

REGULATORY IMPACT REVIEW**CHAPTER 10**

10.1 INTRODUCTION

Actions taken to amend fisheries management plans or implement other regulations governing U.S. fisheries are subject to the requirements of a number of Federal laws and executive orders. Among these is Executive Order 12866, which states the following:

In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environment, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

In accordance with the requirements of Executive Order 12866, this Regulatory Impact Review (RIR) evaluates the modifications to the Atlantic Large Whale Take Reduction Plan (ALWTRP) that the National Marine Fisheries Service (NMFS) is considering. The scope of the discussion includes:

- The objectives and legal basis of the proposal to revise the ALWTRP;
- The problem of large whale entanglement;
- The fisheries affected by the ALWTRP;
- The provisions included in the regulatory alternatives under consideration;
- Estimation of the costs and benefits associated with the alternatives;
- Characterization of the social impacts associated with the alternatives; and
- Integration and comparison of the alternatives' costs and benefits.

10.2 OBJECTIVES AND LEGAL BASIS OF PROPOSED RULES

The revisions to the ALWTRP that NMFS is considering are designed to improve the effectiveness of commercial fishing regulations implemented to conserve and protect three endangered species – North Atlantic right whales (*Eubalaena glacialis*), North Atlantic humpback whales (*Megaptera novaeangliae*), and fin whales (*Balaenoptera physalus*) – thereby fulfilling NMFS' obligations under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA). The need for the proposed revisions is demonstrated by the continuing risk of serious injury and mortality of Atlantic large whales due to entanglement in commercial fishing gear.

The MMPA of 1972 provides protection for species or stocks that are, or may be, in danger of extinction or depletion as a result of human activity. The MMPA states that measures should be taken immediately to replenish the population of any marine mammal species or stock that has diminished below its optimum sustainable level. With respect to any stock or species, the “optimum sustainable population” is the number of animals that will result in the maximum productivity of the stock or species, taking into account the carrying capacity of the habitat and the health of the ecosystem of which they form a constituent element.

Under the MMPA, the Secretary of Commerce is responsible for the conservation and management of pinnipeds (other than walruses) and cetaceans (including whales). The Secretary of Commerce has delegated MMPA authority to NMFS.

In 1994, Congress amended the MMPA, establishing new provisions to govern the taking of marine mammals incidental to commercial fishing operations.¹ These new provisions include the preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction, and development and implementation of take reduction plans for stocks that may be reduced or are being maintained below their optimum sustainable population due to interactions with commercial fisheries.

Take reduction plans are required for all "strategic stocks." Under the MMPA, a "strategic stock" is a stock: (1) for which the level of direct human-caused mortality exceeds the Potential Biological Removal (PBR) level; (2) that is declining and is likely to be listed under the ESA in the foreseeable future; or (3) that is listed as a threatened or endangered species under the ESA or as a depleted species under the MMPA.² The immediate goal of a take reduction plan is to reduce, within six months of its implementation, the mortality and serious injury of strategic stocks incidentally taken in the course of U.S. commercial fishing operations to below the PBR levels established for such stocks. The long-term goal of a take reduction plan is to reduce, within five years of its implementation, the incidental mortality and serious injury of strategic marine mammals taken in the course of commercial fishing operations to insignificant levels

¹ As defined in the MMPA, the term "take" means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.

² The Potential Biological Removal (PBR) level is defined in the MMPA as the maximum number of animals, not including natural mortalities, which may be removed from a marine mammal stock annually while allowing that stock to reach or maintain its optimum sustainable population. Procedures for calculating the PBR level are described in the MMPA.

approaching a zero mortality and serious injury rate, taking into account the economics of the fishery, the availability of existing technology, and existing state or regional fishery management plans.

