NORTH ATLANTIC RIGHT WHALE
(*Eubalaena glacialis*)

5-YEAR REVIEW:
SUMMARY AND EVALUATION

NOAA Fisheries Service
Northeast Regional Office
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5-YEAR REVIEW
Species reviewed: North Atlantic Right Whale (*Eubalaena glacialis*)

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office: Northeast Regional Office – Mary A. Colligan, Assistant Regional Administrator for Protected Resources, 978-281-9328

Cooperating Regional Office: Southeast Regional Office – David M. Bernhart, Assistant Regional Administrator for Protected Resources, 727-824-5312

Cooperating Science Center: Northeast Fisheries Science Center – Michael Simpkins, Protected Species Branch Chief, 508-495-2358

Cooperating Headquarters Office: Office of Protected Resources – Shannon Bettridge, Office of Protected Resources, 301-427-8402

1.2 Methodology used to complete the review:

The Northeast Regional Office led the 5-year review and requested review by the Northeast Fisheries Science Center, Office of Protected Resources, Southeast Regional Office, and Southeast Fisheries Science Center. The Recovery Plan for the North Atlantic Right Whale (*Eubalaena glacialis*), the 2011 Marine Mammal Stock Assessment Report, and a literature review provided the information in this review.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:

77 FR 16538, March 21, 2012 – Endangered and Threatened Species; Initiation of 5-Year Review for the North Atlantic Right Whale and the North Pacific Right Whale

1.3.2 Listing history

Original Listing
Federal Register notice: 35 FR18319
Date listed: December 2, 1970
Entity listed: Northern right whale *(Eubalaena spp.)*
Classification: Endangered (Under the Endangered Species Conservation Act of 1969)

Revised Listing
Federal Register notice: 73 FR 12024

Date listed: March 6, 2008
Entity listed: North Atlantic right whale (*Eubalaena glacialis*)
Classification: Endangered

1.3.3 Associated rulemakings

Critical Habitat Designation: 59 FR 28805, June 3, 1994. Designated Critical Habitat; Northern Right Whale
Atlantic Large Whale Take Reduction Plan: 62 FR 39157, July 22, 1997 Taking of Marine Mammals Incidental to Commercial Fishing Operations; Atlantic Large Whale Take Reduction Plan Regulations *and subsequent amendments*
Federal Regulations Governing the Approach to North Atlantic Right Whales: 69 FR 69536, November 30, 2004.
Final Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions with North Atlantic Right Whales: 73 FR 60173, October 10, 2008. Endangered Fish and Wildlife; Final Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions with North Atlantic Right Whales
Findings on Petition to Revise Critical Habitat: 75 FR 61690, October 6, 2010. Endangered and Threatened Wildlife and Designating Critical Habitat for the Endangered North Atlantic Right Whale

1.3.4 Review History

National Marine Fisheries Service. (2006). Review of the Status of the Right Whales in the North Atlantic and North Pacific Oceans. U.S. Department of Commerce NOAA Technical Memorandum. www.nmfs.noaa.gov/pr/pdfs/statusreviews/rightwhale2006.pdf

1.3.5 Species' Recovery Priority Number at start of 5-year review: 1

North Atlantic right whales have a species' recovery priority number of One (1), based on the criteria in the Recovery Priority Guidelines (55 FR 24296, June 15, 1990). The recovery priority number for North Atlantic right whales reflects a high degree of threat based on extremely low population numbers, high recovery potential, and potential conflict with economic activities. (2010 Biennial Report to Congress on the Recovery Program for Threatened and Endangered Species, October 1, 2008–September 30, 2010)

1.3.6 Recovery Plan or Outline

Name of plan or outline: Recovery Plan for the Western North Atlantic Right Whale, *Eubalaena glacialis*. 70 FR 32293
Date issued: June 2, 2005
Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

__X__ **Yes,** go to section 2.1.2.
_____ **No,** go to section 2.2.

2.1.2 Is the species under review listed as a DPS?

____ ***Yes****, go to section 2.1.3.*
__X__ ***No****, go to section 2.1.4.*

2.1.3 Was the DPS listed prior to 1996?

____ ***Yes****, give date and go to section 2.1.3.1.*
____ ***No****, go to section 2.1.4.*

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

____ ***Yes,*** *provide citation and go to section 2.1.4.*
____ ***No****, go to section 2.1.3.2.*

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

____ ***Yes****, discuss how it meets the DPS policy, and go to section 2.1.4.*
____ ***No****, discuss how it is not consistent with the DPS policy and consider the 5-year review completed. Go to section 2.4., Synthesis.*

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

____ ***Yes****, provide citation(s) and a brief summary of the new information; explain how this new information affects our understanding of the species and/or the need to list as DPSs. This may be reflected in section 4.0, Recommendations for Future Actions. If the DPS listing remains valid, go to section 2.2, Recovery Criteria. If the new information indicates the DPS listing is no longer valid, consider the 5-year review completed, and go to section 2.4, Synthesis.*

__X__ ***No****, go to section 2.2., Recovery Criteria.*

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan[1] containing objective, measurable criteria?

__X__ ***Yes****, continue to section 2.2.2.*

[1] Although the guidance generally directs the reviewer to consider criteria from final approved recovery plans, criteria in published draft recovery plans may be considered at the reviewer's discretion.

____ ***No****, consider recommending development of a recovery plan or recovery criteria in section IV, Recommendations for Future Actions, and go to section 2.3., Updated Information and Current Species Status.*

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

_**X**_ ***Yes,*** *go to section 2.2.2.2.*

____ ***No****, go to section 2.2.3.*

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)? =

__**X**_***Yes****, go to section 2.2.3.*

____ ***No****, go to section 2.2.3.*

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.

The following are the Downlisting Criteria excerpted from the 2005 Recovery Plan for the North Atlantic Right Whale:

Based on the current population size of North Atlantic right whales, which has remained at approximately 300 animals, the continued human-caused threats to the species, and the whale's life history, North Atlantic right whales face a high risk of extinction into the foreseeable future. As a result, the criteria identified here for reclassification from endangered to threatened are not likely to be met for decades or longer. Although the criteria included in this plan will likely not be applicable in the near future, the agency has developed a set of rigorous recovery criteria (for reclassifying the species as threatened) based on existing knowledge of the population and available scientific tools. It is anticipated that the following criteria will be revisited; in addition, delisting criteria will be incorporated when the population has begun to recover such that conditions now distant and hypothetical (such as recovery trends and future threats) are apparent.

North Atlantic right whales may be considered for reclassifying to threatened when all of the following have been met:

1. The population ecology (range, distribution, age structure, and gender ratios, etc.) and vital rates (age-specific survival, age-specific reproduction, and lifetime reproductive success) of right whales are indicative of an increasing population.

