits would be limited to the use of only traps designed to effectively target Jonah crabs, while minimizing the retention of lobster. Any such trap design would be subject to the review and approval of the Lobster PDT and Board. In the absence of an approved design, no Jonah crab trap permits shall be issued. Note: If this option were approved the Board would consider if crab trap specifications (e.g. trap size, vents, trap limits, trap tags) would be necessary through a subsequent addendum.

Option 5: ***Directed fishery and incidental permit requirements.*** Participation in the directed trap fishery would only be allowed only for those persons or vessels that already hold a lobster permit from whatever jurisdiction the vessel is authorized to fish in, and all traps must conform to specifications of the lobster management plan, including the trap tag and escape vent requirements. Landing of Jonah crab by all others would require an incidental permit from a state or federal agency for the appropriate jurisdiction in which the vessel if fishing and would be subject to landing limits (outlined in issue 6).

Issue 2: Minimum size (See tables 2a-c for port and sea sampling data on Jonah crab sizes)

Option 1: No coastwide minimum size
Option 2: 4" minimum size
Option 3: 4.25" minimum size
Option 4: 4.5" minimum size
Option 5: 4.75" minimum size
Option 6: 5" minimum size
Option 7: 5.25" minimum size
Option 8: 5.5" minimum size

Issue 3: Commercial minimum size tolerance

Option 1: No tolerance for undersize crabs.
Option 2: 5% tolerance for undersize catch
Option 3: 10% tolerance for undersize catch

If a tolerance is allowed then the following procedure could be an example of how to apply tolerances. This procedure will be reviewed with the LEC for recommendations to the Board: **Minimum Size Tolerance / Jonah crab sampling procedure**: It is unlawful for any vessel or person to take, possess, have on board, land or off-load any Jonah Crabs which are less than XX inches in the longest shell diameter to the amount of more than XX% of any batch unless authorized by a permit issued by a State or Federal agency. Enforcement personnel will sample 1-5 batches of Jonah crab, depending on the volume of crabs being landed or possessed, at the discretion of the Enforcement agency personnel.

Batch means all shellfish in each separate container.
Container means any bag, box, basket, cage, or other receptacle containing loose shellfish which may be separated from the entire load or shipment.

Issue 4: Crab Part Retention

Option 1: Crabs parts, such as claws, may be retained and sold in any form
Option 2: Only whole crabs may be retained and sold

Issue 5: Prohibition on Retention of Egg-Bearing Females

Note: If the minimum size is set correctly, then this option would not be an issue. The PDT strongly discourages the use of option 1.

Option 1: No prohibition on retention of egg-bearing females.
Option 2: Egg-bearing females may not be retained.
Option 3: No females may be retained; 1% tolerance for females (total percentage of catch that is female cannot exceed 1%).

If a tolerance is allowed then the following procedure could be an example of how to apply tolerances. This procedure will be reviewed with the LEC for recommendations to the Board: **Minimum Size Tolerance / Jonah crab sampling procedure**: It is unlawful for any vessel or person to take, possess, have on board, land or off-load any Jonah Crabs which are less than XX inches in the longest shell diameter to the amount of more than XX% of any batch unless authorized by a permit issued by a State or Federal agency. Enforcement personnel will sample 1-5 batches of Jonah crab, depending on the volume of crabs being landed or possessed, at the discretion of the Enforcement agency personnel.

Issue 6: Incidental Bycatch limit for non-trap gear

Option 1: No coastwide possession limit
Option 2: 200 pounds per day up to a max of 500 pounds per trip

4.2. Recreational Fisheries Management Measures

Issue 1: Possession limits

Option 1: No coastwide possession limit
Option 2: 50 (whole crabs); or 100 claw possession limit per person

Issue 2: Prohibition on Retention of Egg-Bearing Females

Note: If the minimum size is set correctly, then this option would not be an issue. The PDT strongly discourages the use of Option 1

Option 1: No prohibition on retention of egg-bearing females.
Option 2: Egg-bearing females may not be retained.
Option 3: No females may be retained; 1% tolerance for females (total percentage of catch that is female cannot exceed 1%).

4.3. Alternative State Management Regimes

Once approved by the American Lobster Management Board, states are required to obtain prior approval from the Management Board of any changes to their management program for which a compliance requirement is in effect. Changes to non-compliance measures must be reported to the Management Board but may be implemented without prior Management Board approval. A state can request permission to implement an alternative to any mandatory compliance measure only if

that state can show to the Management Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (***Section 4.5***). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process/Annual Compliance Reports.

4.3.1. General Procedures

A state may submit a proposal for a change to its regulatory program or any mandatory compliance measure under the Jonah Crab Fishery Management Plan to the Commission, including a proposal for *de minimis* status. Such changes shall be submitted to the Chair of the Plan Review Team, who shall distribute the proposal to the Management Board, the Plan Review Team, the Technical Committee, the Stock Assessment Committee, and the Advisory Panel.

The Plan Review Team is responsible for gathering the comments of the Technical Committee, the Stock Assessment Committee and the Advisory Panel, and presenting these comments as soon as possible to the Management Board for decision.

The American Lobster Management Board will decide whether to approve the state proposal for an alternative management program if it determines that it is consistent with the goals and objectives of this FMP.

4.3.2. Management Program Equivalency

The Jonah Crab Technical Committee, under the direction of the Jonah Crab Plan Review Team, will review any alternative state proposals under this section and provide to the American Lobster Management Board its evaluation of the adequacy of such proposals. The PDT can also ask for reviews by the LEC or the AP.

Following the first full year of implementation of an alternate management program, the Jonah Crab Plan Review Team will have the responsibility of evaluating the effects of the program to determine if the measures were actually equivalent with the standards in the FMP or subsequent amendments or addenda. The Jonah Crab PRT will report to the Management Board on the performance of the alternate program.

4.3.3. *De minimis* Fishery Guidelines

The ASMFC Interstate Fisheries Management Program Charter defines *de minimis* as "a situation in which, under the existing condition of the stock and scope of the fishery, conservation, and enforcement actions taken by an individual state would be expected to contribute insignificantly to a coastwide conservation program required by a Fishery Management Plan or amendment" (ASMFC 2009b).

States may petition the American Lobster Management Board at any time for *de minimis* status. Once *de minimis* status is granted, designated states must submit annual reports including

commercial and recreational landings to the Management Board justifying the continuance of *de minimis* status. States must include *de minimis* requests as part of their annual compliance reports.

<u>*De Minimis* Criteria Options</u>

Option 1: Recreational and Commercial separate de minimis status

States may apply for *de minimis* status, if for the preceding three years for which data are available, their average commercial landings or recreational landings (by weight) constitute less than ***X*** percent of the average coastwide commercial or recreational landings for the same period. A state that qualifies for *de minimis* based on their commercial landings will qualify for exemptions in their commercial fishery only, and a state that qualifies for *de minimis* based on their recreational landings will qualify for exemptions in their recreational fishery only.

Sub-option 1a: X = 1%
Sub-option 1b: X = 2%
Sub-option 1c: X = 3%

Option 2: Recreational and Commercial combined de minimis status

States may apply for *de minimis* status, if for the preceding three years for which data are available, their average combined, commercial and recreational landings (by weight) constitute less than ***X*** percent of the average coastwide combined, commercial and recreational landings for the same period.

Sub-option 2a: X = 1%
Sub-option 2b: X = 2%
Sub-option 2c: X = 3%

4.3.4. *De minimis* Exemptions

States who qualify for *de minimis* are not required to implement the following requirements: Fishery independent and port/sea sampling requirements

4.4. Adaptive Management

The American Lobster Management Board may vary the requirements specified in this amendment as a part of adaptive management in order to conserve the Jonah crab resources. Specifically, the Management Board may change target fishing mortality rates and harvest specifications, or other measures designed to prevent overfishing of the stock complex or any spawning component. Such changes will be instituted to be effective on the first fishing day of the following year, but may be put in place at an alternative time when deemed necessary by the Management Board.

4.4.1. General Procedures

The Jonah Crab Plan Review Team (PRT) will monitor the status of the fisheries and the resources and report on that status to the American Lobster Management Board annually or when directed to do so by the Management Board. The PRT will consult with the Jonah Crab Technical Committee, Stock Assessment Committee, and Advisory Panel, in making such review and report.

The American Lobster Management Board will review the report of the PRT, and may consult further with the Technical Committee, Stock Assessment Committee, or Advisory Panel. The Management Board may, based on the PRT Report or on its own discretion, direct the PRT to prepare an addendum to make any changes it deems necessary. The addendum shall contain a schedule for the states to implement its provisions.

The PRT will prepare a draft addendum as directed by the Management Board, and shall distribute it to all states for review and comment. A public hearing will be held in any state that requests one. The PRT will also request comment from federal agencies and the public at large. After a 30-day review period, staff in consultation with the PDT will summarize the comments and prepare a final version of the addendum for the Management Board.

The Management Board shall review the final version of the addendum prepared by the PRT, and shall also consider the public comments received and the recommendations of the Technical Committee, Stock Assessment Committee, and Advisory Panel; and shall then decide whether to adopt or revise and, then, adopt the addendum.

Upon adoption of an addendum implementing adaptive management by the Management Board, states shall prepare plans to carry out the addendum, and submit them to the Management Board for approval according to the schedule contained in the addendum.

4.4.2. Measures Subject to Change

The following measures are subject to change under adaptive management upon approval by the American Lobster Management Board:

(1) Fishing year and/or seasons;
(2) Area closures;
(3) Overfishing definition, MSY and OY; Reference points
(4) Rebuilding targets and schedules;
(5) Catch controls for both the commercial and recreational fishery, including trip/bag and size limits;
(6) Effort controls;
(7) Bycatch allowance
(8) Reporting requirements;
(9) Gear limitations;
(10) Measures to reduce or monitor bycatch;
(11) Observer requirements;
(12) Management areas and unit

(13) Definition of a trap; trap requirements and specifications
(14) Recommendations to the Secretaries for complementary actions in federal jurisdictions;
(15) Research or monitoring requirements;
(16) Frequency of stock assessments;
(17) *De minimis* specifications;
(18) Maintenance of stock structure;
(19) Catch allocation; and
(20) Any other management measures currently included in the FMP.

4.5. Emergency Procedures

Emergency procedures may be used by the American Lobster Management Board to require any emergency action that is not covered by or is an exception or change to any provision in the FMP. Procedures for implementation are addressed in the ASMFC Interstate Fisheries Management Program Charter, Section Six (c)(10) (ASMFC 2009b).

4.6. Management Institutions

The management institution for Jonah crab shall be subject to the provisions of the ISFMP Charter (ASMFC 2009b). The following is not intended to replace any or all of the provisions of the ISFMP Charter. All committee roles and responsibilities are included in detail in the ISFMP Charter and are only summarized here.

4.6.1. ASMFC and the ISFMP Policy Board

The ASMFC and the ISFMP Policy Board are generally responsible for the oversight and management of the Commission's fisheries management activities. The Commission must approve all fishery management plans and amendments, and must make all final determinations concerning state compliance or non-compliance. The ISFMP Policy Board reviews any non-compliance recommendations of the various Management Boards and Sections and, if it concurs, forwards them on to the Commission for action.

4.6.2. American Lobster Management Board

The American Lobster Management Board was established under the provisions of the Commission's ISFMP Charter (Section Four; ASMFC 2009b) and is generally responsible for carrying out all activities under this FMP.

The American Lobster Management Board (Management Board) establishes and oversees the activities of each species' Plan Development and Plan Review Team, Technical Committee and Stock Assessment Subcommittee, and the Advisory Panel. Among other things, the Management Board makes changes to the management program under adaptive management and approves state programs implementing the amendment and alternative state programs under ***Sections 4.4* and *4.5***. The Management Board reviews the status of state compliance with the management program, at least annually, and if it determines that a state is out of compliance, reports that determination to the ISFMP Policy Board under the terms of the ISFMP Charter.

4.6.3. Plan Development Team and Plan Review Team

The Plan Development Team (PDT) and Plan Review Team (PRT) for Jonah crab will be composed of a small group of scientists and/or managers whose responsibility is to provide all of the technical support necessary to carry out and document the decisions of the American Lobster Management Board. An ASMFC FMP Coordinator chairs the PDT and PRT. The PDT and PRT are directly responsible to the Management Board for providing information and documentation concerning the implementation, review, monitoring and enforcement of the species management plan. The PDT and PRT shall be comprised of personnel from state and federal agencies who have scientific and management ability and knowledge of the relevant species. The Jonah Crab PDT is responsible for preparing all documentation necessary for the development of the FMP, using the best scientific information available and the most current stock assessment information. The PDT will either disband or assume inactive status upon completion of the FMP. Alternatively, the Board may elect to retain PDT members as members of the species-specific PRT or appoint new members. The PRT will provide annual advice concerning the

implementation, review, monitoring, and enforcement of the FMP once it has been adopted by the Commission.