Right whales, humpback whales, and fin whales are listed as endangered species under the ESA, and are thus considered strategic stocks under the MMPA. Pursuant to its obligations under the MMPA, NMFS in 1996 established the Atlantic Large Whale Take Reduction Team (ALWTRT), an advisory group empaneled to develop recommendations for reducing the incidental take of large whales in commercial fisheries along the Atlantic Coast. The ALWTRT includes representatives of the fishing industry, state and Federal resource management agencies, the scientific community, and conservation organizations. The purpose of the ALWTRT is to provide guidance to NMFS in developing and amending the ALWTRP to meet the goals of the MMPA with respect to Atlantic large whales.

In addition to the MMPA, the ESA provides a legal foundation for measures to protect right whales, humpback whales, and fin whales. The ESA provides for the conservation of species that are in danger of extinction throughout all or a significant portion of their range, as well as the conservation of the ecosystems on which these species depend.³ The right whale, humpback whale, and fin whale species are all federally-listed as endangered and are therefore subject to protection under the ESA.

Section 7 of the ESA directs all Federal agencies to use their existing authorities to conserve threatened and endangered species and to ensure that their actions do not jeopardize listed species or destroy or adversely modify the critical habitat of those species. When a proposed Federal action may affect an ESA-listed marine species, Section 7 directs that the "Action agency" consult with the Secretary of Commerce; this is referred to as a Section 7 consultation.^{4,5}

To assess impacts on large whale and sea turtle species protected under the ESA, NMFS has prepared Biological Opinions for the continued authorization of Federal fisheries under the Fishery Management Plans (FMPs) for the multispecies, spiny dogfish, and monkfish fisheries, and under Federal regulations for the lobster fishery, amongst others. Section 7 consultations were first initiated for each of these fisheries either at the time the FMP was developed or, in the case of lobster, when a significant amendment (Amendment 5) to the Federal Lobster Management Plan was under consideration. The Northeast multispecies fishery has a long consultation history, including formal and informal Section 7 consultations, beginning with a formal consultation initiated on June 12, 1986. Formal consultation was first initiated for spiny dogfish on August 13, 1999; for monkfish on December 21, 1998; and for lobster on March 23, 1994. Subsequent ESA Section 7 consultations on those fisheries incorporated the ALWTRP as

³ "Species," as defined by the ESA, includes any subspecies of fish, wildlife, or plant and any distinct population segment of any vertebrate species which interbreeds when mature.

⁴ The "Action agency" is the Federal agency charged with permitting, conducting or funding the proposed activity serving as the basis for the consultation.

⁵ Federal agencies must consult with the Secretary of the Interior when a proposed action may affect an ESA-listed species under the Department of Interior's purview.

a Reasonable and Prudent Alternative (RPA) to avoid jeopardy to right whales. NMFS reinitiated consultation on May 4, 2000, for the multispecies, spiny dogfish and monkfish gillnet fisheries, and on June 22, 2000, for the lobster fishery, following new whale entanglements resulting in serious injuries to right whales, at least one right whale mortality in gillnet gear, new information indicating a declining status for western North Atlantic right whales, and revisions to the ALWTRP.

The Biological Opinions from the May/June 2000 Section 7 consultations, finalized June 14, 2001, found that NMFS' authorization of these Federal fisheries, as modified by the ALWTRP requirements in effect at that time, was likely to jeopardize the continued existence of the western North Atlantic right whale. The Biological Opinions identified a set of Reasonable and Prudent Alternatives designed to avoid the likelihood of jeopardy to right whales. These measures included:

- Seasonal Area Management (SAM);
- Dynamic Area Management (DAM);
- An expansion of gillnet gear modification requirements and restrictions to Mid-Atlantic waters and modification of fishing practices in Southeastern waters;
- Continued gear research and modifications; and
- Additional measures that implement and monitor the effectiveness of the RPAs.

These measures were intended, in combination, to reduce the risk of serious injury or mortality of large whales from entanglements in commercial fishing gear, and to minimize adverse impacts if entanglements occur.