Although trends in population abundance are an important measure of a population's viability, a population can increase in abundance and still face very high risks of extinction because other aspects of its population ecology are unstable. To avoid

reaching an erroneous conclusion based on changes in the population size of right whales, this criterion includes multiple measures that would indicate a right whale population that is growing and that the growth will probably be sustained.

This criterion has not been met. Please see section 2.3.1.2 of this document for further information.

2. The population has increased for a period of 35 years at an average rate of increase equal to or greater than 2% per year.

A 2% increase is generally accepted as the minimum detectable rate of growth of a long-lived, slow-growing large mammal. Thirty-five years is the estimated amount of time it would take for right whale population to double in size if the population grows at an average of 2 percent per year.

This criterion has not been met. Please see section 2.3.1.2 of this document for further information.

3. None of the known threats to Northern right whales (summarized in the five listing factors) are known to limit the population's growth rate (for thorough discussion, see Appendix C).

***Listing/Recovery Factor A**: The Present or Threatened Destruction, Modification or Curtailment of a Species Habitat or Range.*

In order to ensure the long-term recovery needs of the North Atlantic right whale and provide adequate assurance of population stability, threats to right whale habitat or range must be reduced or removed. Habitat degradation may occur from oil spills, noise pollution from shipping or oil and gas development, dredging, and contaminants.

- *Habitat degradation from oil spills, noise pollution, dredging and contaminants are not limiting the recovery of` the species.*

This criterion has not been met. Please see section 2.3.2.1 of this document for further information.

***Listing/Recovery Factor B**: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes.*
There are no data at this time to indicate that these issues are limiting the recovery of the North Atlantic right whale. However, prior to downlisting, the effects of commercial harvest, research activities, and recreational and educational activities such as whale-watching must be considered.

- *Recreational and educational activities are adequately regulated by the permitting process.*

- *No right whales are allowed to be harvested for commercial purposes.*

This criterion has been met. Please see section 2.3.2.2 of this document for further information.

***Listing/Recovery Factor C**: Disease or Predation.*
At this time, there are no data indicating that predation is limiting right whale recovery. However, results of body condition analysis and the occurrence of skin lesions on North Atlantic right whales may be indicative of health issues within the population.

- *Disease is not appreciably affecting the recovery of the species and is not likely to do so in the foreseeable future.*

This criterion has not been met. Please see section 2.3.2.3 of this document for further information.

***Listing/Recovery Factor D**: The Inadequacy of Existing Regulatory Mechanisms.*
Regulations may be insufficient to adequately protect the population. In particular, it may be necessary to enhance existing regulations, or promulgate new regulations to reduce or eliminate the threat of ship strikes and fishing gear entanglement.

- *Adequate regulations or other means to minimize ship strikes are in place and being implemented and the criterion set forth under Factor E is met.*
- *Adequate regulations, gear, or other means to minimize entanglement in fishing gear exist and are being implemented and the criterion set forth under Factor E is met.*

This criterion has not been met. Please see section 2.3.2.4 of this document for further information.

***Listing/Recovery Factor E**: Other Natural or Manmade Factors Affecting Its Continued Existence.*
No natural factors are known to be limiting the recovery of North Atlantic right whales at this time. The most significant threat to North Atlantic right whale recovery remains human-related mortality, most notably, ship collisions and entanglement in fishing gear. Additionally, other factors may be identified as direct or indirect threats in the future, such as habitat degradation, coastal development, undersea noise, and contaminant loads (covered under Factors A-D).

- *Human-caused mortality and serious injury from ship strikes and fishery interactions result in a level of mortality considered to be biologically insignificant.*

This criterion has not been met. Please see section 2.3.2.5 of this document for further information.

To support and confirm a reclassification determination generated by the above criteria, the following criteria must also be met:

4. Given current and projected threats and environmental conditions, the right whale population has no more than a 1% chance of quasi-extinction in 100 years (see Angliss et al. 2002). Criteria, i.e., population numbers, structure and trends, have not yet been developed; however, a top priority in the recovery action narrative of this plan is to conduct analyses to derive such criteria. These analyses should expressly indicate the assumptions, goals, uncertainties and approximations of the model used, and include sensitivity analyses of parameters and assumptions. In addition to being useful in examining the population viability analysis, sensitivity analyses can be useful in management of the species, and subsequent revisions or updates of this recovery plan. Finally, the analysis should be peer reviewed before being accepted as criteria.

The NMFS Northeast Fisheries Science Center is developing a population viability analysis (PVA) to examine the influence of anthropogenic mortality reduction on the recovery prospects for the species. The PVA will evaluate several scenarios on how the populations would fare without entanglement mortalities compared to the status quo.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

Right whale life history begins in the shallow, coastal waters of the known right whale nursery areas. In the western North Atlantic, calving takes place between December and March. In both the northern and southern hemisphere, females give birth to their first calf at an average age of nine years (Best *et al.* 2001; Hamilton *et al.* 1998).

While juvenile and female right whales migrate to the southeastern U.S. for winter months, individuals from other demographic segments of the right whale population travel to this area as well and include mostly juveniles, with some non-calving females and adult males (Hamilton *et al.* 2007). During the winter months, recent aerial surveys have sighted aggregations of right whales in the central Gulf of Maine. The demographic composition of individuals suggests this may be a mating ground (NEFSC *unpublished data*).

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Abundance

The pre-exploitation distribution of right whales in the North Atlantic likely included coastal and continental shelf waters in temperate to subarctic latitudes. Pre-exploitation abundance is unknown but has been estimated to be more than 1,000 individuals (Reeves *et al.* 1992). Current distribution and abundance data suggest significant reductions from historic levels. In the eastern North Atlantic, the right whale population likely numbers in the low tens at best with little known regarding their distribution and migration pattern (NMFS 2010). This population may be functionally extinct (Best *et al.* 2001). The western North Atlantic population numbered at least 361 individuals in 2005 and at least 396 in 2010 (Waring *et al.* 2012).

Population Trends

North Atlantic right whales are showing signs of a slow and variable recovery, with the average rate of population increase for the period of 1986-1992 at 2.5% (Knowlton *et al.* 1994) and the period 1990-2007 at 2.4% (Waring *et al.* 2012). However, there have been two periods of documented high mortality rates: from the early 1980s to the mid-1990s, survival probability declined from 0.99 to 0.94 (Caswell *et al.* 1999). Then, eight whales died in a 16-month period in 2004-2005. Of these, six were adult females, three of which carried near-term fetuses (Kraus *et al.* 2005). Despite these periods of increased mortality, overall growth rates have been 2% over 17 years (1990-2007) (Waring *et al.* 2012).