4.6.4. Technical Committee

The Jonah Crab Technical Committee will consist of representatives from state and/or federal agencies, Regional Fishery Management Councils, Commission, university or other specialized personnel with scientific and technical expertise and knowledge of the relevant species. The Management Board will appoint the members of a Technical Committee and may authorize additional seats as it sees fit. Its role is to act as a liaison to the individual state and federal agencies, provide information to the management process, and review and develop options concerning the management program. The Technical Committee will provide scientific and technical advice to the Management Board, PDT, and PRT in the development and monitoring of a fishery management plan or amendment.

4.6.5. Stock Assessment Subcommittee

The Jonah Crab Stock Assessment Subcommittee will be appointed and approved by the Management Board, with consultation from the Jonah Crab Technical Committee, and will consist of scientists with expertise in the assessment of the relevant population. Its role is to assess the species population and provide scientific advice concerning the implications of proposed or potential management alternatives, or to respond to other scientific questions from the Management Board, Technical Committee, PDT or PRT. The Jonah Crab Stock Assessment Subcommittee will report to the Jonah Crab Technical Committee.

4.6.6. Advisory Panel

The Jonah Crab Advisory Panel was established according to the Commission's Advisory Committee Charter. Members of the Advisory Panel are citizens who represent a cross-section of commercial and recreational fishing interests and others who are concerned about the conservation and management of Jonah crab. The Advisory Panel provides the Management Board with advice directly concerning the Commission's management program for the species.

4.6.7. Federal Agencies

4.6.7.1. Management in the Exclusive Economic Zone (EEZ)

Management of Jonah crab in the EEZ is within the jurisdiction of NOAA Fisheries under the Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 U.S.C. 1801 et seq.). In the absence of a Council Fishery Management Plan for Jonah crab, management of this species is the responsibility of NOAA Fisheries as mandated by the Atlantic Coastal Fisheries Cooperative Management Act (16 U.S.C. 5105 et seq.).

4.6.7.2. Federal Agency Participation in the Management Process

The Commission has accorded the United States Fish and Wildlife Service (USFWS) and NOAA Fisheries voting status on the ISFMP Policy Board and the American Lobster Board in accordance with the Commission's ISFMP Charter. NOAA Fisheries and USFWS may also participate on the Management Board's supporting committees described in *Sections 4.7.3-4.7.6*.

4.6.7.3. Consultation with Fishery Management Councils

In carrying out the provisions of this FMP, the states, as members of the American Lobster Management Board, shall closely coordinate with the New England and Mid Atlantic Fishery Management Councils and NOAA Fisheries to cooperatively manage the Atlantic coast population of Jonah crab. In accordance with the Commission's ISFMP Charter, a representative of the New England Fishery Management Council was invited to participate as a full member of the American Lobster Management Board in April of 2015. If more than one council is interested in participating on the Board, the applicable Councils will need to identify one Executive Director/Chair to receive the invitation to participate on the board.

4.7. Recommendations to the Secretaries for Complementary Actions in Federal Jurisdictions

If options are adopted, the Board would consider which options, if any should be recommended to NOAA Fisheries for implementation in the Exclusive Economic Zone.

4.8. Cooperation with Other Management Institutions

At this time, no other management institutions have been identified that would be involved with management of Jonah crab on the Atlantic coast. Nothing in the FMP precludes the coordination of future management collaborations with other management institutions should the need arise.

5. COMPLIANCE

Full implementation of the provisions of this FMP is necessary for the management program to be equitable, efficient and effective. States are expected to implement these measures faithfully under state laws. Although the ASMFC does not have authority to directly compel state implementation of these measures, it will continually monitor the effectiveness of state implementation and determine whether states are in compliance with the provisions of this fishery management plan. This section sets forth the specific elements states must implement in order to be in compliance with this fishery management plan, and the procedures that will govern the evaluation of compliance. Additional details of the procedures are found in the ASMFC Interstate Fisheries Management Program Charter (ASMFC 2009b).

5.1. Mandatory Compliance Elements for States

A state will be determined to be out of compliance with the provisions of this fishery management plan, according to the terms of Section Seven of the ISFMP Charter if:

- Its regulatory and management programs to implement *Section 4* have not been approved by the American Lobster Management Board; or
- It fails to meet any schedule required by *Section 5.1.2*, or any addendum prepared under adaptive management (*Section 4.6*); or
- It has failed to implement a change to its program when determined necessary by the American Lobster Management Board; or
- It makes a change to its regulations required under *Section 4* or any addendum prepared under adaptive management (*Section 4.6*), without prior approval of the American Lobster Management Board.

5.1.1. Mandatory Elements of State Programs

To be considered in compliance with this fishery management plan, all state programs must include harvest controls on Jonah crab fisheries consistent with the requirements of *Sections 4.1, 4.2, 4.3*; except that a state may propose an alternative management program under *Section 4.5*, which, if approved by the American Lobster Management Board, may be implemented as an alternative regulatory requirement for compliance.

5.1.1.1. Regulatory Requirements

Each state must submit its required Jonah crab regulatory program to the Commission through the ASMFC staff for approval by the American Lobster Management Board. During the period from submission until the Board makes a decision on a state's program, a state may not adopt a less protective management program than contained in this amendment or contained in current state law. The following lists the specific compliance criteria that a state/jurisdiction must implement in order to be in compliance with this FMP:

[Will be included once final options are selected]

Once approved by the American Lobster Management Board, states are required to obtain prior approval from the Board of any changes to their management program for which a compliance requirement is in effect. Other measures must be reported to the Board but maybe implemented without prior Board approval. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (*Section 4.6*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process or the Annual Compliance reports.

5.1.1.2. Monitoring Requirements

There are requirements for additional monitoring.

5.1.1.3. Research Requirements

The Plan Development Team and Technical Committee have prioritized the research needs for Jonah crab (*Section 6.2*). Appropriate programs for meeting these needs may be implemented under Adaptive Management (*Section 4.6*) in the future.

5.1.1.4. Law Enforcement Requirements

All state programs must include law enforcement capabilities adequate for successfully implementing that state's black drum regulations. The adequacy of a state's enforcement activity will be monitored annually by reports of the ASMFC Law Enforcement Committee to Jonah Crab Plan Review Team. The first reporting period will cover the period from January 1, 20XX to December 31, 20XX.

5.1.1.5. Habitat Requirements

There are no mandatory habitat requirements in the FMP, although requirements may be added under Adaptive Management (*Section 4.6*). See *Section 4.4* for Habitat Recommendations.

5.1.2. Compliance Schedule

States must implement the FMP according to the following schedule:

Month XX, 20XX:	States must submit programs to implement the FMP for approval by the American Lobster Management Board. Programs must be implemented upon approval by the Management Board.
Month XX, 20XX:	States with approved management programs must implement FMP requirements. States may begin implementing management programs prior to this deadline if approved by the Management Board.

Reports on compliance must be submitted to the Commission by each jurisdiction annually, no later than Month XX, beginning in 20XX.

5.1.3. Compliance Reporting Content

Each state must submit an annual report concerning its Jonah crab fisheries and management program for the previous calendar year. A standard compliance report format has been prepared and adopted by the ISFMP Policy Board. States should follow this format in completing the annual compliance report.

5.2. Procedures for Determining Compliance

Detailed procedures regarding compliance determinations are contained in the ISFMP Charter, Section Seven (ASMFC 2009b). Future revisions to the ISFMP Charter may take precedence over the language contained in this FMP, specifically in regards to the roles and responsibilities of the various groups contained in this section. The following summary is not meant in any way to replace the language found in the ISFMP Charter.

In brief, all states are responsible for the full and effective implementation and enforcement of fishery management plans in areas subject to their jurisdiction. Written compliance reports as specified in the Plan (or subsequent Amendments and/or Addenda) must be submitted annually by each state with a declared interest. Compliance with the FMP will be reviewed at least annually. The American Lobster Management Board, ISFMP Policy Board or the Commission, may request that the Black Drum Plan Review Team conduct a review of plan implementation and compliance at any time.

The American Lobster Management Board will review the written findings of the PRT within 60 days of receipt of a State's compliance report. Should the Management Board recommend to the Policy Board that a state be determined to be out of compliance, a rationale for the recommended non-compliance finding will be included addressing specifically the required measures of the FMP that the state has not implemented or enforced, a statement of how failure to implement or enforce the required measures jeopardizes Jonah crab conservation, and the actions a state must take in order to comply with the FMP requirements.

The ISFMP Policy Board shall, within thirty days of receiving a recommendation of non-compliance from the American Lobster Management Board, review that recommendation of non-compliance. If it concurs in the recommendation, it shall recommend to the Commission that a state be found out of compliance.

The Commission shall consider any FMP non-compliance recommendation from the Policy Board within 30 days. Any state which is the subject of a recommendation for a non-compliance finding is given an opportunity to present written and/or oral testimony concerning whether it should be found out of compliance. If the Commission agrees with the recommendation of the Policy Board, it may determine that a state is not in compliance with the FMP, and specify the actions the state must take to come into compliance.

Any state that has been determined to be out of compliance may request that the Commission rescind its non-compliance findings, provided the state has revised its Jonah crab conservation measures or shown to the Board and/or Commission's satisfaction that actions taken by the state provide for conservation equivalency.

5.3. Recommended (Non-Mandatory) Management Measures

5.4. Analysis of Enforceability of Proposed Measures

[Law Enforcement Committee analysis]

6. MANAGEMENT AND RESEARCH NEEDS

Characterized as High (H), Medium (M), or Low (L) priority, these management and research needs will be reviewed annually as part of the Commission's FMP Review process. The annual Jonah Crab FMP Review will contain an updated list for future reference.

6.1. Stock Assessment and Population Dynamics

A coastwide stock assessment has yet to be completed for Jonah crab but is considered a high priority need. The assessment will provide much needed data on the status of the Jonah crab resource as well as contribute to recommendations for additional management needs, if any.

6.2. Research and Data Needs

Research and data needs will be identified once the Technical Committee for Jonah crab is established.

6.2.1. Biological

6.2.2. Social

6.2.3. Economic

6.2.4. Habitat

7. PROTECTED SPECIES

In the fall of 1995, Commission member states, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) began discussing ways to improve implementation of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) in state waters. Historically, these policies have been only minimally enforced in state waters (0-3 miles). In November 1995, the Commission, through its Interstate Fisheries Management Program (ISFMP) Policy Board, approved amendment of its ISFMP Charter (Section Six (b)(2)) so that interactions between ASMFC-managed fisheries and species protected under the MMPA, ESA, and other legislation, including the Migratory Bird Treaty Act be addressed in the Commission's fisheries management planning process. Specifically, the Commission's fishery management plans describe impacts of state fisheries on certain marine mammals and endangered species (collectively termed "protected species"), and recommend ways to minimize these impacts. The following section outlines: (1) the federal legislation which guides protection of marine mammals, sea turtles, and marine birds; (2) the protected species with potential fishery interactions; (3) the specific type(s) of fishery interactions; (4)

population status of the affected protected species; and (5) potential impacts to Atlantic coastal state and interstate fisheries.

7.1. Marine Mammal Protection Act (MMPA) Requirements

Since its passage in 1972, one of the primary goals of the MMPA has been to reduce the incidental serious injury and mortality of marine mammals permitted in the course of commercial fishing operations to insignificant levels approaching a zero mortality and serious injury rate. Under the 1994 Amendments, the MMPA requires the National Marine Fisheries Service (NMFS) to develop and implement a take reduction plan to assist in the recovery or prevent the depletion of each strategic stock that interacts with a Category I or II fishery. Specifically, a strategic stock is defined as a stock: (1) for which the level of direct human-caused mortality exceeds the potential biological removal (PBR)[1] level; (2) which is declining and is likely to be listed under the Endangered Species Act (ESA) in the foreseeable future; or (3) which is listed as a threatened or endangered species under the ESA or as a depleted species under the MMPA. Category I and II fisheries are those that have frequent or occasional incidental mortality and serious injury of marine mammals, respectively, whereas Category III fisheries have a remote likelihood of incidental mortality and serious injury of marine mammals. Each year, NMFS publishes an annual List of Fisheries which classifies commercial fisheries into one of these three categories.

Under the 1994 mandates, the MMPA also requires fishermen participating in Category I and II fisheries to register under the Marine Mammal Authorization Program (MMAP), the purpose of which is to provide an exception for commercial fishermen from the general taking prohibitions of the MMPA for non-ESA listed marine mammals. All fishermen, regardless of the category of fishery they participate in, must report all incidental injuries and mortalities caused by commercial fishing operations within 48 hours.