Following implementation of the measures described above, entanglements leading to serious injury or death of protected whales, including the North Atlantic right whale, continued to occur. Accordingly, NMFS reinitiated consultation on the continued authorization of a number of fisheries and began to develop modifications to the ALWTRP. At its 2003 meeting, the ALWTRP agreed to manage entanglement risks by focusing first on reducing the risk associated with groundlines, then reducing the risk associated with vertical lines. In October 2007, NMFS issued a final rule that replaced the SAM and DAM programs with broad-based gear modification requirements, including the use of sinking groundline; expanded weak link requirements; additional gear marking requirements; changes in boundaries; seasonal restrictions for gear modifications; expanded exempted areas; and changes in regulatory language for the purposes of clarification and consistency (72 FR 57104, October 5, 2007). The broad-based sinking groundline requirement became fully effective on April 5, 2009. This final rule also incorporated an amendment to the ALWTRP (72 FR 34632, June 25, 2007) that implemented, with revisions, previous ALWTRP regulations by expanding the Southeast U.S. Restricted Area to include waters within 35 nm (64.82 km) of the South Carolina coast, dividing the Southeast

U.S. Restricted Area into Southeast U.S. Restricted Areas North and South, and modified regulations pertaining to gillnetting within the Southeast U.S. Restricted Area.

Following implementation of these measures, NMFS and the ALWTRT turned their collective focus to vertical line risk reduction. At the 2009 ALWTRT meeting, the Team agreed on a schedule to develop a management approach to reduce the risk of serious injury and mortality due to vertical line. As a result of this schedule, NMFS committed to publishing a final rule to address vertical line entanglement by 2014. NMFS also reinitiated consultation on continued authorization of FMPs for a number of fisheries (American lobster; bluefish; spiny dogfish; monkfish; Northeast multispecies; skate; Atlantic mackerel, squid, and butterfish; and summer flounder, scup and Northern black sea bass). These consultations concluded in October 2010. After identifying the steps being taken by NMFS to develop, analyze and implement a vertical line reduction rule, the agency's Biological Opinions concluded that continued operation of the fisheries noted above would be likely to adversely affect, but not jeopardize, the continued existence of right, humpback, and fin whales.

10.3 PROBLEM ADDRESSED BY ALWTRP

Right whales, humpback whales, and fin whales are listed as endangered species under the ESA, and are thus considered strategic stocks under the MMPA. The measures that the ALWTRP requires focus on the conservation of these species, and also benefit minke whales. The current status of these species is summarized below:

- **Right Whale:** The western North Atlantic right whale (*Eubalaena glacialis*) is one of the rarest of all large cetaceans. It is among the most endangered species in the world and is listed as endangered under the ESA. NMFS considers the best estimate of the population of North Atlantic right whales to be approximately 444, well below the optimum sustainable population (OSP).⁶ PBR for this species is currently 0.9 whales per year (Waring et al., 2013).
- **Humpback Whale:** The North Atlantic humpback whale (*Megaptera novaeangliae*) is listed as an endangered species under the ESA. For the Gulf of Maine stock of humpback whales, NMFS estimates a minimum population of 823. PBR for this stock is currently 2.7 whales per year (Waring et al., 2013).
- **Fin Whale:** The fin whale (*Balaenoptera physalus*) is listed as an endangered species under the ESA. Although researchers debate the existence of several distinct subpopulations of this species, NMFS currently treats all fin whales within U.S. waters of the North Atlantic as

⁶ The optimum sustainable population of any stock or species is defined as the number of animals that will result in the maximum productivity of the stock or species, keeping in mind the carrying capacity of the habitat and the health of the ecosystem of which they form a constituent element (16 USC 1362(9)).

members of a single population, with an estimated minimum size of 2,817. PBR for this species is currently 5.6 whales per year (Waring et al., 2013).