Right whale births

Right whales give birth to a single calf after 12-13 months of gestation (Best *et al.* 2001). Weaning seems to be variable, and has been reported as 8 to 17 months in North Atlantic right whales (Hamilton and Marx 1995). The only known calving and nursery grounds are in the coastal waters off the southeastern U.S., from Savannah, Georgia to St. Augustine, Florida. The number of calves born each year has varied from 1 to 39 from the years 1980 to 2009 and shows an upward trend (Kraus *et al.* 2007; Waring *et al.* 2012). The upward trend may be due to greater survey effort (Kraus *et al.* 2007).

Annual birth rate

The number of newborn calves per year ranged from 5 to 17, with a mean of 11.2 (SE=0.90) from 1980-1992. The mean calf production for the 17-year period of 1990-2007 rose to 17.2 (15.3-19.4; 95% C.I.) (Waring *et al.* 2012). Preliminary reports from the 2012 calving season indicate that only 7 newborn calves were spotted, the lowest number on record since 2000, and far below the average of 20 observed for the last decade.

Calving intervals

The mean calving interval from 1980-1992 was calculated to be 3.67 years (Knowlton *et al.* 1994), but increased to 5 years using data from 1998-2003 (Best *et al.* 2001; Kraus *et al.* 2001). The most recent information (2004-2005) shows calving intervals closer to 3 years (Kraus *et al.* 2007). Longer calving intervals suggest miscarriages, neonatal deaths, and unsuccessful or delayed conceptions in the population possibly caused by infectious diseases such as brucellosis and leptospirosis, lack of genetic variability, contaminants, or

biotoxins (Browning *et al.* 2010). A workshop on the possible causes of reproductive failure during the 1990s considered these factors as well as nutrition/food limitation, but no conclusions were reached (Reeves *et al.* 2001). Climatic changes may also impact calving success by changing prey availability (Kenney 2007; Greene and Pershing 2003).

Reproductive population

The reproductively active female pool was static at approximately 51 individuals during 1987-1992, and increased to 92 by 2005. Part of the increase may be due to increased recognition of individuals by the survey teams (Kraus *et al.* 2007). Nearly 12% of the adult female population has never been sighted with a calf (Kraus *et al.* 2007). It is possible that the apparently low reproductive rate is due in part to an unstable age structure or to reproductive senescence on the part of some females. However, few data are available on either factor and senescence has not been documented for any baleen whale.

Age structure

An analysis of the age structure of this population suggests that it contains a smaller proportion of juvenile whales than expected (Hamilton *et al.*1998; Best *et al.* 2001), which may reflect lowered recruitment and/or high juvenile mortality.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

Recent evaluation of a single right whale bone at a known 16th and 17th century whaling site revealed that low genetic variation in the present population may date back as far as four centuries, and may not have been caused by whaling activities (McLeod *et al.* 2010). Although whaling reduced the population size, there is evidence that genetic variability among North Atlantic right whales was already low when the peak of Basque whaling, generally blamed for the genetic loss, occurred (McLeod *et al.* 2010).

2.3.1.4 Taxonomic classification or changes in nomenclature:

Northern right whales have been listed as endangered under the Endangered Species Act (ESA) since its passage in 1973. At the time of its listing, Northern right whales included right whales in both the North Pacific (*Eubalaena japonica*) and North Atlantic (*Eubalaena glacialis*). Genetic data provided support for distinguishing three right whale lineages as separate phylogenetic species (Rosenbaum *et. al*. 2000), and three separate species of right whale are now recognized:

1. The North Atlantic right whale (*Eubalaena glacialis*), ranging in the North Atlantic Ocean
2. The North Pacific right whale (*Eubalaena japonica*), ranging in the North Pacific Ocean
3. The southern right whale (*Eubalaena australis*), ranging throughout the Southern Hemisphere

The North Atlantic right whale and the North Pacific right whale were listed as distinct species under the ESA in 2008 (73 FR 12024, March 6, 2008).

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

Prior to extensive exploitation, the North Atlantic right whale was found distributed in temperate, subarctic, coastal and continental shelf waters throughout the North Atlantic Ocean rim (Perry *et al.* 1999). The post-exploitation distribution is largely limited to the western North Atlantic Ocean (i.e., Florida to Canada). Based on whaling records, it appears that right whales in the eastern North Atlantic migrated along the coast from northern Europe to northwest Africa. Sighting surveys from the eastern Atlantic Ocean suggest that right whales are currently rare in this region and this population may be functionally extinct (Best *et al.* 2001).

In the western North Atlantic, right whales migrate along the North American coast from Nova Scotia to Florida. Data have revealed five major habitats or congregation areas for right whales in the western North Atlantic: Georgia-North Florida coast; the Great South Channel and northern edge of George's Bank; Massachusetts Bay and Eastern Cape Cod Bay; the Bay of Fundy; and the southeastern Scotian Shelf (Winn *et al.* 1986). The Georgia-Florida region is used in winter as the only known calving area. The other four areas are recognized as important feeding areas.

Right whales have been observed from the Mid-Atlantic Bight northward through the Gulf of Maine during all months of the year. Foraging right whales (and their habitat) appear to be concentrated in New England waters. In New England, peak abundance of right whales in feeding areas occurs in Cape Cod Bay beginning in late winter. In early spring (May), peak right whale abundance occurs in Wilkinson Basin to the Great South Channel (Kenney *et al.* 1995). In late June and July, right whale distribution gradually shifts to the northern edge of Georges Bank. In late summer (August) and fall, much of the population is found in waters in the Bay of Fundy and around Roseway Basin (Winn *et al.* 1986; Kenny *et al.* 1995; Kenny *et al.* 2001). Right whale sightings peak near Jeffreys Ledge in late fall (Weinrich *et al.* 2000) and the central Gulf of Maine in mid-winter (NEFSC *unpublished data*). Recent passive acoustic studies analyzing right whale calls detected in Massachusetts Bay indicate a persistent presence of right whales and call activity throughout much of the year (Morano *et al.* 2012; Mussoline *et al.* 2012).

Variation in the abundance and development of suitable prey appears to modify the general patterns of movement of right whales by reducing peak numbers, stay durations and specific locations (Brown *et al.* 2001; Kenney 2001). In particular, large changes in the typical pattern of food abundance will dramatically change the general pattern of right whale habitat use (Kenney 2001).

Known wintering areas for this population occur along the southeastern U.S. coast where calving occurs from December through March (Winn 1984; Kraus *et al*. 1986; IWC 1986). It appears that not all reproductively active females return to the calving grounds each year (Kraus *et al.* 1986; Payne 1986).

Knowlton *et al*. (1992) reported several long-distance movements as far north as Newfoundland, the Labrador Basin, and southeast of Greenland. In addition, recent re-sightings of photographically identified individuals have been made off Iceland, arctic Norway and in the old Cape Farewell whaling ground east of Greenland. A 2007 acoustic survey of Cape Farewell recorded 2012 right whale upcalls from July to November, indicating that this area is still important habitat for right whales (Mellinger *et al.* 2011). The Norwegian sighting (in September 1999) represents one of only two sightings this century of a right whale in Norwegian waters, and the first since 1926. Together, these long-range matches indicate an extended range for at least some individuals and perhaps the existence of important habitat areas not presently well described.