Section 101(a)(5)(E) of the MMPA allows for the authorization of the incidental taking of individuals from marine mammal stocks listed as threatened or endangered under the ESA in the course of commercial fishing operations if it is determined that (1) incidental mortality and serious injury will have a negligible impact on the affected species or stock; (2) a recovery plan has been developed or is being developed for such species or stock under the ESA; and (3) where required under Section 118 of the MMPA, a monitoring program has been established, vessels engaged in such fisheries are registered in accordance with Section 118 of the MMPA, and a take reduction plan has been developed or is being developed for such species or stock. Currently, there are no permits that authorize takes of threatened or endangered species by any commercial fishery in the Atlantic. Permits are not required for Category III fisheries; however, any serious injury or mortality of a marine mammal must be reported.

7.2. Endangered Species Act (ESA) Requirements

[1] PBR is the number of human-caused deaths per year each stock can withstand and still reach an optimum population level. This is calculated by multiplying “the minimum population estimate” by “½ stock’s net productivity rate” by “a recovery factor ranging from 0.1 for endangered species to 1.0 for healthy stocks.”

The taking of endangered sea turtles and marine mammals is prohibited and considered unlawful under Section 9(a)(1) of the ESA. In addition, NMFS or the USFWS may issue Section 4(d) protective regulations necessary and advisable to provide for the conservation of threatened species. There are several mechanisms established in the ESA to allow exceptions to the take prohibition in Section 9(a)(1). Section 10(a)(1)(A) of the ESA authorizes NMFS to allow the taking of listed species through the issuance of research permits for scientific purposes or to enhance the propagation or survival of the species. Section 10(a)(1)(B) authorizes NMFS to permit, under prescribed terms and conditions, any taking otherwise prohibited by Section 9(a)(1)(B) of the ESA, if the taking is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Finally, Section 7(a)(2) requires federal agencies to consult with NMFS to ensure that any action that is authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat of such species. If, following completion of consultation, an action is found to jeopardize the continued existence of any listed species or cause adverse modification to critical habitat of such species, reasonable and prudent alternatives will be identified so that jeopardy or adverse modification to the species is removed and section 7(a)(2) is met (see Section 7(b)(3)(A)). Alternatively, if, following completion of consultation, an action is not found to jeopardize the continued existence of any listed species or cause adverse modification to critical habitat of such species, reasonable and prudent measures will be identified that minimize the take of listed species or adverse modification of critical habitat of such species (see Section 7(b)(4)). Section (7)(o) provides the actual exemption from the take prohibitions established in Section 9(a)(1), which includes Incidental Take Statements that are provided at the end of consultation via the ESA Section 7 Biological Opinions.

Under Section 7 of the Endangered Species Act of 1973, as amended, a review of listed species and designated critical habitat(s) known to occur in the area of proposed action(s) and potential impacts to these species and habitat(s) is required of federal FMPs. Although not required for Commission FMPs, the following is included for informational purposes.

Marine listed species and critical habitat designations in the eastern U.S.

Species	**Status**	**Potentially affected by this action?**
Cetaceans		
North Atlantic right whale (*Eubalaena glacialis*)	Endangered	Yes
Humpback whale (*Megaptera novaeangliae*)	Endangered	Yes
Fin whale (*Balaenoptera physalus*)	Endangered	Yes
Sei whale (*Balaenoptera borealis*)	Endangered	Yes
Blue whale (*Balaenoptera musculus*)	Endangered	No
Sperm whale (*Physeter macrocephalus*	Endangered	No
Minke whale (*Balaenoptera acutorostrata*)	Protected	Yes

Pilot whale (*Globicephala spp*.)[1]	Protected	Yes
Risso's dolphin (*Grampus griseus*)	Protected	Yes
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected	Yes
Short Beaked Common dolphin (*Delphinus delphis*)[2]	Protected	Yes
Spotted dolphin (*Stenella frontalis*)	Protected	No
Bottlenose dolphin (*Tursiops truncatus*)[3]	Protected	Yes
Harbor porpoise (*Phocoena phocoena*)	Protected	Yes
Sea Turtles		
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Yes
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered	Yes
Green sea turtle (*Chelonia mydas*)	Endangered[4]	Yes
Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic DPS	Threatened	Yes
Hawksbill sea turtle (*Eretmochelys imbricate*)	Endangered	No
Fish		
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered	No
Atlantic salmon (*Salmo salar*)	Endangered	Yes
Atlantic sturgeon *(Acipenser oxyrinchus)*		
Gulf of Maine DPS	Threatened	Yes
New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS	Endangered	Yes
Cusk (*Brosme brosme*)	Candidate	Yes
Pinnipeds		
Harbor seal (*Phoca vitulina*)	Protected	Yes
Gray seal (*Halichoerus grypus*)	Protected	Yes
Harp seal (*Phoca groenlandicus*)	Protected	Yes
Hooded seal (*Cystophora cristata*)	Protected	Yes
Critical Habitat		
North Atlantic Right Whale	ESA Listed	No
Atlantic Salmon	ESA Listed	No

Northwest Atlantic DPS of Loggerhead Sea Turtle	ESA Listed	No

Notes:

[1] There are 2 species of pilot whales: short finned (*G. melas melas*) and long finned (*G. macrorhynchus*). Due to the difficulties in identifying the species at sea, they are often just referred to as *Globicephala spp*.

[2] Prior to 2008, this species was called "common dolphin."

[3] This includes the Western North Atlantic Offshore, Northern Migratory Coastal, and Southern Migratory Coastal Stocks of Bottlenose Dolphins.

[4] Green turtles in U.S. waters are listed as threatened except for the Florida breeding population which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters.

Candidate species are those petitioned species that NMFS is actively considering for listing as endangered or threatened under the ESA. Candidate species also include those species for which NMFS has initiated an ESA status review through an announcement in the Federal Register. Candidate species receive no substantive or procedural protection under the ESA; however, NMFS recommends that project proponents consider implementing conservation actions to limit the potential for adverse effects on candidate species from any proposed project. NMFS has initiated review of recent stock assessments, bycatch information, and other information for these candidate and proposed species. The results of those efforts are needed to accurately characterize recent interactions between fisheries and the candidate/proposed species in the context of stock sizes. Any conservation measures deemed appropriate for these species will follow the information reviews. Please note that once a species is proposed for listing the conference provisions of the ESA apply (see 50 CFR 402.10).

Many of the protected species that occur in the New England and Mid-Atlantic waters have never been observed as bycatch in the lobster trap/pot fishery, nor have they been documented as killed by lobster trap/pot gear in the stranding records. Based on this information, detailed species accounts are given below for endangered, threatened or protected species that are likely to be incidentally taken in the lobster trap/pot fishery. The remaining non ESA-listed species that are not likely to be affected will not be discussed further in this statement.

4.3.1 Species Potentially Affected

North Atlantic Right Whale

The North Atlantic right whale (Eubalaena glacialis) is listed as endangered under the ESA and is among the most endangered large whale species in the world. Two populations, 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. Yet, despite decades of conservation measures, the population remains at low numbers. Fewer than 200 females are estimated in the population (Best et al. 2001). As of 2009, there were only an estimated 97 breeding females (Schick et al. 2009). Modeling work using data collected through the mid-1990s indicated that if the conditions that existed at that time were to continue, western North Atlantic right whales would be extinct within 200 years (Caswell et al. 1999).

The total number of North Atlantic right whales is estimated to be at least 444 animals (Waring et al. 2013). The minimum rate of annual human-caused mortality and serious injury to right whales averaged 3.0 mortality or serious injury incidents per year during 2006 to 2010 (Waring et al. 2011). Of these, fishery interactions resulted in an average of 1.8 mortality or serious injury incidents per year, all in U.S. waters. The potential biological removal (PBR) level for this stock is 0.9 animals per year (Waring et al. 2011). 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).

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. 2009). 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 Jeffrey's Ledge, as well as Canadian waters including the Bay of Fundy and Browns and Baccaro Banks, in the spring through fall. 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. In terms of abundance, an exact count of right whales in the western North Atlantic cannot be obtained.

Based on a census of individual whales using photo-identification techniques, a total of 425 individually recognized whales were known to be alive during 2009. Whales identified by this date included 20 of the 39 calves born during that year. Thus adding the 19 calves not yet catalogued brings the minimum number alive in 2009 to 444 (Waring et al. 2013). Previous

estimates using the same method with the added assumption of mortality for those whales not seen in 7 years, a total of 299 right whales was estimated in 1998 (Kraus et al. 2001), and a review of the photo-ID recapture database on July 6, 2010, indicated that 396 individually recognized whales were known to be alive during 2007 (Waring et al. 2011). Because this 2009 review was a nearly complete census, it is assumed this estimate represents a minimum population size. The minimum number alive population index for the years 1990-2009 suggests a positive and slowly accelerating trend in numbers. These data reveal a significant increase in the number of catalogued whales alive during this period. Mean growth rate for the period was 2.6% (Waring et al. 2013).

Ship strikes and fishing gear entanglements are the principal factors believed to be retarding growth and recovery of western North Atlantic right whales population. 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. 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). 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, who 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. Not included in these numbers is one right whale that was entangled in both buoy line and groundline on the tail.

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).
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 Jeffrey's 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).

The overall North Atlantic population, derived from genetic taggind data collected by the Years of the North Atlantic Humpback (YONAH) project on breeding ground was estimated to be 4,894 males and 2,804 females, or 7,698 individuals. Photographic mark-recapture analyses from the YONAH project gave an ocean-basin-wide estimate of 11,570 animals during 1992/1993 and an additional genotype-based analysis yielded a similar but less precise estimate of 10,400 whales (95% c.i. = 8,000-13,600) (Waring et al. 2013). As part of a large-scale assessment called More of North Atlantic Humpbacks (MoNAH) project, extensive sampling was conducted on humpbacks in the Gulf of Maine/Scotian Shelf region and the primary wintering ground on Silver Bank during 2004-2005. These data are being analyzed along with additional data from the Gulf of Maine to estimate abundance and refine knowledge of the North Atlantic humpback whales' population structure. The work is intended to update the YONAH population assessment. The most recent line-transect survey, 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 (Waring et al. 2013).

Population modeling, using data obtained from photographic mark-recapture studies, estimates the growth rate of the Gulf of Maine stock to be 6.5% for the period 1979-1991 (Barlow and Clapham 1997). More recent analysis for the period 1992-2000 estimated lower population growth rates ranging from 0 percent to 4.0 percent, depending on calf survival rate (Clapham et al. 2003 in Waring et al. 2011). However, it was unclear whether the apparent decline in growth rate is a biased result due to a shift in distribution documented for the period 1992-1995, or whether the population growth rates truly declined due to high mortality of young-of-the-year whales in U.S. Mid-Atlantic waters (Waring et al. 2011). Zerbini et al. (2010) reviewed various estimates of maximum productivity rates for humpback whale populations, and, based on simulation studies, they proposed that 11.8% be considered as the maximum rate at which the species could grow. Despite the uncertainty accompanying the more recent estimates of observed population growth rate for the Gulf of Maine stock, the maximum net productivity rate was assumed to be 6.5% calculated by Barlow and Clapham (1997) because it represents an observation greater than the default of 0.04 for cetaceans (Barlow et al. 1995) but is conservative in that it is well below the results of Zerbini et al. (2010) (Waring et al. 2013). The PBR for the Gulf of Maine stock of humpback whale is 2.7 whales per year (Waring et al. 2013).

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). Between 1992 and 2001, at least 92 humpback whale entanglements and 10 ship strikes were recorded. 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. 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. 2009).

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.2 In addition, five out of seven buoy line

2Note that one humpback whale was entangled in both buoy line and groundline and was placed in both categories.

entanglements and three out of four gillnet floatline entanglements involved the tail (Johnson et al. 2005).3

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.

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. 2009).

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 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).

3 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).

This particular stock is considered strategic because the fin whale is listed as endangered under the ESA. A Recovery Plan for fin whales is currently awaiting legal process (Waring et al. 2009).

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).

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).

Various estimates have been provided to describe the current status of fin whales in western North Atlantic waters. One method used the catch history and trends in Catch Per Unit Effort (CPUE) to obtain an estimate of 3,590 to 6,300 fin whales for the entire western North Atlantic (Perry et al. 1999). Hain et al. (1992) estimated that about 5,000 fin whales inhabit the Northeastern U.S. continental shelf waters. The 2012 Stock Assessment Report (SAR) gives a best estimate of abundance for fin whales in the western North Atlantic of 3,522 (CV = 0.27). However, this estimate must be considered extremely conservative in view of the incomplete coverage of the known habitat of the stock and the uncertainties regarding population structure and whale movements between surveyed and unsurveyed areas (Waring et al. 2013). The minimum population estimate for the western North Atlantic fin whale is 2,817 (Waring et al. 2013). However, there are insufficient data at this time to determine population trends for the fin whale (Waring et al. 2013). The PBR for the western North Atlantic fin whale is 5.6. 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.