- **Minke Whale:** The minke whale (*Balaenoptera acutorostrata*) is not listed as endangered or threatened under the ESA. Minke whales in U.S. waters of the North Atlantic are considered part of the Canadian east coast stock of this species. NMFS estimates a minimum population for this stock of 16,199; PBR is currently 162 whales per year (Waring et al., 2013).

Atlantic large whales are at risk of becoming entangled in fishing gear because the whales feed, travel and breed in many of the same ocean areas utilized for commercial fishing. Fishermen typically leave fishing gear such as gillnets and traps/pots in the water for a discrete period, after which time the nets/traps/pots are hauled and their catch retrieved. While the gear is in the water, whales may become entangled in the lines and nets that comprise trap/pot and gillnet fishing gear. The effects of entanglement can range from no permanent injury to death.

A scarification analysis conducted by the New England Aquarium (Knowlton et al., 2002) found that juvenile right whales are entangled with greater frequency than adults. Juvenile animals may not have sufficient strength to break free from entangling lines, which can lead to serious injury and infection resulting from the animal "growing into" the lines.

A study of right whale and humpback whale entanglements (Johnson et al., 2005) found that in cases where the point of gear attachment was known, right whale entanglements frequently (77.4 percent; 24 of 31 entanglement events) involved the mouth, which may indicate that many entanglements occur while whales are feeding. The study also found that humpback whales are more commonly reported with entanglements in the tail region (53.0 percent; 16 of 30 entanglement events), in cases where the point of attachment was known.⁷ The number of entanglements for which gear type can be identified is too small to detect any trends in the type of gear involved in lethal entanglements. Trap/pot and gillnet gear, however, seem to be the most common, as in 89 percent of the cases the gear was identified as or consistent with trap/pot or gillnet gear (Johnson et al., 2005).⁸ The study confirmed that vertical lines and floating groundlines posed risks for large whales; however, the authors concluded that any type and part of fixed gear is capable of entangling a whale, and several body parts of the whale can be involved.

⁷ In some cases, other parts of the body in addition to the tail may have been entangled.

⁸ According to Johnson et al. (2005), analyses focused on entanglements from which the gear was examined by NMFS gear specialists, as well as other sources considered reliable, but also included entanglements for which the gear type and/or part was identified (e.g., by a fisherman or biologist) but not recovered. In some cases, recovered gear can definitively be traced back to a particular fishery, but in other cases, certain parts of the gear may be recovered that could be considered consistent with gear that is used in a particular fishery. For example, the gear recovered from right whale #3107 consisted of line with a 600-pound weak link, and thus was considered consistent with gear used in the lobster trap/pot fishery. Note that Johnson et al. (2005) have classified this whale's entanglement as lobster trap/pot gear that was set in an unknown location.

Exhibit 10-1 summarizes all known serious injury entanglements of right, humpback, fin, and minke whales from 1997 through 2010, the most recent year that data is available for all species. Humpback whales account for the greatest number of serious injury entanglements (35), followed by right whales (11); minke whales account for five, and fin whales account for four.