Similarly, records from the Gulf of Mexico (Moore and Clark 1963, Schmidly *et al*. 1972; Ward-Geiger *et al.* 2011) represent either geographic anomalies or a more extensive historic range beyond the sole known calving and wintering ground in the waters of the southeastern United States (Ward-Geiger *et al.* 2011; Waring *et al*. 2012).

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem): These are discussed in Section 2.3.2, below.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

In order to ensure the long-term recovery needs of the North Atlantic right whale and provide adequate assurance of population stability, threats to right whale habitat or range must be reduced or removed. Habitat degradation may occur from oil spills, noise pollution from shipping or oil and gas development, dredging, and contaminants.

Oil and Gas Development

A continued threat to the coastal habitat of right whales in the western North Atlantic is the undersea exploration and development of mineral deposits. Offshore oil and gas activities have been proposed off the coast of the mid and south Atlantic U.S. (NMFS 1991), but after the Deepwater Horizon oil spill in 2010, all lease plans were cancelled. There is a ban in effect through 2017 for drilling in federal waters off the Atlantic coast. However, if that policy is reversed and drilling activities occur, there may be consequent adverse effects to the right whale population by vessel movements, noise, spills, or effluents. These activities may possibly result in disturbance of the whales or their prey,

and/or disruption of the habitat. Future oil and gas exploration and development activities will be subject to ESA Section 7 consultations.

It is unknown to what extent these activities may disturb or otherwise affect right whales. It appears that whale behavior and the type of activity in which the whales are engaged influence right whale sensitivity to, and tendency to avoid, noise disturbance and vessel activity (Watkins 1986; NMFS 1991), but more studies are needed.

Noise Pollution

Underwater noise from anthropogenic sources has grown in the last 50 years due to increased oil and gas exploration, sonar use (both military and commercial), shipping traffic, and recreational boating (Rolland *et al.* 2012, citing National Research Council 2003; Hildebrand 2009; Ross 1993; Ross 2005). Right whales, like many large cetaceans, communicate over large distances in the open ocean using low-frequency, long-wavelength sounds, which are subject to masking by human activities (Rolland *et al.* 2012). Studies have indicated that whales may respond to increased noise by leaving certain habitats, changing behavior, and changing their vocalization patterns (Rolland *et al.* 2012; citing Nowacek *et al.* 2007; Weilgart 2007).

Right whales use vocal calls for social communication, including mate attraction (Parks and Tyack 2005). A recent study showed that right whales increase their call amplitude linearly with the rise of background noise, indicating that the whales are able to modify their vocalizations to compensate for the increased noise of their environment (Parks *et al.* 2011). The cost of this behavior modification may include increased energy expenditure or modification of the original information of the signal, but more data are needed to fully understand the effects of anthropogenic sound on right whale communication (Parks *et al.* 2011).

Noise pollution has been correlated to an increase in stress-related fecal hormone metabolites in North Atlantic right whales (Rolland *et al.* 2012). Chronic elevations of these fecal hormone metabolites have been shown to negatively affect growth, immune system response, and reproduction in a variety of vertebrate species (Rolland *et al.* 2012 citing Sapolsky *et al.* 2000; Romero and Butler 2007). Rolland *et al.* (2012) suggested that anthropogenic noise pollution may have negative consequences for the North Atlantic right whale's continued viability.

Because North Atlantic right whales are experiencing the cumulative impacts of multiple stressors, the effect of noise pollution on the population's recovery is not yet clear.

Dredging

Right whales frequent coastal waters where dredging and its associated disposal operations occur on a regular basis. Dredging and dredge spoil disposal generally increases sedimentation and turbidity of the water column, which can affect the early life stages and adults of some highly sensitive species (Newcombe and Jensen 1996; Wilber and Clarke 2001). The U.S. Army Corps of Engineers (ACOE) has responsibility and

oversight for many of these dredging and disposal operations and consults with NMFS under Section 7 of the ESA on these activities. NMFS has concluded in past consultations that dredging and dredge spoil disposal are not likely to adversely affect right whales.

Contaminants

Additional potential sources of habitat degradation for right whales are marine contaminants. O'Shea and Brownell (1994) concluded that there is currently no evidence for significant contaminant-related problems in baleen whales. Although more research is needed, the existing data on mysticetes support the view that the lower trophic levels at which these animals feed should result in lower levels of contaminant accumulation than would be expected in many odontocetes, which typically show concentrations that differ from those of baleen whales by an order of magnitude (O'Shea and Brownell 1994). However, the manner in which pollutants negatively impact animals is complex and difficult to study, particularly in taxa (such as large whales) for which many of the key variables and pathways are unknown (Aguilar 1987; O'Shea and Brownell 1994). A more plausible potential problem is that of trans-generational accumulation (Colborn and Smolen 1996), but this remains unstudied in right whales or any other cetacean species.

The contaminant levels found in right whales are considered low relative to those found in other marine mammals, such as seals, sea lions, and dolphins (Montie *et al.* 2010). The copepods on which right whales feed (*Calanus finmarchicus* from the Bay of Fundy; *C. finmarchicus* and *Pseudocalanus spp.* from Cape Cod Bay) tend to have lower concentrations of these contaminants than the levels found in prey items of other marine mammals (Montie *et al.* 2010).

There are several classes of contaminants that could potentially affect right whales such as organohalogens (DDT, DDE, dieldrin, chlordanes, hexachlorocyclohexanes [HCHs], polychlorinated biphenyls [PCBs], polycyclic aromatic hydrocarbons), and brominated flame retardants, including polybrominated diphenyl ethers (PBDEs)(Kraus *et al.* 2007, Montie *et al.* 2010). Contaminants may enter right whales through food and ingestion of other nonfood items. Because right whales feed in oceanic convergence zones where currents concentrate prey items, trash, and other surface particles, they ingest more than their intended prey. As a result, chemicals from, for example, sewage treatment facilities, boat maintenance (anti-fouling agents, flame retardants), and terrestrial run-off are consumed directly. Contaminants tend to accumulate in whale tissues, and can be passed to calves through lactation.

There is evidence that some contaminants, particularly those in flame retardants (polybrominated diphyenyl ethers), detergents and pesticides (alkylphenol ethoxylates), disrupt endocrine pathways and reproduction in animals (Colborn and Smolen 1996; Meerts *et al.* 2001). Montie *et al.* (2010) analyzed blubber samples taken from five North Atlantic right whales that stranded along the eastern U.S. and Canada, and detected the presence of organochlorines, PCBs, and brominated flame retardants in all five samples. A previous study found that data from biopsy-derived samples are relevant to the whole

animal given that lipid-normalized contaminant burden is comparable between different blubber depths and locations in large whales (Gauthier *et al.* 1997).