Like right whales and humpback whales, anthropogenic mortality of fin whales includes entanglement in commercial fishing gear and ship strikes. Of 18 fin whale mortality records collected between 1991 and 1995, four were associated with vessel interactions, although the primary cause of mortality was not known. From 1996 to July 2001, there were nine observed fin whale entanglements and at least four ship strikes. Experts believe that fin whales are struck by large vessels more frequently than any other cetacean (Laist et al. 2001).

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.

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; 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. 2009).

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 6 and 9 months, when the whales are on the summer feeding grounds (NMFS 1998a). Sei whales reach sexual maturity between 5 and 15 years of age. The calving interval is believed to be 2 to 3 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).

The abundance estimate of 357 sei whales (CV=0.52), was derived from a line-transect sighting survey conducted during 12 June to 4 August 2004 by a ship and plane that surveyed 10,761 km of trackline in waters north of Maryland (38ºN)(Waring et al. 2013). This estimate is best available for the Nova Scotia stock of sei whales, but must be considered extremely conservative because all of the known range of this stock was not surveyed, and because of uncertainties regarding population structure and whale movements between surveyed and unsurveyed areas. An abundance estimate of 207 (CV=0.62) sei whales was obtained from an aerial survey conducted in August 2006 which covered 10,676 km of trackline in the region from the 2000-m depth contour on the southern edge of Georges Bank to the upper Bay of Fundy and to the entrance of the Gulf of St. Lawrence (Waring et al. 2013). An abundance estimate of 357 (CV=0.52) sei whales was generated from a shipboard and aerial surveyconducted 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 from 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 (Waring et al. 2013). The minimum population estimate for this sei whale stock is 236 (Waring et al. 2013). Current and maximum net productivity rates are unknown for this stock. A population trend analysis has not been done for this species (Waring et al. 2013). The PBR for the Nova Scotia stock sei whale is 0.5 animals. Entanglement is not known to greatly affect this species in the U.S. Atlantic, possibly because sei whales typically inhabit waters farther offshore than most commercial fishing operations, or perhaps because any entanglements that do occur in offshore areas are less likely to be observed.

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.

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. 2009). 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.

Minke whales reach sexual maturity between 5 and 7 years of age (NAMMCO 1998). Most mature females become pregnant every year. Mating occurs in the late winter; after a gestation period of 10 months, calves are born in the lower latitudes of the range (Martin et al. 1990). Multiple population estimates are available for portions of minke whale habitat, but the recent abundance estimate for this stock is 20,741 (CV=0.30) minke whales. This is the estimate derived from the Canadian Trans-North Atlantic Sighting Survey (TNASS) in July-August 2007 and is considered best because, while it did not cover any U.S. waters, the survey covered more of the minke whale range than the other surveys reported here (Waring et al, 2013). During 2006 to 2010, the average annual minimum detected human-caused mortality and serious injury was 5.0 minke whales per year (2.6 (0.46) minke whales per year from observed U.S. fisheries, 1.0 minke whales per year (unknown CV) from U.S. fisheries using strandings and entanglement data, 1.0 (unknown CV) from Canadian fisheries using strandings and entanglement data, and 0.4 per year from U.S. ship strikes (Waring et al. 2013). PBR for this stock is 162 animals per year (Waring et al. 2013).

Based on Waring et al. (2009), 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.
The majority of documented minke whale entanglements reported by Waring et al. (2009) resulted in the death of the animal. Waring et al. (2009) report the mouth and tail stock/fluke regions to be a common entanglement location for those minke whales that were seriously injured or killed.

Harbor Seal
The harbor seal (*Phoca vitulina*) is not listed as endangered or threatened under the ESA, although the species is protected under the MMPA. Although PBR cannot be determined for this stock, the level of human-caused mortality and serious injury in the U.S. Atlantic EEZ is believed to be low relative to the total stock size; therefore, this is not a strategic stock.

The harbor seal is found in all nearshore waters of the Atlantic Ocean above 30 degrees latitude (Waring et al. 2009). 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. 2009). 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 in waters north of the New Hampshire/Maine border, although breeding occurred as far south as Cape Cod in the early part of the twentieth century. 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 8 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).

Incidental takes of harbor seals have been recorded in groundfish gillnet, bottom trawl, herring purse seine, halibut tub trawl, and lobster fisheries (Gilbert and Wynne 1985 and 1987; Waring et al. 2009). Mortalities involving the herring purse seine, halibut tub trawl, and lobster fisheries are reportedly rare. The Northeast multispecies sink gillnet fishery is responsible for the majority of harbor seal fishery takes on the East Coast of the United States. This fishery is located in the Gulf of Maine and in Southern New England. There were 658 harbor seal mortalities observed in the Northeast sink gillnet fishery between 1990 and 2010, excluding 3 animals taken in the 1994 pinger experiment (NMFS unpublished data) but including one animal taken in a hanging ratio experiment. Williams (1999) aged 261 harbor seals caught in this fishery from 1991 to 1997, and 93 percent were juveniles (i.e.. less than 4 years old). Estimated annual mortalities (CV in parentheses) from this fishery were 332 (0.33) in 1998, 1,446 (0.34) in 1999, 917 (0.43) in 2000, 1,471 (0.38) in 2001, 787 (0.32) in 2002, 542 (0.28) in 2003, 792 (0.34) in 2004, 719 (0.20) in 2005, 87 (0.58) in 2006, 92 in 2007, 243 (0.41) in 2008, 516 (0.28) in 2009, and 461 (0.30) in 2010.

No harbor seals were taken in observed Mid-Atlantic coastal gillnet fishery trips during 1993–1997, or 1999–2003. Two harbor seals were observed taken in 1998, 1 in 2004, 2 in 2005, 1 in 2006, 0 in 2007, 2 in 2008, 2 in 2009, and 6 in 2010. Using the observed and experimental takes, the estimated annual mortality (CV in parentheses) attributed to this fishery was 0 in 1995–1997 and 1999–2003, 11 in 1998 (0.77), 15 (0.86) in 2004, 63 (0.67) in 2005, 26 (0.98) in 2006, 0 in 2007, 88 (0.74) in 2008, 47 (0.68) in 2009, and 89 (0.41) in 2010. Average annual estimated fishery-related mortality attributable to this fishery during 2006–2010 was 50 (CV =0.34) harbor seals.

One harbor seal mortality was observed in the Northeast bottom trawl fishery in 2010. The estimated annual fishery-related mortality and serious injury attributable to this fishery has not been generated. Until this bycatch estimate can be developed, the average annual fishery-related mortality and serious injury for 2006–2010 is calculated as 0.2 animals (1 animal every 5 years). Additional sources of mortality for harbor seals include boat strikes, entrainment in power plant intakes (12-20 per year), oil contamination, shooting (around salmon aquaculture sites and fixed fishing gear), storms, abandonment by the mother, and disease (Katona et al. 1993).

Loggerhead Sea Turtle

The loggerhead sea turtle (Caretta caretta) was listed as threatened under the ESA on July 28, 1978, but is considered endangered by the International World Conservation Union (IUCN). Loggerheads are circumglobal, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters. The loggerhead sea turtle is the most abundant species of sea turtle in U.S. waters. They commonly occur in the U.S. 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 appear to concentrate in nearshore and southerly areas influenced by warmer Gulf Stream waters off North Carolina. Summer nesting usually occurs in the lower latitudes.

Genetic analyses conducted since the last 5-year review indicate there are five demographically independent groups in the Western North Atlantic, corresponding to nesting beaches found in Florida and Mexico. The primary metric used to evaluate trends in global loggerhead populations are counts of beach nests, many of which occur in areas outside U.S. waters. Given that loggerhead nest counts have generally declined during the period 1989-2005, NMFS & USFWS (2007b) concluded that loggerhead turtles should not be delisted or reclassified and should remain designated as threatened under the ESA. However, the review also concluded that available information indicates that an analysis and review of the species should be conducted in the future to determine if application of the Distinct Population Segment policy under the ESA is warranted for the species. Additionally, the Center for Biological Diversity and the Turtle Island Restoration Network filed a petition to reclassify loggerhead turtles in the North Pacific Ocean as a distinct population segment (DPS) with endangered status and designate critical habitat under the ESA (72 FR 64585; November 16, 2007). Critical habitat for loggerhead sea turtles was proposed in July 2013 (78 FR 43005). While this petition is geared toward the North Pacific, the possibility exists that it could affect status in other areas. NMFS concluded that the petition presented substantial scientific information such that the petition action may be warranted, and has since published a final rule (76 FR 58868; September 22, 2011) after requesting comment, available at: http://www.nmfs.noaa.gov/pr/pdfs/fr/fr76-58868.pdf. In this final rule, we determined that determined that the loggerhead sea turtle is composed of nine DPSs that constitute ‘‘species’’ that may be listed as threatened or endangered under the ESA. We listed four DPSs as threatened and five as endangered under the ESA. We will propose to designate critical habitat for the two loggerhead sea turtle DPSs occurring within the United States in a future rulemaking.

The Second Revision of the Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea turtle (Caretta caretta) was published in December 2008 (NMFS and USFWS 2008). The Loggerhead Recovery Team conducted a detailed analysis of threats to assist in prioritizing recovery actions. The highest priority threats, adjusted for relative reproductive values for each life stage/ecosystem, include bottom trawl, pelagic longline, demersal longline, and demersal large mesh gillnet fisheries; legal and illegal harvest; vessel strikes; beach armoring; beach erosion; marine debris ingestion; oil pollution; light pollution; and predation by native and exotic species.

Currently, there are no population estimates for loggerhead sea turtles in any of the ocean basins in which they occur. However, a recent loggerhead assessment prepared by NMFS states that the loggerhead adult female population in the western North Atlantic ranges from 20,000 to 40,000 or more, with a large range of uncertainty in total population size (SEFSC 2009).
As part of the Atlantic Marine Assessment Program for Protected Species , line transect aerial abundance surveys and turtle telemetry studies were conducted along the Atlantic Coast in the summer of 2010. The Atlantic Marine Assessment Program for Protected Species is a multi-agency initiative to assess marine mammal, sea turtle, and seabird abundance and distribution in the Atlantic. Aerial surveys were conducted from Cape Canaveral, Florida to the Gulf of St. Lawrence, Canada. Satellite tags on juvenile loggerhead turtles were deployed in two locations: off the coasts of northern Florida to South Carolina (n=30) and off the New Jersey and Delaware coasts (n=14). As presented in NMFS NEFSC (2011), the 2010 survey found a preliminary total surface abundance estimate within the entire study area of about 60,000 loggerhead turtles (CV=0.13) or 85,000 if a portion of unidentified hardshelled sea turtles were included (CV=0.10). Surfacing times were generated from the satellite tag data collected during the aerial survey period, resulting in a 7 percent (5 to -11 percent inter-quartile range) median surface time in the South Atlantic area and a 67 percent (57 to 77 percent inter-quartile range) median surface time to the north. The calculated preliminary regional abundance estimate is about 588,000 loggerhead turtles along the U.S. Atlantic coast, with an inter-quartile range of 382,000 to 817,000 loggerhead turtles (NMFS NEFSC 2011). The estimate increases to approximately 801,000, with an inter-quartile range of 521,000-1,111,000 loggerhead turtles when based on known loggerhead turtles and a portion of unidentified turtle sightings. The density of loggerheads was generally lower in the north than the south; based on number of turtle groups detected, 64 percent were seen south of Cape Hatteras, North Carolina, 30 percent in the southern Mid-Atlantic Bight, and 6 percent in the northern Mid-Atlantic Bight. Although they have been seen farther north in previous studies (e.g., Shoop and Kenney 1992), no loggerheads were observed during the aerial surveys conducted in the summer of 2010 in the more northern zone encompassing Georges Bank, Cape Cod Bay, and the Gulf of Maine. These estimates of loggerhead abundance over the U.S. Atlantic continental shelf are considered very preliminary.

A more thorough analysis will be completed pending the results of further studies related to improving estimates of regional and seasonal variation in loggerhead surface time (by increasing the sample size and geographical area of tagging) and other information needed to improve the biases inherent in aerial surveys of sea turtles (e.g., research on depth of detection and species misidentification rate). This survey effort represents the most comprehensive assessment of sea turtle abundance and distribution in many years. Additional aerial surveys and research to improve the abundance estimates are anticipated in 2011-2014, depending on available funds.