Exhibit 10-1

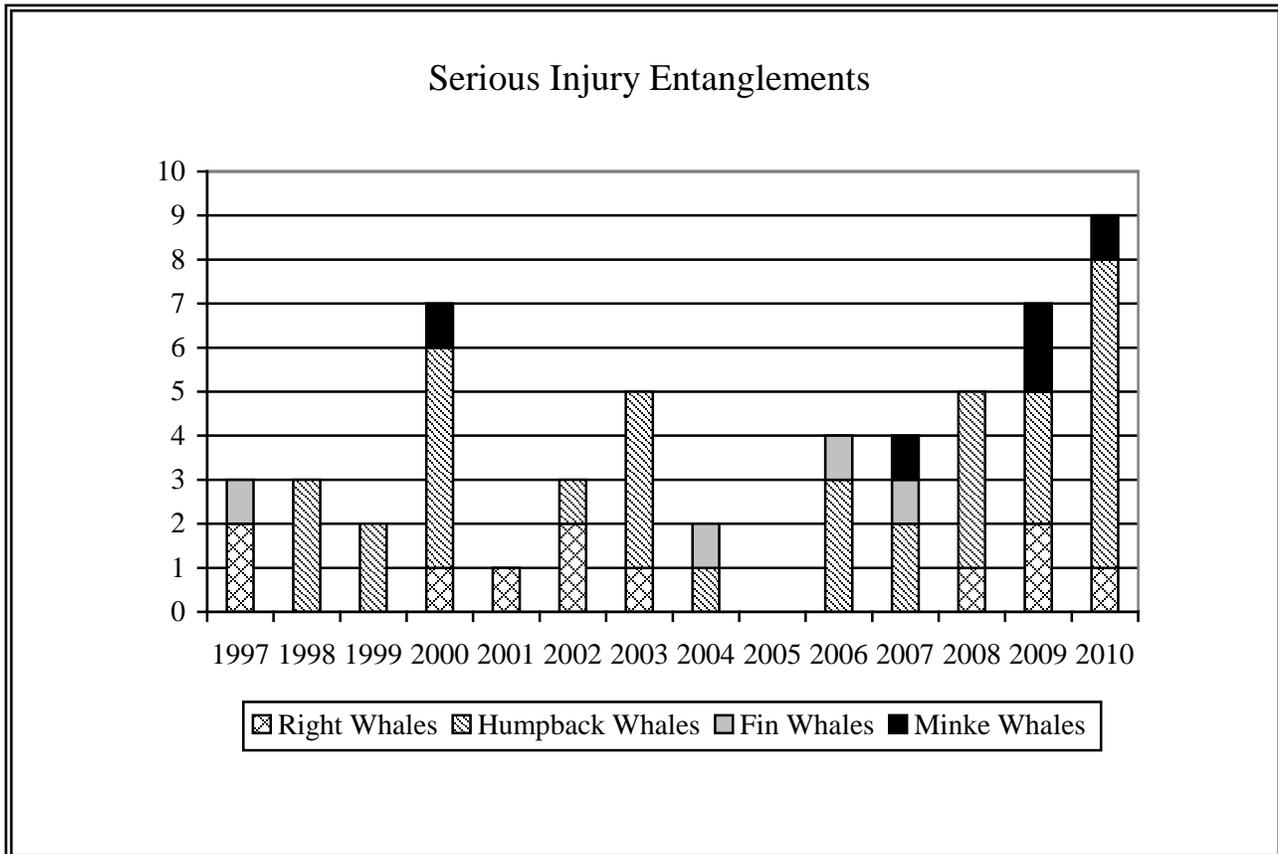
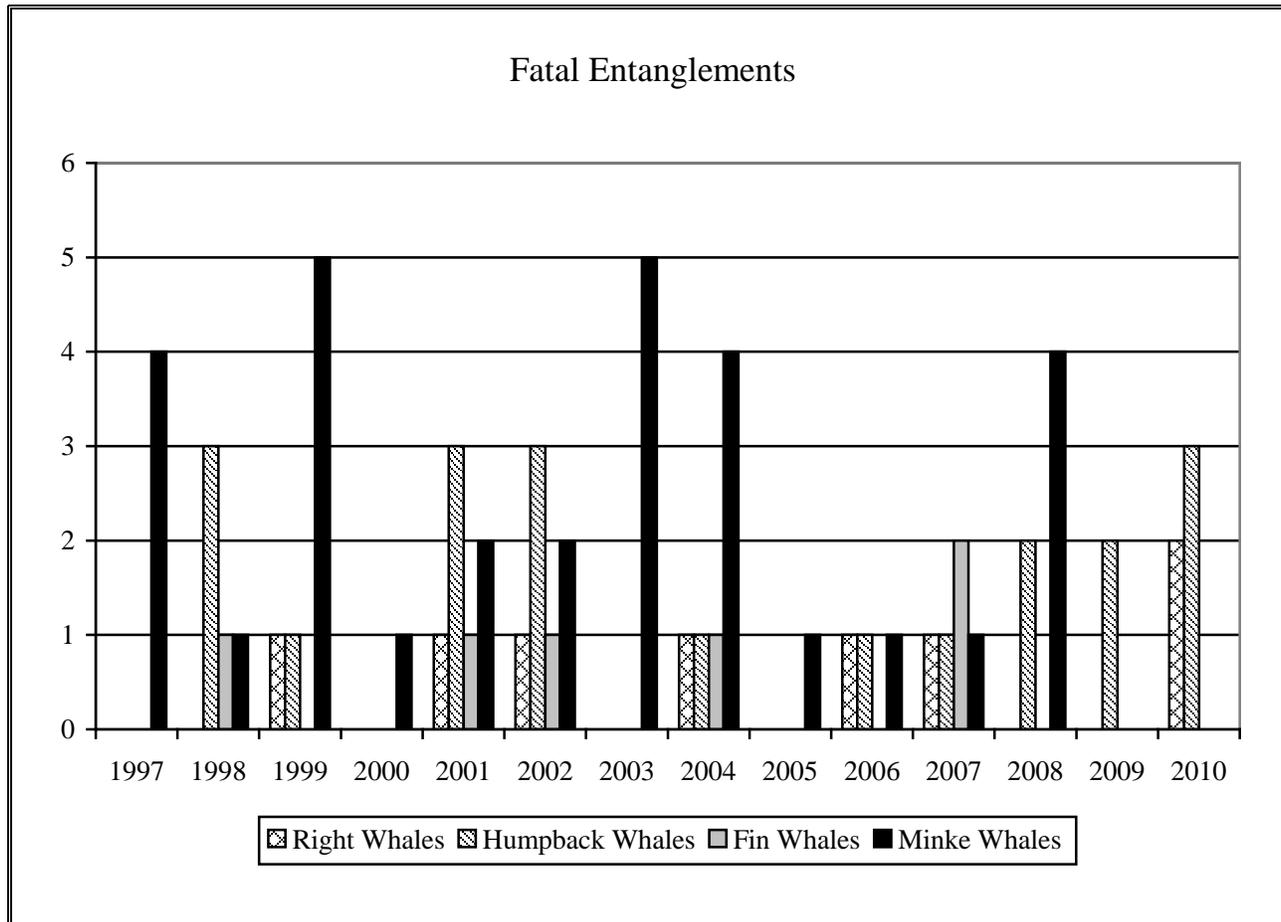