In summary, right whale recovery potentially could be affected by various habitat related impacts but the extent to which these factors are inhibiting the recovery of the species is not clearly understood. Recent studies on the effects of noise pollution and contaminants on right whale reproduction suggest that these two factors may be playing a larger role in reproduction but much more research is needed to understand the full effects..

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

There are no data at this time to indicate that these issues are limiting the recovery of the North Atlantic right whale. However, any effects of commercial harvest, research activities, and recreational and educational activities such as whale-watching must be considered.

Currently, there is no commercial harvest of right whales and research activities are not considered to be affecting right whale recovery in the North Atlantic. Scientific activities are considered to be adequately regulated by the permitting process (NMFS 2010). Whale-watching directed at right whales has been mitigated as the result of the prohibition on approaching or remaining within 500 yards of right whales (50 CFR 224.102(c)).

2.3.2.3 Disease or predation:

Predation

Low levels of shark predation on right whale calves have been reported in the southeastern U.S. (Taylor *et al.* 2012). Some right whale flukes bare scars thought to be the result of killer whale (*Orcinus orca*) encounters (Kraus 1990). However, at this time, there are no data indicating that predation is limiting right whale recovery.

Disease

Results of body condition analysis and the occurrence of skin lesions on North Atlantic right whales may be indicative of health issues within the population. The occurrence of skin lesions on North Atlantic right whales has been documented in recent years (Marx *et al.* 1999; Pettis *et al.* 2004). The origins and significance of these lesions are unknown, and further research is required to determine whether they represent a topical or systemic health problem for the affected animals. Brucellosis and leptospirosis have both been found in free-swimming cetaceans, and are known to cause spontaneous abortions and reproductive dysfunction (Smith *et al.* 1974; Miller *et al.* 1999). Influenza, herpes, and calicivirus have all been found in cetaceans, and are also known to affect reproduction or survival in terrestrial mammals (Van Bessem *et al.* 1999).

The 1990s saw a rise in the geographic distribution, frequency, duration, and severity of harmful algal blooms (HABs) (Hallegraeff 1993; Gilbert *et al.* 2005). HABs have caused mortalities of sea lions, sea otters, dolphins, and whales (Landsberg 2002). It has been

suggested that marine biotoxins may also be having an effect on right whale survival. There is currently no conclusive evidence linking red tide toxins to deaths or chronic health problems in right whales.

In the Bay of Fundy, the primary right whale copepod prey, *Calanus finmarchicus*, contains measurable levels of PSP (paralytic shellfish poisoning) toxins. Right whale feces in this area contains measurable levels of PSP and domoic acid, both of which are associated with fetal and neonatal deaths in California sea lions (Scholin *et al.* 2000). A recent study (Doucette *et al.* 2012) found that 22% of fecal samples collected from 2001 to 2006 in the waters off the northeast U.S. and Canadian Maritimes (Bay of Fundy, Cape Cod Bay, Great South Channel, and Roseway Basin) showed concurrent exposure to both neurotoxins. Most (70-80%) of the sampled whales showed exposure to paralytic shellfish toxins (PSTs), while only 25-30% showed exposure to domoic acid. Eighty-five percent of the lactating females from which feces were collected and 100% of the pregnant females tested positive for PSTs. Possible effects of PST in whales include a range of behavioral and physiological effects, such as poor peripheral heat-conserving mechanisms, impaired diving and feeding capabilities, and prolonged recovery from dives (Doucette *et al.* 2012, citing Durban *et al.* 2002).

Doucette *et al.* (2012) found that 20% to 30% of the juvenile, lactating, and pregnant females in the study tested positive for domoic acid. Domoic acid is known to cause death of pregnant females, miscarriage, and premature birth in California sea lions (Brodie *et al.* 2006; Goldstein *et al.* 2009). Domoic acid is also known to cause seizures and a chronic neurological syndrome in sea lions (Brodie *et al.* 2006). Domoic acid has been demonstrated to cross the placental barrier, and amniotic fluid may act as a sink for domoic acid, which could lead to reduced appearance of domoic acid in feces, suggesting that the 20-30% figure may be low for pregnant females (Doucette *et al.* 2012). California sea lions exposed to domoic acid show signs of epilepsy, seizures, and atrophy of the hippocampus which could affect a sea lion's ability to navigate (Scholin *et al.* 2000; Goldstein *et al.* 2009). It has been suggested that these types of effects, if they occurred in right whales, could heighten their susceptibility to both ship strikes and entanglements (Doucette *et al.* 2012).

The effects of marine biotoxins on right whale survival and reproduction is not yet well-understood, though both direct (neurotoxicity, reproductive failure) and indirect (increased susceptibility to ship strikes) effects could be a factor impeding recovery of right whales. At present, it is not possible to determine that disease is affecting the recovery of the species. There is no direct evidence at this time that marine biotoxins are negatively affecting right whale recovery and more research is needed before conclusions can be drawn.

2.3.2.4 Inadequacy of existing regulatory mechanisms:
Regulations may be insufficient to adequately protect the population. In particular, it may be necessary to enhance existing regulations or promulgate new regulations to reduce or eliminate the threat of ship strikes and fishing gear entanglement.

NMFS has taken regulatory steps to reduce the threats of ship strikes and commercial fishing gear entanglements. Anthropogenic activities accounted for 50% of all confirmed right whale deaths from 1985 to 2005; 38% were due to ship collisions and 12% were due to fishing gear entanglement (Kraus *et al.* 2005). In addition, 75% of all right whales show scars from gear interaction at some time in their lives (Knowlton *et al.* 2005). From 2005 to 2009, the minimum rate of annual human-caused mortality and serious injury to right whales averaged 2.4 per year (U.S. waters, 2.0; Canadian waters, 0.4). This is derived from two components: (1) incidental fishery entanglement records at 0.8 per year (U.S. waters, 0.8; Canadian waters, 0), and (2) ship strike records at 1.6 per year (U.S. waters, 1.2; Canadian waters, 0.4) (Waring *et al.* 2012). Given that the Potential Biological Removal (PBR) level for North Atlantic right whales is 0.8, any mortality or serious injury is significant for this population.

NMFS has implemented a number of new and ongoing programs (e.g., the Atlantic Large Whale Take Reduction Plan) that are intended to protect not only North Atlantic right whales but also endangered Gulf of Maine humpback (*Megaptera novaeangliae*) and western North Atlantic fin whales (*Balaenoptera physalus*), and to benefit non-endangered Canadian east coast minke whales (*Balaenoptera acutorostrata*). NMFS' Marine Mammal Health and Stranding Response Program and its partners continue to respond to strandings and entanglements. The program also administers grants for response and recovery of marine mammals through the John H. Prescott Marine Mammal Rescue Assistance Grant Program. Below are summaries of the regulatory actions taken to reduce the threats of incidental ship strikes and commercial fishing gear entanglement.