Anthropogenic factors that impact hatchlings and adult females on land, or the success of nesting and hatching include: beach erosion, beach armoring, and nourishment; artificial lighting; beach cleaning; beach pollution; increased human presence; recreational beach equipment; vehicular and pedestrian traffic; coastal development/construction; exotic dune and beach vegetation; removal of native vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs, and an increased presence of native species (e.g., raccoons, armadillos, and opossums) which raid nests and feed on turtle eggs (NMFS and USFWS 2007a, 2008). Loggerheads are affected by a completely different set of anthropogenic threats in the marine environment. These include oil and gas exploration, coastal development, and transportation; marine pollution; underwater explosions; hopper dredging; offshore artificial lighting; power plant entrainment and/or impingement; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; poaching; and fishery interactions. A 1990 National Research Council (NRC) report concluded that for juveniles, sub-adults, and breeders in coastal waters, the most important source of anthropogenic caused mortality in U.S. Atlantic waters was fishery interactions.

Loggerhead turtles are captured and injured or killed in interactions with a variety of fishing gear, including shrimp trawl, gillnet, longline, dredge, pound net, pot/trap, and hook and line fisheries. The average annual bycatch estimate of loggerhead sea turtles from 2000-2004 (based on the rate from 1994-2004) over FMP groups identified by the Greater Altantic Regional Fisheries Office (GARFO) was 411 turtles, with an additional 77 estimated bycatch events unassigned.

There have been three entanglements of loggerhead turtles reported in lobster gear. One loggerhead turtle was reported dead in New Jersey in July 1983; one loggerhead turtle was reported as released alive in New York in August 1987; and one loggerhead turtle was reported dead, entangled by the right flipper, in a pot line located in New Jersey in July of 1991. In addition, the Sea Turtle Stranding and Salvage Network (STSSN) database reveals that from 1980 to 2000, there was one loggerhead turtle alive and entangled in lobster gear in Massachusetts (SEFSC STSSN database). More recent data (2002-2008), has recorded confirmed reports of eight loggerhead entanglements in vertical line gear. Four of those entanglements were confirmed to be caused by whelk pots, and one confirmed to be from crab fisheries. Gear from three of the loggerhead entanglements was never identified.

Leatherback Sea Turtle

Leatherback sea turtles (*Dermochelys coriacea*) were listed as endangered under the ESA on June 2, 1970. Leatherback turtles are the largest of the living turtles and are distinct from other sea turtle species because of its rubber-like, flexible carapace. Like the loggerhead, the leatherback is also circumglobal. In the northwestern Atlantic, the leatherback turtle's range extends from Cape Sable, 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 the middle of Florida.

The leatherback sea turtle 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). However, the most recent population size estimate for the North Atlantic alone is a range of 34,000 to 94,000 adult leatherback turtles (Turtle Expert Working Group, TEWG 2007). Thus, there is substantial uncertainty with respect to global population estimates of leatherback sea turtles.

Seven leatherback sea turtle populations or groups of populations were identified by the Leatherback TEWG as occurring within the Atlantic. These are: Florida, North Caribbean, Western Caribbean, Southern Caribbean, West Africa, South Africa, and Brazil (TEWG 2007). In the U.S., the Florida Statewide Nesting Beach Survey program has documented an increase in leatherback nesting numbers from 98 nests in 1988 to between 800 and 900 nests in the early 2000s (NMFS and USFWS 2007b). 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). The TEWG reports an increasing or stable trend for all of the seven populations or groups of populations with the exception of the Western Caribbean and West Africa.

Poaching is not known to be a problem for U.S. nesting populations. However, numerous fisheries that occur in both U.S. state and Federal waters are known to negatively impact juvenile and adult leatherback sea turtles. Leatherbacks have been documented interacting with longline, trap/pot, trawl, and gillnet fishing gear. Of the Atlantic sea turtle species, leatherbacks seem to be the most vulnerable to entanglement in fishing gear, particularly with trap/pot fishing gear. This susceptibility may be the result of their body type (large size, long pectoral flippers, and lack of a hard shell), and their attraction to gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface, and perhaps to the lightsticks used to attract target species in longline fisheries. Leatherbacks entangled in fishing gear generally have a reduced ability to feed, dive, surface to breathe, or perform any other behavior essential to survival (Balazs 1985). In addition to drowning from forced submergence, they may be more susceptible to boat strikes if forced to remain at the surface, and entangling lines can constrict blood flow resulting in tissue necrosis. The American lobster fishery has been verified as the gear/fishery involved in 29 leatherback entanglements in the Northeast Region between 2002-2008 (STDN 2009). All of the 29 entanglements involved vertical lines of the lobster gear. Other major threats facing the leatherback sea turtle in the Atlantic Ocean include marine pollution (including ingesting marine debris), development and erosion of nesting beach sites, and vessel strikes.

4.3.2 Species Not Likely to Be Affected

Several ESA-listed species, while their distribution overlaps to some degree with the management unit of the lobster trap/pot fishery, are not likely to be affected by the fishery since the fishery does not typically operate in areas where these species occur or the gear used is not known to affect the species. These species include Atlantic sturgeon, shortnose sturgeon, the Gulf of Maine Distinct Population of Atlantic Salmon, hawksbill sea turtles, green sea turtles, Kemp's ridley sea turtles, blue whales, and sperm whales.

Atlantic Sturgeon

A status review for Atlantic sturgeon was completed in 2007 which indicated that five distinct population segments (DPS) of Atlantic sturgeon exist in the United States (ASSRT 2007). On October 6, 2010, NMFS proposed listing these five DPSs of Atlantic sturgeon along the U.S. East Coast as either threatened or endangered species (75 FR 61872 and 75 FR 61904). Final listing rules were published on February 6th, 2012 (77 FR 5880 and 75 FR 5914). The GOM DPS of Atlantic sturgeon has been listed as threatened, and the New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs of Atlantic sturgeon have been listed as endangered. Atlantic sturgeon from any of the five DPSs could occur in areas where the American lobster fishery operates.

Atlantic sturgeon is an anadromous species that spawns in relatively low salinity, river environments, but spends most of its life in the marine and estuarine environments from Labrador, Canada to the Saint Johns River, Florida (Holland and Yelverton 1973, Dovel and Berggen 1983, Waldman et al. 1996, Kynard and Horgan 2002, Dadswell 2006, Atlantic Sturgeon Status Review Team (ASSRT) 2007). Tracking and tagging studies have shown that sub-adult and adult Atlantic sturgeon that originate from different rivers mix within the marine environment, utilizing ocean and estuarine waters for life functions such as foraging and overwintering (Stein et al. 2004a, Dadswell 2006, ASSRT 2007, Laney et al. 2007, Dunton et al. 2010).

Fishery-dependent data as well as fishery-independent data demonstrate that Atlantic sturgeon use relatively shallow inshore areas of the continental shelf; primarily waters less than 50 m deep (Stein et al. 2004b, ASMFC TC 2007, Dunton et al. 2010). The data also suggest regional differences in Atlantic sturgeon depth distribution with sturgeon observed in waters primarily less than 20 m in the Mid-Atlantic Bight and in deeper waters in the Gulf of Maine (Stein et al. 2004b, ASMFC TC 2007, Dunton et al. 2010). Information on population sizes for each Atlantic sturgeon DPS is very limited. Based on the best available information, NMFS has concluded that bycatch, vessel strikes, water quality and water availability, dams, lack of regulatory mechanisms for protecting the fish, and dredging are the most significant threats to Atlantic sturgeon.

Since the ESA listing of Atlantic sturgeon, the NEFSC has completed new population estimates using data from the Northeast Area Monitoring and Assessment (NEAMAP) survey (Kocik et al. 2013). Atlantic sturgeon are frequently sampled during the NEAMAP survey. NEAMAP has been conducting trawl surveys from Cape Cod, Massachusetts to Cape Hatteras, North Carolina in nearshore waters at depths up to 18.3 meters (60 feet) during the fall since 2007 and depths up to 36.6 meters (120 feet) during the spring since 2008 using a spatially stratified random design with a total of 35 strata and 150 stations per survey. The information from this survey can be directly used to calculate minimum swept area population estimates during the fall, which range from 6,980 to 42,160 with coefficients of variation between 0.02 and 0.57 and during the spring, which range from 25,540 to 52,990 with coefficients of variation between 0.27 and 0.65. These are considered minimum estimates because the calculation makes the unlikely assumption that the gear will capture 100% of the sturgeon in the water column along the tow path. Efficiencies less than 100% will result in estimates greater than the minimum. The true efficiency depends on many things including the availability of the species to the survey and the behavior of the species with respect to the gear. True efficiencies much less than 100% are common for most

species. The NEFSC's analysis also calculated estimates based on an assumption of 50% efficiency, which reasonably accounts for the robust, yet not complete sampling of the Atlantic sturgeon, oceanic temporal and spatial ranges, and the documented high rates of encounter with NEAMAP survey gear and Atlantic sturgeon. For this analysis, NMFS has determined that the best available scientific information for the status of Atlantic sturgeon at this time are the population estimates derived from NEAMAP swept area biomass (Kocik et al. 2013) because the estimates are derived directly from empirical data with few assumptions. NMFS has determined that using the median value of the 50% efficiency as the best estimate of the Atlantic sturgeon ocean population is most appropriate at this time. This results in a total population size estimate of 67,776 fish, which is considerably higher than the estimates that were available at the time of listing. This estimate is the best available estimate of Atlantic sturgeon abundance at the time of this analysis. The Commission has begun work on a benchmark assessment for Atlantic sturgeon to be completed in 2014, which would be expected to provide an updated population estimate and stock status. The Commission is currently collecting public submissions of data for use in the assessment: http://www.asmfc.org/uploads/file/pr20AtlSturgeonStockAssmtPrep.pdf.

Atlantic sturgeon from any of the five DPSs could occur in areas where the American lobster fishery operates, however, the species has not been captured in gear targeting American lobster (Stein et al. 2004a, ASMFC 2007, NMFS 2012), thus, this species is not considered further in this EA.

Shortnose Sturgeon

Shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. They can be found in rivers along the western Atlantic coast from St. Johns River, Florida (possibly extirpated from this system), to the Saint John River in New Brunswick, Canada. The species is anadromous in the southern portion of its range (i.e., south of Chesapeake Bay), while some northern populations are amphidromous (NMFS 1998b). Since the lobster trap/pot fishery does not operate in or near the rivers where concentrations of shortnose sturgeon are most likely found, it is highly unlikely that the lobster trap/pot fishery will affect shortnose sturgeon.

Atlantic Salmon

The wild populations of Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River are listed as endangered under the ESA. Juvenile salmon in New England rivers typically migrate to sea in May after a 2 to 3 year period of development in freshwater streams, and remain at sea for 2 winter seasons before returning to their U.S. natal rivers to spawn. Results from a 2001-2003 post-smolt trawl survey in Penobscot Bay and the nearshore waters of the Gulf of Maine indicate that Atlantic salmon post-smolts are prevalent in the upper water column throughout this area in mid to late May. Therefore, commercial fisheries deploying small mesh active gear (pelagic trawls and purse seines within 10-m of the surface) in nearshore waters of the Gulf of Maine may have the potential to incidentally take smolts. However, it is highly unlikely that the lobster trap/pot fishery will affect the Gulf of Maine DPS of Atlantic salmon given that operation of the lobster trap/pot fishery does not occur in or near the rivers where concentrations of Atlantic salmon are likely to be found and lobster trap/pot gear operates in the ocean at or near the bottom rather than near the surface.

Blue Whale
Blue whales do not regularly occur in waters of the U.S. Exclusive Economic Zone (EEZ) (Waring et al. 2002). In the North Atlantic, blue whales are most frequently sighted in the St. Lawrence from April to January (Sears 2002). No blue whales were observed during the Cetacean and Turtle Assessment Program (CETAP) surveys of the mid- and north Atlantic areas of the outer continental shelf (CETAP 1982). Calving for the species occurs in low latitude waters outside of the area where the lobster trap/pot fishery operates. Blue whales feed on euphausiids (krill) (Sears 2002) which are too small to be captured in lobster fishing gear. Given that the species is unlikely to occur in areas where the lobster fishery operates, and given that the operation of the lobster fishery will not affect the availability of blue whale prey or areas where calving and nursing of young occurs, the lobster fishery is not expected to affect blue whales.

Sperm Whale
Sperm whales regularly occur in waters of the U.S. Exclusive Economic Zone (EEZ). However, the distribution of the sperm whale in the U.S. EEZ occurs on the continental shelf edge, over the continental slope, and into mid-ocean regions (Waring et al. 2007). In contrast, the American lobster fishery operates in continental shelf waters. The average depth of sperm whale sightings observed during the CETAP surveys was 1,792m (CETAP 1982). Female sperm whales and young males almost always inhabit waters deeper than 1000m and at latitudes less than 40° N (Whitehead 2002). Sperm whales feed on larger organisms that inhabit the deeper ocean regions (Whitehead 2002). Calving for the species occurs in low latitude waters outside of the area where the American lobster fishery operates. Given that sperm whales are unlikely to occur in areas (based on water depth) where the American lobster fishery operates, and given that the operation of the American lobster fishery will not affect the availability of sperm whale prey or areas where calving and nursing of young occurs, the continued operation of the American lobster fishery is not likely to affect sperm whales.

Hawksbill Sea Turtle
The hawksbill turtle is uncommon in the waters of the continental U.S. Hawksbills prefer coral reefs, such as those found in the Caribbean and Central America. Hawksbills feed primarily on a wide variety of sponges, but also consume bryozoans, coelenterates, and mollusks. The Culebra Archipelago of Puerto Rico contains especially important foraging habitat for hawksbills. Nesting areas in the western North Atlantic include Puerto Rico and the Virgin Islands. There are accounts of hawksbills in south Florida and individuals have been sighted along the east coast as far north as Massachusetts; however, east coast sightings north of Florida are rare (NMFS 2009). Since operation of the lobster trap/pot fishery would not occur in waters that are typically used by hawksbill sea turtles, it is highly unlikely that its operations would affect this turtle species.

Kemp's Ridley Sea Turtle
The Kemp's ridley is one of the least abundant of the world's sea turtle species. In contrast to loggerhead, leatherback, and green sea turtles, which are found in multiple oceans of the world, Kemp's ridleys typically occur only in the Gulf of Mexico and the northwestern Atlantic Ocean (USFWS and NMFS 1992). Foraging areas documented along the U.S. Atlantic coast include Charleston Harbor, Pamlico Sound (Epperly et al. 1995), Chesapeake Bay (Musick and Limpus 1997), Delaware Bay, and Long Island Sound (Morreale and Standora 1993). Adult Kemp's

ridleys are found in the coastal regions of the Gulf of Mexico and southeastern U.S., but are typically rare in the northeastern U.S. waters of the Atlantic (TEWG 2000).

Like other turtle species, the severe decline in the Kemp's ridley population appears to have been heavily influenced by a combination of exploitation of eggs and impacts from fishery interactions. Currently, anthropogenic impacts to the Kemp's ridley population are similar to those discussed above for other sea turtle species. Takes of Kemp's ridley turtles have been recorded by sea sampling coverage in the Northeast otter trawl fishery, pelagic longline fishery, and southeast shrimp and summer flounder bottom trawl fisheries. There is no documentation of Kemp's ridley sea turtles being incidentally taken by the lobster trap/pot fishery, therefore it is unlikely that this operation would affect this turtle species.

Green Sea Turtle

In the western Atlantic, green sea turtles range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean (Wynne and Schwartz 1999). Green sea turtles occur seasonally in Mid-Atlantic and Northeast waters such as Chesapeake Bay and Long Island Sound (Musick and Limpus 1997; Morreale and Standora 1998; Morreale et al. 2005), which serve as foraging and developmental habitats. As with the other sea turtle species, incidental fishery mortality accounts for a large proportion of annual anthropogenic mortality outside the nesting beaches. Sea sampling coverage in the pelagic driftnet, pelagic longline, southeast shrimp trawl, and summer flounder bottom trawl fisheries has recorded takes of green sea turtles. There is no documentation of green sea turtles being incidentally taken by the lobster trap/pot fishery, therefore this species is unlikely to be affected.

Atlantic Salmon Critical Habitat

Coincident with the June 19, 2009 ESA listing, NMFS designated critical habitat for the endangered GOM DPS of Atlantic salmon (74 FR 29300; June 19, 2009) (Figure 3). Designation of critical habitat is focused on the known primary constituent elements within the occupied areas of a listed species that are deemed essential to the conservation of the species. Within the GOM DPS, the primary constituent elements for Atlantic salmon are: 1) sites for spawning and rearing, and 2) sites for migration (excluding marine migration; although successful marine migration is essential to Atlantic salmon). NMFS was not able to identify the essential features of marine migration and feeding habitat or their specific locations at the time that the critical habitat was designated. While there is potential for lobster fishing activity to occur within estuaries in the GOM DPS of Atlantic Salmon, the placement of lobster traps and trawls is expected to allow adequate passage for migrating salmon. Likewise, the associated fishing activities (i.e. hauling gear and vessel movements) are not expected to alter water chemistry or physical attributes to levels that would affect migration patterns of smolts or adult salmon.

7.3. Potential Impacts to Atlantic Coastal State and Interstate Fisheries

Regulations under all three take reduction plans for Atlantic large whales (which includes humpback whales), harbor porpoises, and bottlenose dolphins have the potential to impact Jonah crab fisheries.

8. REFERENCES

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9.
10. TABLES ANS FIGURES

Table 1. Jonah crab landings from 1990-2013 by state in pounds, ACCSP May 2015. *Landings have been removed for confidential purposes, totals do not include confidential data.

Year	CT	DE	MA	MD	ME	NC	NH	NJ	NY	RI	VA	Total
1990			1,264,321	6,573	403,843			18,845	480	882,843	13,044	2,589,949
1991			979,250	7,209	194,780			38,040		976,744	2,046	2,198,069
1992			1,487,991	5,448	34,610			37,833	1,040	1,067,826	28	2,634,776
1993		2,000	1,312,751	5,725	50,281			18,548	10,459	1,028,322	64	2,428,150
1994		400	1,294,893	*	63,844		*	22,431	249,150	1,059,321		2,695,421
1995	10		1,048,824	*	*			22,101	39,074	731,518	*	1,905,446
1996	9		1,202,790	1,028	131,260			26,253	331,467	958,031		2,650,838
1997	267		2,693,851	*	169,233		*	20,700	120,069	534,319	*	4,367,857
1998	535		1,118,194	490	*		*	76,792	115,261	843,575	*	2,767,228
1999	1,022		1,739,112	2,925	52,356		*	14,037	757	1,396,757	*	3,414,305
2000	16,806		1,358,571	*	*	*	*	16,446	54,919	225,435	*	2,630,328
2001	6,244		1,507,268	33,210	*	*	*	18,668	111,845	5,535		4,046,509
2002	688		1,667,683	*	223,071		*	18,308	34,763	127,992		2,625,524
2003		*	1,530,595	*	1,279,228		*	22,698	62,426	308,681		3,216,152
2004	570		933,869	93	2,579,162		*	7,209	35,300	906,660		4,463,168
2005	328		3,663,582	*	2,717,849			29,254	11,160	754,594	*	7,180,766
2006	*		3,614,261	2,762	2,299,912			15,545	24,465	752,490	*	6,710,836
2007	*		4,118,477	8,720	2,062,084			80,062	202,898	2,065,799	*	8,538,345
2008	287		4,478,505	12,188	1,482,514		*	115,995	561,386	2,303,482	*	9,097,352
2009	*		4,869,605	11,657	1,103,629		*	38,460	510,642	1,618,121	*	8,624,254
2010	*		5,689,431	18,045	1,075,747	*	*	28,400	968,122	2,922,404		10,872,716
2011	*		5,379,792	92,401	1,096,592	*	*	26,286	69,440	2,540,337	*	9,273,632
2012	2,349		7,540,392	*	556,675		*	68,252	609	3,286,569	*	11,662,595
2013	51,462		10,095,401	*	378,340		344,551	7,803	*	4,397,734		15,912,923
2014	49,998		11,943,076	152,614	332,997	*	404,703	33,456	*	4,130,880	*	17,048,056

Table 2a.. Percent of Jonah crabs below various size thresholds from the Massachusetts Division of Marine Fisheries Jonah crab port sampling program. Percentages are from 6464 Jonah crabs that were measured from 2013-2015.

Carapace Width	%
< 139.7 mm (5.5")	34.8%
<133.4 mm (5.25")	13.6%
<127 mm (5")	2.5%
<120.7 mm (4.75")	0.4%
<114.3mm (4.5")	0.1%
<108 mm (4.25")	<0.1%
<101.6 mm (4")	<0.1%

Table 2b. Percentage of crab by sex in various size thresholds from the Maine Jonah crab sea sampling. This represents 7,131 crabs with a 637/6048, female/male breakdown, from 15 trips, mostly in 2003.

Maine 2003-4	4”	4.25”	4.5”	4.75”	5”
females under	27%	41%	65%	84%	96%
males under	3%	6%	11%	18%	29%

Table 2c. Percentage of crab by sex in various size threshold from the CFRF sea sampling data conducted by fishermen using commercial vented pots. Fishermen examined 8,392 crabs (962 females and 7428 males) with the results below.

	4"	4.25"	4.5"	4.75"	5"
Females % under	39%	50%	70%	93%	98%
Male % under	2%	4%	7%	15%	31%

Table 3. Percentage of Jonah crab and rock crab landed by gear type from 1990-2014, ACCSP May 2015.

Crab (Jonah and Rock) Percent Landings by Year and Gear

Year	Dredge	Hand Line	Long Line	Other	Pots & Traps	Trawls
1990	0.07%	0.00%	0.00%	0.00%	99.71%	0.22%
1991	0.00%	0.00%	0.00%	0.00%	99.65%	0.35%
1992	0.00%	0.00%	0.00%	0.00%	99.24%	0.76%
1993	0.09%	0.00%	0.00%	0.00%	99.54%	0.37%
1994	0.00%	0.00%	0.00%	0.01%	94.43%	5.56%
1995	0.00%	0.00%	0.00%	0.06%	99.38%	0.56%
1996	0.00%	0.00%	0.00%	8.00%	91.62%	0.38%
1997	0.00%	0.00%	0.00%	3.27%	96.16%	0.57%
1998	0.00%	0.01%	0.00%	1.21%	97.43%	1.36%
1999	0.00%	0.00%	0.00%	0.19%	99.45%	0.36%
2000	0.00%	0.01%	0.00%	0.31%	99.57%	0.11%
2001	0.00%	0.01%	0.00%	3.24%	94.19%	2.56%
2002	0.00%	0.00%	0.00%	0.49%	99.43%	0.08%
2003	0.00%	0.00%	0.00%	1.09%	98.75%	0.16%
2004	0.01%	0.09%	0.00%	8.46%	90.91%	0.53%
2005	0.00%	0.52%	1.55%	5.35%	92.57%	0.01%
2006	0.85%	0.04%	0.04%	7.16%	91.86%	0.05%
2007	1.29%	1.49%	0.01%	5.03%	92.04%	0.15%
2008	0.16%	0.22%	0.07%	5.91%	93.55%	0.09%
2009	1.93%	2.53%	0.14%	5.91%	89.26%	0.23%
2010	0.10%	0.31%	0.59%	3.07%	94.75%	1.18%
2011	1.11%	0.15%	0.00%	1.29%	96.50%	0.95%
2012	0.10%	0.07%	0.10%	3.84%	95.44%	0.45%
2013	0.07%	0.05%	0.13%	3.95%	95.04%	0.76%
2014	0.64%	0.08%	0.01%	3.46%	95.47%	0.34%

Table 4. Ex-vessel value for Jonah crab by state 1990-2013, ACCSP May 2015. *values have been removed for confidential purposes.

Year	CT	DE	MA	MD	ME	NC	NH	NJ	NY	RI	VA	Total
1990			$515,135	$10,765	$90,285			$17,928	$361	$338,163	$22,817	$995,454
1991			$389,357	$10,923	$50,298			$37,212		$384,420	$3,538	$875,748
1992			$600,014	$8,907	$12,713			$32,357	$780	$421,508	$42	$1,076,321
1993		$2,500	$524,833	$9,481	$21,322			$16,949	$8,373	$414,758	$106	$998,322
1994		$500	$556,133	*	$25,162		*	$21,347	$186,863	$447,406		$1,240,749
1995	$25		$648,966	*	*			$20,013	$19,542	$402,856	*	$1,122,410
1996	$4		$662,191	$1,483	$53,917			$23,834	$100,216	$444,389		$1,286,034
1997	$119		$1,317,345	*	$81,268		*	$19,841	$81,803	$244,111	*	$2,132,321
1998	$259		$557,411	$245	*		*	$46,172	$79,388	$376,603	*	$1,359,233
1999	$441		$902,110	$1,465	$21,806		*	$12,367	$450	$590,772	*	$1,650,665
2000	$6,879		$736,339	*	*	*	*	$14,460	$28,875	$97,037	*	$1,581,986
2001	$2,131		$885,463	$41,587	*	*	*	$19,970	$57,960	$2,875		$2,227,714
2002	$413		$946,640	*	$110,515		*	$21,978	$17,910	$63,988		$1,521,534
2003		*	$828,738	*	$570,553		*	$23,471	$36,172	$160,999		$1,631,568
2004	$254		$520,039	*	$1,021,543		*	$6,667	$18,265	$488,253		$2,055,491
2005	$164		$2,017,215	*	$1,098,086			$29,070	$5,310	$376,215	*	$3,536,382
2006	*		$1,792,316	$4,862	$861,116			$15,039	$12,144	$377,213	*	$3,063,353
2007	*		$2,393,498	$6,783	$790,494			$91,570	$89,470	$1,179,259	*	$4,551,219
2008	$118		$2,652,304	$11,654	$577,647		*	$110,645	$233,787	$1,353,852	*	$5,012,196
2009	*		$2,769,169	$13,498	$423,383		*	$48,442	$212,458	$887,638	*	$4,442,500
2010	*		$3,211,302	$24,006	$371,297	*	*	$33,077	$417,980	$1,524,750		$5,653,102
2011	*		$3,648,497	$71,794	$381,960	*	*	$32,479	$27,082	$1,499,969	*	$5,701,619
2012	$1,509		$5,573,252	*	$217,753		*	$57,137	$280	$2,297,708	*	$8,293,585
2013	$36,301		$9,111,004	*	$186,097		$238,406	$5,094	*	$3,179,936		$12,856,754
2014	$37,843		$9,385,514	$115,821	$99,618	*	$289,089	$20,379	*	$3,125,928	*	$13,074,447

Table 5. Crab regulations by state and agency.