<u>Ship Strike Reduction Regulations and Actions</u>

- In December 2008, NMFS promulgated new rules for all vessels 65 feet or greater limiting vessel speed to 10 knots or less in Seasonal Management Areas where whales are known to occur at particular times (73 FR 60173, October 10, 2008). NMFS also expects, but does not require, mariners to avoid or limit speed to 10 knots or less in Dynamic Management Areas (www.nmfs.noaa.gov/pr/shipstrike/). Vessel speed is considered a principal factor in both the occurrence and severity of vessel-whale collisions, and therefore formed the basis for the ship strike reduction measures.
- NMFS and its partners made a concerted effort to notify the public and maritime community about the requirements of the speed regulation both prior to its enactment and during the periods in which Seasonal Management Areas were in effect. Notifications appear in various navigational aids, including the U.S. Coast Pilots, Sailing Directions, U.S. Coast Guard Local and Broadcast Notices to Mariners; periodic NOAA Weather Radio announcements; distribution of laminated "compliance guides" and free interactive CDs through U.S. Coast Guard personnel, port captains, and marine exchanges; National Weather Buoy

and other websites; NOAA shipping industry liaisons and NOAA's Nav Managers; e-mail distribution lists; press releases; notifications provided directly to their members by maritime associations; announcements and articles in trade journals and periodicals; distributions by agencies such as the Department of Transportation's Maritime Administration; outgoing messages of the U.S. East Coast right whale Mandatory Ship Reporting systems (see below), and other means.

- The U.S. submitted proposals to the International Maritime Organization to modify vessel operations to reduce the risk of ship strikes to right whales. These proposals were adopted by the International Maritime Organization and the measures are now in effect. One effort modified the Boston Traffic Separation Scheme (by shifting traffic 12 degrees and narrowing the traffic lanes by about one half mile each) to move the shipping lanes away from known right whale aggregation areas. A second measure is a voluntary seasonal Area To Be Avoided (ATBA) in the Great South Channel off of Massachusetts, which came into effect in 2009, and applies from April 1 to July 31 each year. These actions were designed to move ships away from the greatest densities of whales while minimizing overlap between whales and ships.
- NOAA and the U.S. Coast Guard developed and implemented in 1999 Mandatory Ship Reporting Systems to protect right whales. The systems were endorsed by the International Maritime Organization and require ships 300 tons or larger to report relevant ship information when they enter certain waters off New England and calving/nursery areas in waters off Georgia and Florida. This reporting prompts an automated return message providing information about the vulnerability of right whales to ship strikes and recent right whale sighting locations.
- NOAA and other federal and state agencies continue to support and conduct extensive aircraft and vessel-based surveys to monitor the right whale population and to enhance ship strike and entanglement reduction measures.
- NMFS assembles reports and disseminates "alerts" to mariners via e-mail, webpages, U.S. Coast Guard Broadcast Notices to Mariners, NOAA Weather Radio, NAVTEX, NOAA Weather Buoys, shipping agents, pilots, and port authorities. These efforts have been ongoing since the early 1980s.
- NOAA contributed to many ship strike reduction outreach and education projects including: continued distribution of placards, brochures, and videos to mariners on ways to reduce ship strikes; maintenance of two websites devoted to ship-strike reduction; implementation of reprinted updates to whale advisory charts; contributions to mariner trade magazines; production and distribution of an interactive CD on reducing ship strikes; and a new free Whale Alert App for the iPad and iPhone that displays all right whale management measures on NOAA nautical charts, and informs a vessel when it enters right whale management areas. The Whale Alert App, launched in 2012, links acoustic buoys that pick up right whale calls with an iPad or iPhone on a ship's bridge, showing a captain where the whales are in near real-time.

Recent studies indicate that the likelihood of the occurrence of a vessel strike is decreased by reduced vessel speed (Gende *et al.* 2011). Reduced vessel speeds also reduce the magnitude of the impact if a whale-ship collision does occur (Vanderlaan and Taggart 2007; Campbell-Malone, *et al.* 2008; Silber *et al.* 2010). Studies conducted since the implementation of the vessel speed rule indicate that lowered vessel speeds reduce the risk of fatal whale strikes (Vanderlaan *et al.* 2009; Vanderlaan and Taggart 2009; Gende *et al.* 2011; Lagueux *et al.* 2011; Wiley *et al.* 2011). In particular, Lagueux *et al.* (2011) and Wiley *et al.* (2011) concluded that NMFS's 2008 10-knot vessel speed restrictions reduced the risk of lethal strikes of right whales by 38.5% and 56.7% in waters off the southeast U.S. coast and New England, respectively. Therefore, the research used to initiate vessel speed restrictions to reduce vessel collisions with right whales, and studies subsequent to implementation of the regulations support continued use of the restrictions (Silber and Bettridge 2012).

For the period 2005 through 2009, the minimum rate of annual human-caused mortality and serious injury to right whales from ship strikes averaged 1.6 per year (U.S. waters, 1.2; Canadian waters, 0.4) (Waring *et al.* 2012).

However, analysis of two years of data regarding the biological effectiveness of the 2008 vessel speed rules showed inconclusive results because the period in which the rule was in effect was too brief to fully assess biological effectiveness (Silber and Bettridge 2012). Complicating the analysis is that mariner compliance with the rules was low in 2009 and 2010, but increased in 2011, although compliance among foreign vessels remained low throughout the three-year time period. Thus, while these studies support the vessel speed rules, it is too soon to tell whether these rules are sufficient to adequately protect the population (Silber and Bettridge 2012).

Gear Entanglement Mitigation Regulations and Actions

NMFS implemented the Atlantic Large Whale Take Reduction Plan (ALWTRP) specifically to reduce injuries and deaths of large whales due to incidental entanglement in fishing gear. Despite the plan having been in place since 1997, entanglement in fisheries gear continues to be a problem, with 12% of right whale mortalities between 1986 and 2005 caused by entanglements (Kraus *et al.* 2005), and 75% of all right whales showing scars from gear interactions at some time in their lives (Knowlton *et al.* 2005). Annually, between 14% and 51% of right whales become entangled in fishing gear (Knowlton *et al.* 2005). From 2005 to 2009, the minimum rate of annual human-caused mortality and serious injury to right whales caused by entanglements in fishing gear averaged 0.8 (0.8 in U.S. waters and 0 in Canadian waters) (Waring *et al.* 2012). Disentanglement is not always possible or successful, but during the period of 2005 to 2009, at least three right whales likely avoided serious injury or mortality by being freed from fishing gear by disentanglement teams (Waring *et al.* 2012). NMFS plans to develop a vertical line reduction rule in 2014 because we not believe that current regulations are sufficient to adequately protect the population from entanglements in fishing gear.