	Trap Limit	Trap Restrictions	License Required	Minimum Size	Sex Restrictions	Closed Seasons	Comm Harvest Limit	Recreational License	Rec Harvest Limit	Rec Trap Limit	Landing license	Reporting requirements
Maine	Lobster Limit	Lobster Traps	Yes	None	None	Dec 30 - Apr 1 in rivers	200 pounds/day or 500 pounds/trip	No - hand harvest; Yes - traps	No	5 traps	yes (endorsement to the commercial fishing lic)	Yes- 100% dealer and 10% harester-tied to lobster reporting
New Hampshire	Lobster Limit (1,200)	Lobster Traps	Yes	None	None	No	No	Yes (if more than 12 taken)	No	No	Yes	yes 100 dealer
Massachusetts	Lobster Limit	Lobster Traps	Yes	None	No egg bearers	Jan 1 Apr 30 in state waters	No	No - hand harvest; Yes - traps/SCUBA	50 crabs	10 traps	Yes	Yes 100% dealer and harvestor
Rhode Island	No	No	Yes	None	None	No	No	No	No	No		
Connecticut		Lobster Traps	Yes-gen com lic	No	No	No	No	No	No	No		Yes
New York	No	Escape panel required	Yes-limited entry	No	No egg bearers	No	No	50/day	50/day	No	No	Yes 100% dealer and harvestor
New Jersey	No	Biodegradable panel required	Yes	3" - 4.5" (varies by hardness)	No egg bearers	Yes	No	Yes	One bushel/day	yes		
Maryland	No	No	Yes	No	No	No	No	No	No	No		
Virginia	No	No	No	None	No	No	No	No	No	No		
Federal - Lobster permit holder	Lobster Limit	Lobster Traps	No	None	No	No*	No	No	No	No	NA	Yes, Either VTR or state reporting depending on permits held.
Federal - Non-lobster permit holder	None	None	No	None	No	No*	No	No	No	No	NA	No, unless hold more restrictive permit that requires VTR.

*No crab specific closures, but there may be other various closures for fixed gear (i.e. ALTWRP, lobster)

Figure 1. Picture of a Jonah (left) and rock crab (right).

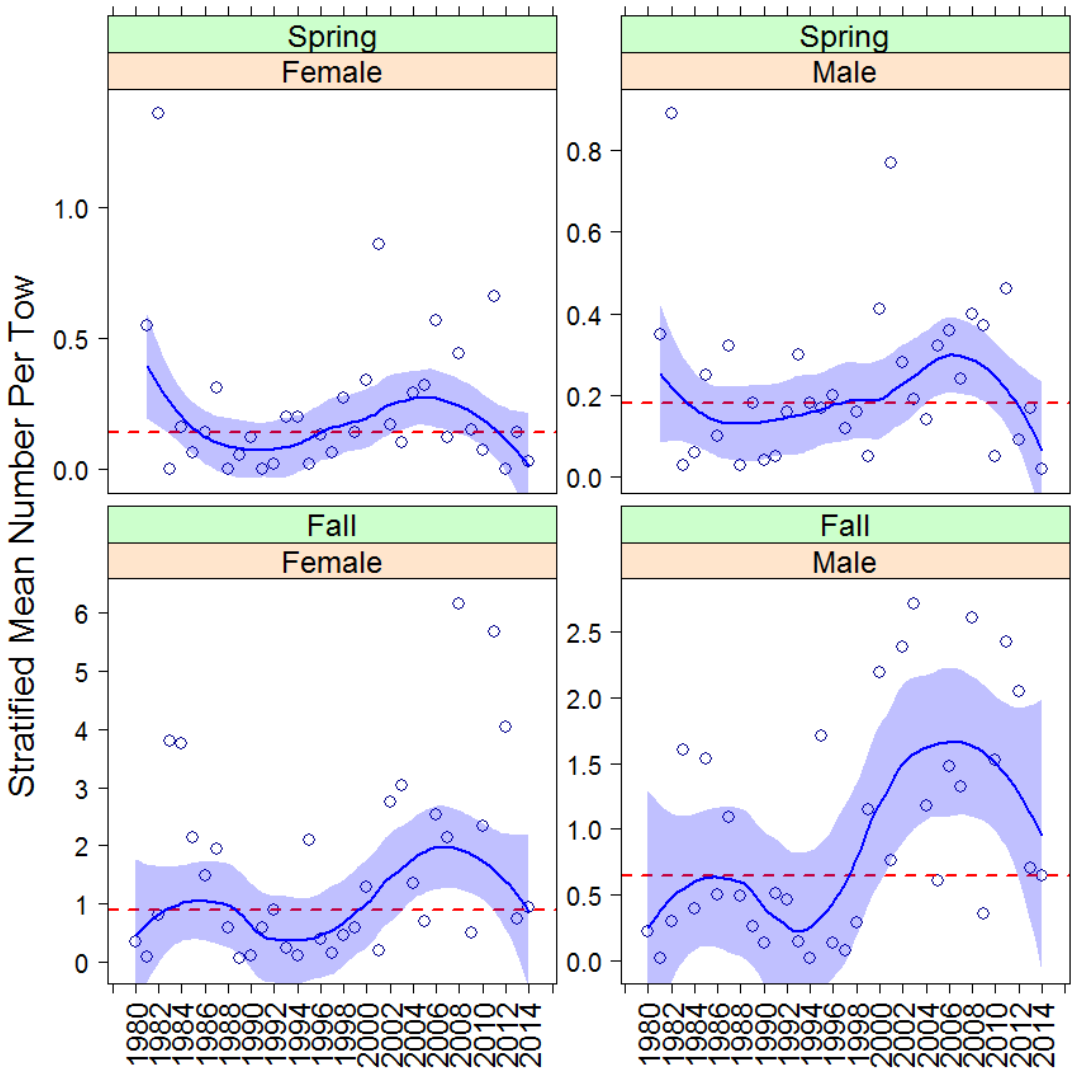

Figure 2. Jonah crab stratified mean number per tow from the Massachusetts Division of Marine Fisheries spring and fall trawl survey indices by sex in the Gulf of Maine. Red, dashed line is the time series median, blue line is a loess fit using family=symmetric and span=0.66. Blue shaded area is approximate 95% confidence interval for the fit.

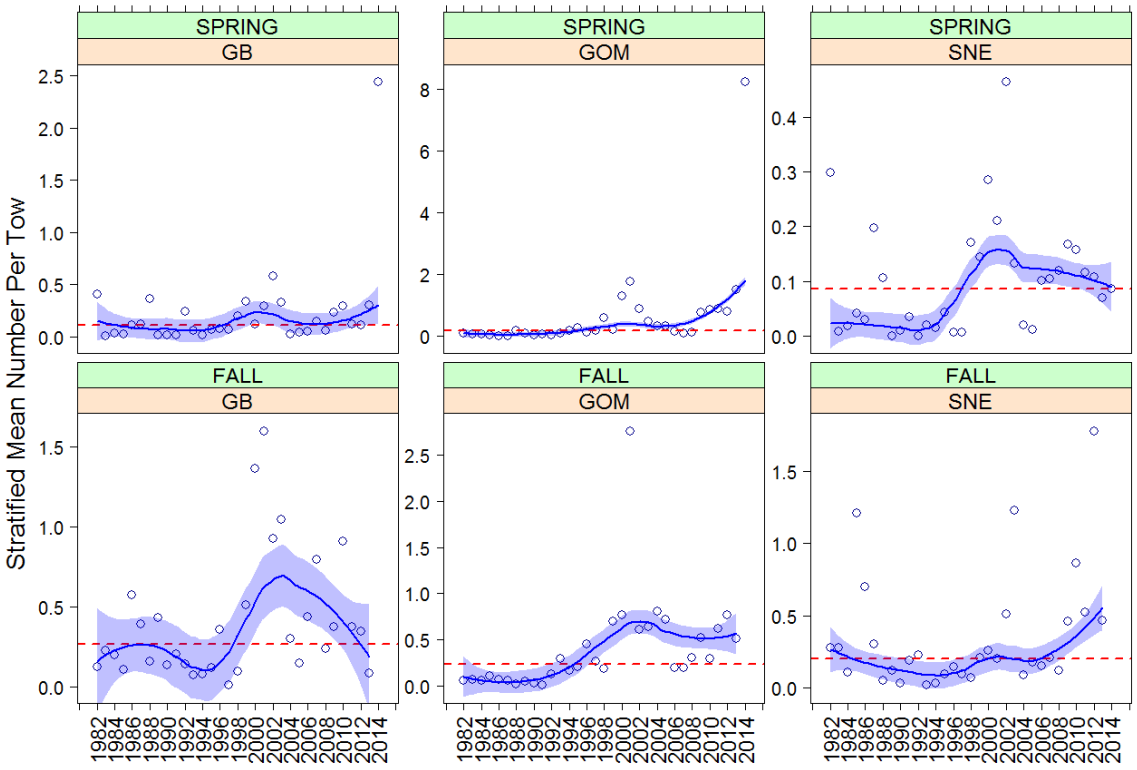

Figure 3. Jonah crab stratified mean number per tow from the National Marine Fisheries Service spring and fall trawl survey indices by sex and region (Georges Bank, Gulf of Maine, and Southern New England). Red, dashed line is the time series median, blue line is a loess fit using family=symmetric and span=0.66. Blue shaded area is approximate 95% confidence interval for the fit.

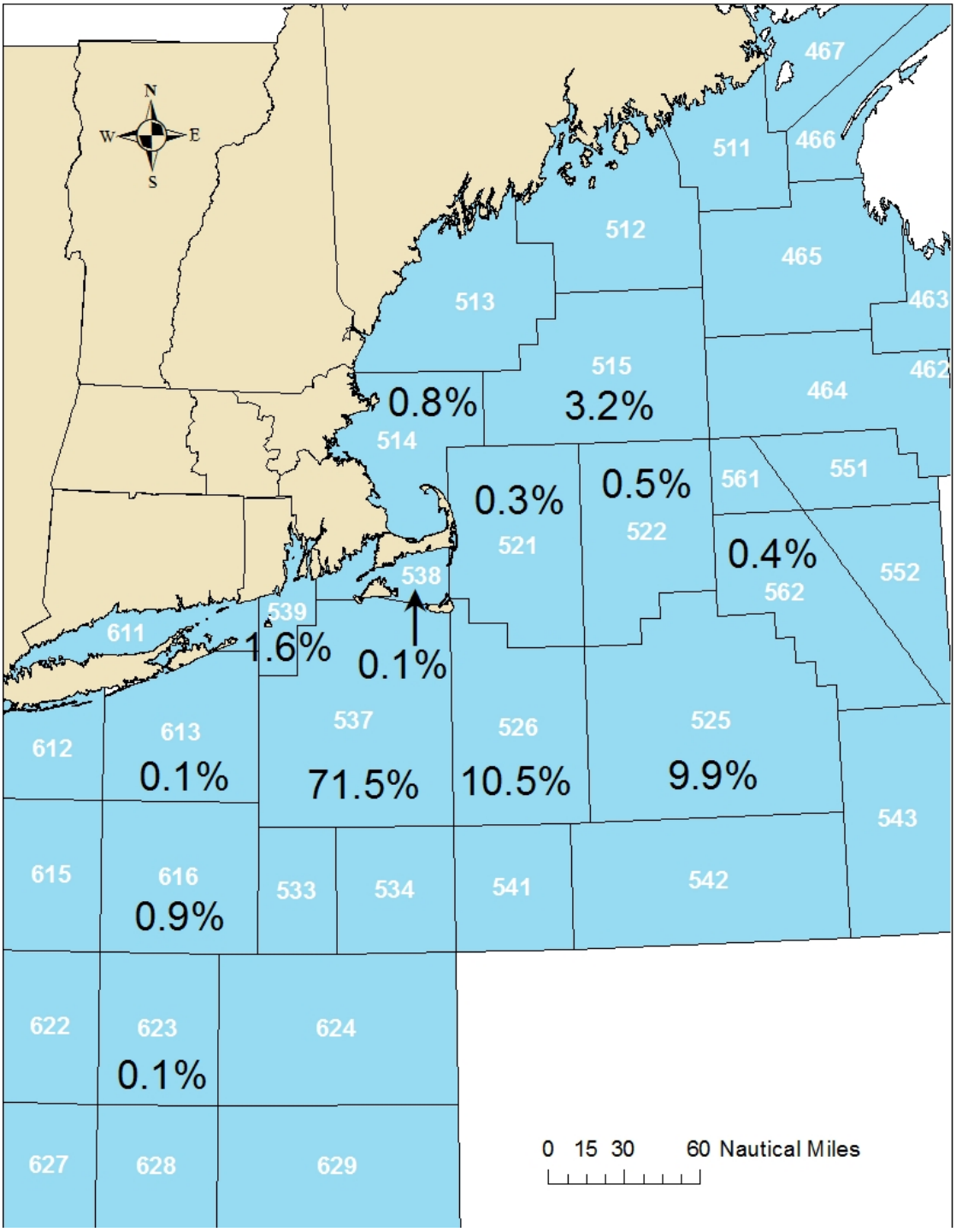

Figure 4. 2012-2014 Massachusetts and Rhode Island Jonah crab landings by NMFS statistical area. Areas with less than 0.1% of landings are omitted (data from NMFS VTR, and MA trip level reporting.