The following points discuss additional activities by NMFS to address fishing gear entanglement of right whales:

- As part of the Atlantic Large Whale Take Reduction Plan, NMFS published a final rule prohibiting gillnet fishing during the right whale calving season within the Southeast U.S. Restricted Area on June 25, 2007 (74 FR 34632).
- As part of the Atlantic Large Whale Take Reduction Plan, NMFS implemented 68 Dynamic Area Management zones between 2002 and 2009 requiring gear modifications for trap/pot and gillnet gear in areas of unexpected aggregations of right whales north of 40° N.
- In 2008, NMFS promulgated regulations implementing broad-based gear modifications. Conservation measures include expanded sinking groundline and weak link requirements; additional gear marking requirements; changes in boundaries; and seasonal restrictions for gear modifications. These modifications to the Atlantic Large Whale Take Reduction Plan were in place by April 2009. The sinking groundline requirement removed thousands of miles of floating groundline from the water column potentially reducing the chance of whale/gear interactions.
- NMFS recently developed a strategy for the Atlantic Large Whale Take Reduction Team to assist in the development of additional conservation measures intended to reduce the risk of whale serious injury and mortality of right whales due to interactions with vertical lines (buoy lines or endlines) associated with commercial fixed gear. NMFS is using a co-occurrence model for the East Coast depicting the overlap between density of fixed fishing gear and large whale distribution (right and humpback whales). The results of this model are currently being used in deliberations of the Atlantic Large Whale Take Reduction Team to develop additional measures to further reduce the entanglement risk associated with vertical lines. NMFS is expected to promulgate a final rule to address vertical line entanglement by 2014.
- NMFS administered and implemented Congressionally-directed funding of over $3 million to the Gulf of Maine Lobster Foundation beginning in June of 2006 for the administration and implementation of the Maine groundline exchange program. This program provided financial assistance to Maine lobster trap/pot fishermen through the exchange of floating groundline for a voucher to be used toward the purchase of sinking groundline. The final exchange occurred in August 2010.
- NMFS provided additional funds in the amount of $1.7 million to the Maine Department of Marine Resources of which approximately $650,000 was provided to the Gulf of Maine Lobster Foundation to administer and implement additional groundline exchanges in the state of Maine. Maine Department of Marine Resources is using the remaining funds to collaborate with researchers and industry groups to conduct both biological and gear research off the coast of Maine.
- NMFS provided $3 million in funding to the Commercial Fisheries Research Foundation in October 2009 for the administration and implementation of a groundline exchange/conversion program for Lobster Management Area 2 lobster

fishermen in the state of Rhode Island and for Lobster Management Area 3 fishermen.

- NMFS provided nearly $1.25 million in funding to the New England Aquarium to administer the Consortium for Wildlife Bycatch Reduction, a group dedicated to reducing bycatch and entanglements of protected marine species. A number of sub-projects being conducted by this group relate to reducing entanglement risks to right whales.
- NMFS provided nearly $250,000 to fishing industry and academic groups to support gear research focused on reducing the entanglement risk associated with vertical lines of fixed fishing gear.
- NMFS conducted investigations on gear removed from entangled whales. This work is ongoing.
- NMFS provided funding assistance for the large whale disentanglement programs of East Coast states, including the states of Maine, Massachusetts, Georgia, and Florida.
- NMFS contributed to many outreach and education projects including: conducting dockside outreach meetings throughout the East Coast; collaborating with fishermen and fishing associations throughout the Northeast and Mid-Atlantic on conservation measures and gear research; and providing disentanglement training for fishermen, the U.S. Coast Guard, and State Marine Patrols.
- NMFS continued targeted ALWTRP law enforcement efforts via partnerships with coastal States through Joint Enforcement Agreements (JEA). JEA special operations patrols result in focused at-sea monitoring and enforcement of ALWTRP requirements

2.3.2.5 Other natural or manmade factors affecting its continued existence:
No natural factors are known to be limiting the recovery of North Atlantic right whales at this time. The most significant threat to North Atlantic right whale recovery remains human-related mortality, most notably, ship collisions and entanglement in fishing gear, discussed in Section 2.3.2.4. Additionally, other factors may be identified as direct or indirect threats in the future, such as habitat degradation, disease, undersea noise, and contaminant loads (covered in Sections 2.3.2.1-4).

Climate Change

An emerging human-related threat to right whales may be climate change, and its accompanying ecosystem changes. There is a close link between right whale foraging and the physical forcing processes that concentrate prey in the oceanic environment (Kenney *et al.* 2001). Interannual, decadal, and longer time-scale variability in climate can alter the distribution and biomass of prey available to right whales. For example, decade-scale climatic regime shifts have been related to changes in zooplankton in the North Atlantic (Fromentin and Planque 1996). Decadal trends in the North Atlantic Oscillation (Hurrell 1995) can affect the position of the Gulf Stream (Taylor *et al.* 1998) and other circulation patterns in the North Atlantic that may be important to right whales.

The effects of climate-induced shifts in productivity, biomass, and species composition of zooplankton on the foraging success of right whales has received little attention. Such shifts in community structure and productivity may alter the distribution and occurrence of foraging right whales in coastal habitats, as well as affecting their reproductive potential.

A recent review of the period in the 1990s when the calving interval increased at the same time that survival rate of adult female right whales decreased showed a correspondence with reduced abundance of the copepod *Calanus finmarchicus* (Kenney 2007). While more research needs to be done on the effects of the ongoing atmospheric and oceanographic variations on right whales, it should be noted that this species has adapted to substantial environmental changes over the course of time (Kenney 2007).

2.4 Synthesis

North Atlantic right whales were listed as endangered under the Endangered Species Conservation Act in 1970, the precursor to the Endangered Species Act of 1973. At the time of its listing, Northern right whales included right whales in both the North Pacific (*Eubalaena japonica*) and North Atlantic (*Eubalaena glacialis*). Genetic data provided support for distinguishing three right whale lineages as separate phylogenetic species (Rosenbaum *et. al*. 2000), and three separate species of right whale are now recognized: the North Atlantic right whale (*Eubalaena glacialis*), the North Pacific right whale (*Eubalaena japonica*), and the southern right whale (*Eubalaena australis*). The North Atlantic right whale and the North Pacific right whale were listed as distinct species under the ESA in 2008 (73 FR 12024, March 6, 2008).

In the more than 40 years since right whales were listed as endangered, substantial efforts have been undertaken to gather information on this long-lived migratory species and to protect these whales through regulation and education. A Northern Right Whale Recovery Team was appointed in July 1987, and a Final Recovery Plan for the Northern Right Whale (including both North Atlantic and North Pacific right whales) was approved in December 1991. In 2005, NMFS revised the recovery plan for North Atlantic right whales.