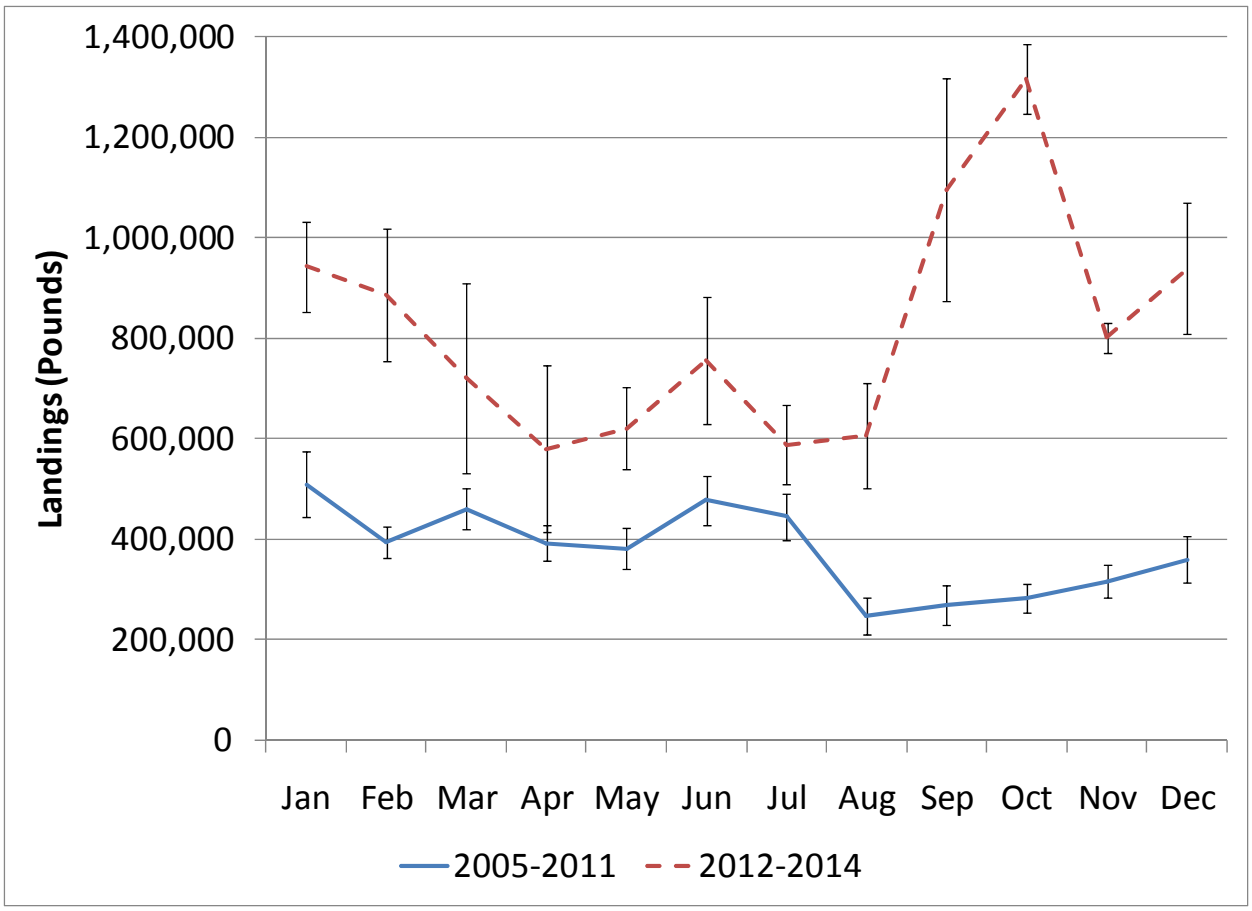

Figure 5. Massachusetts Jonah crab mean landings (±S.E.) by month (from SAFIS dealer reports).

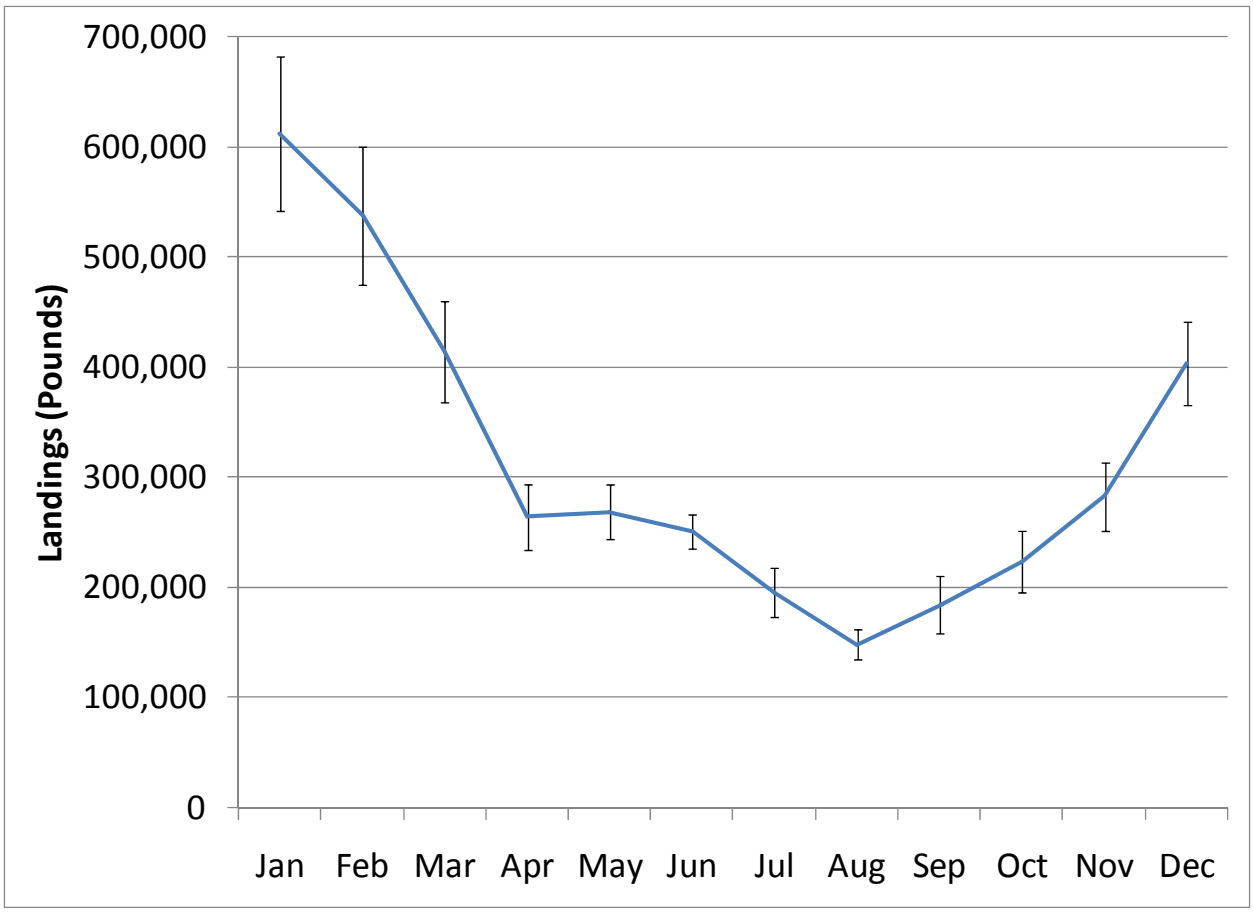

Figure 6. RI Cancer crab landings (±S.E.) by month (data from NMFS VTRs).

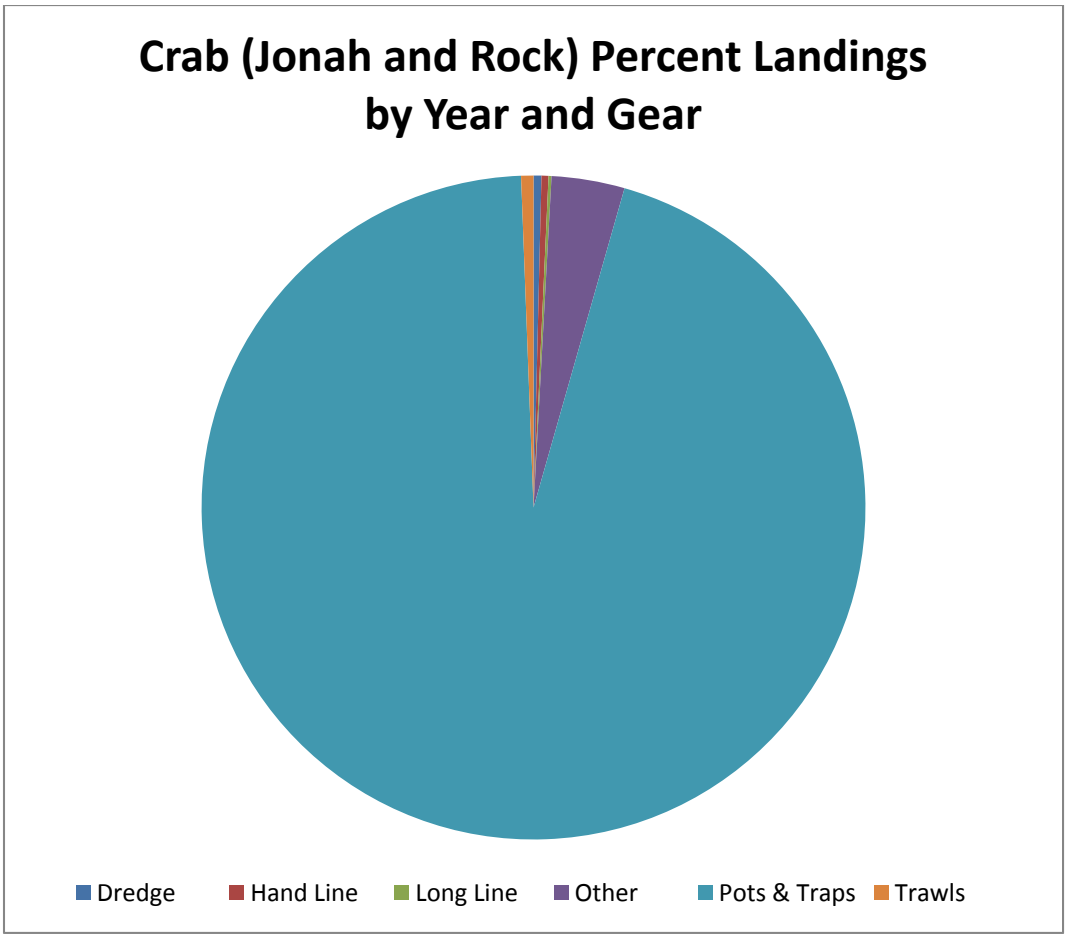

Figure 7. Average percentage of landing caught by gear types from 1990-2014.Values not shown are less than 1%.