While progress has been made toward the goals in this plan, recovery of this population of right whales is a long-term effort that requires cooperation and coordination among federal and state agencies, academic scientists, and other communities from Maine to Florida. There are still significant data gaps and it is still too soon to evaluate the effectiveness of some recovery actions.

NMFS, working with many partners, has made progress in filling data gaps. There is an active research program with new information and publications readily available. New data on the effects of noise on right whale hormonal stress levels and communication, the physiological and behavioral effects of biotoxins, and factors affecting reproductive success have added to the knowledge of anthropogenic stressors of right whales, but

questions remain. Additional research is needed on physiological effects from contaminants and biotoxins, the effects of sound on communication, mating success, and reproduction, the effectiveness of regulatory measures that address entanglements and ship strikes, the possible effects of climate change on migratory patterns, habitat use, and prey availability, and the health status and reproduction of individuals. NMFS and its partners must continue population assessments, aerial and vessel surveys, and habitat monitoring to gather more information on human impact on whales.

The Recovery Plan (2005) provided as a priority the need to address ship strikes and fishing gear entanglements, the two largest known anthropogenic sources of mortality and serious injury. Measures have been put in place to modify shipping lanes, establish recommend shipping routes, reduce vessel speeds, and institute mandatory ship reporting systems. Additional NMFS actions to reduce ship strikes include monitoring whales through aerial surveys, issuing right whale alerts and speed advisories, conducting outreach and education to mariners, and working with stranding response teams. To reduce fishing gear entanglements, NMFS has implemented regulations regarding where and how gear can be set (including a proposed regulation on vertical lines still in progress), has researched whale and fishing gear interactions, has done outreach to inform and collaborate with fishermen and other stakeholders, and coordinates a large whale disentanglement program.

The effectiveness of these activities is still being reviewed, and modifications may be made in the future. Even with progress towards minimizing the impacts of these threats, both still pose a major risk to the survival and recovery of the whales.

The North Atlantic right whale population may have been as low as 50 or fewer animals at the turn of the 20th century (Reeves *et al.* 1992). In 1992, there were an estimated 295 individuals, suggesting that the stock was showing signs of slow recovery (Knowlton *et al.* 1994). The most recent estimate of 396 individuals in 2010 provides further indication that the population is recovering (Waring *et al.* 2012). The biological criteria for downlisting require (a) an increasing population, and (b) that the population growth rate is greater than 2% over a period of 35 years. Additional criteria for downlisting as that (c) none of the threats to North Atlantic right whales can be found to be limiting their recovery, and (d) the right whale population can have no more than a 1% chance of quasi-extinction in 100 years.

While population trends are positive and growth rates are reaching the 2% target, the overall status of the population is not consistent with a healthy, recovered population. Considering the status and continuing threats, North Atlantic right whales remain in danger of extinction. Therefore, the recommended classification for North Atlantic right whales is to remain the same: Endangered.

3.0 RESULTS

3.1 Recommended Classification:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (*Indicate reasons for delisting per 50 CFR 424.11):*
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X_ No change is needed

3.2 New Recovery Priority Number:

No change.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

Recovery of the North Atlantic right whale is likely dependent on simultaneously reducing the two major sources of anthropogenic mortality—ship strikes and fishing gear entanglement—while monitoring the growth and health of this population over a long time series. Various studies of the population are underway and they should be encouraged and funded to the extent possible. Throughout the past 5 years, NMFS has established a number of measures to reduce both ship strikes and entanglements in fishing gear through the ship speed rule and amendments to the ALWTRP, respectively. NMFS is committed to actively monitoring these regulations to determine their effectiveness, and amending them as needed based on the best available scientific information.

To assist the management of human interactions with right whales, researchers should develop reliable population estimates for this species. Sound population estimates will improve the ways in which fishery interactions are managed through the ALWTRP and will also provide a better foundation for evaluating the effectiveness of the ship speed rule. In addition, the development of reliable methods to better partition right whale serious injury/mortality estimates due to entanglement in commercial fishing gear between U.S. and Canadian fishing gear would be of significant benefit to management efforts under the ALWTRP.

While recovery of the North Atlantic right whale will need to be assessed in the coming decades, progress toward fulfilling the following recommendations from the 2005 North Atlantic Right Whale Recovery Plan would be beneficial when conducting the next 5-Year Review:

- *(1.1.5) Assess the effectiveness and efficiency of the survey programs in attaining the primary goal of reducing ship strikes.*

- *(1.1.16) Assess the effectiveness of ship strike measures and adjust, as necessary.*

- *(1.1.19) Develop programs and update materials to educate mariners about right whales, to provide recommended practices for avoiding ship strikes, and to educate the shipping industry about steps being taken to reduce ship strikes. Make provisions for ongoing distribution of materials.*

- *(1.1.36) Continue to review and evaluate stranding and photo-identification data for evidence of collision between ships and whales.*

- *(1.2.1) Develop and implement strategies to modify fishing operations and gear in order to reduce the likelihood of entanglement, mitigate the effects of entanglements, enhance the possibility of disentanglement, and assess the effectiveness of such strategies.*

- *(1.2.2) Conduct research on alternative fishing methods. Implement methods that offer entanglement risk reduction.*

- *(1.2.3) Work with Canadian officials to develop means to reduce entanglement levels in Canadian waters.*

- *(1.2.4) Conduct studies of gear modifications that reduce the likelihood of entanglement, mitigate the effects of entanglements, and enhance the possibility of disentanglement.*

- *(1.4.1) Continue and improve programs to ensure that fishing and shipping regulations are enforced.*

- *(4.1) Develop quantitative recovery criteria population models to determine extinction risk, and parameters to validate the model predictions.*

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NOAA FISHERIES SERVICE
5-YEAR REVIEW
North Atlantic Right Whale (*Eubalaena glacialis*)

Current Classification: Endangered

Recommendation resulting from the 5-Year Review

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_X_ No change is needed

Review Conducted By: Mary A. Colligan
Assistant Regional Administrator for Protected Resources

REGIONAL OFFICE APPROVAL:

Lead Regional Administrator, NOAA Fisheries Service

Approve: _____ Date: 8/28/12

The Lead Region must ensure that other Regions within the range of the species have been provided adequate opportunity to review and comment prior to the review's completion. Written concurrence from other regions is required.

Cooperating Regional Administrator, NOAA Fisheries Service

_√_ *Concur* ____ *Do Not Concur*

Signature for Miles M Croom *Date* 8/29/2012

HEADQUARTERS APPROVAL:

Assistant Administrator, NOAA Fisheries Service

_X_ *Concur* ____ *Do Not Concur*

Signature _____ *Date* 9/13/12