Exhibit 10-2 presents available data on fatal entanglements of Atlantic large whales from 1997 through 2010, the most recent year that data is available for all species. Minke whales account for the most known entanglement mortalities (31), followed by humpback whales (20), right whales (8), and fin whales (6).

Exhibit 10-2

10.4 AFFECTED FISHERIES

As required by the MMPA, NMFS maintains a List of Fisheries that places each commercial fishery into one of three categories. Fisheries are categorized according to the level of serious injury and mortality of marine mammals that occurs incidental to that fishery. The categorization of a fishery in the List of Fisheries determines whether participants in that fishery are subject to certain provisions of the MMPA such as registration, observer coverage, and take reduction plan requirements. Individuals fishing in Category I or II fisheries must comply with requirements of any applicable take reduction plan.⁹

Category I fisheries are associated with frequent incidental mortality and serious injury of marine mammals. These fisheries have a serious injury/mortality rate of 50 percent or more of a stock's potential biological removal rate. Category II fisheries are associated with occasional incidental mortality and serious injury of marine mammals, and have a serious injury/mortality

⁹ Once a fishery is elevated to Category I or II status, it is eligible for inclusion under the ALWTRP; however, NMFS maintains discretion regarding which fisheries it feels must be folded into the Plan in order to provide adequate protection to right, humpback, and fin whales.

rate of more than one percent but less than 50 percent of a stock's PBR. Category III fisheries rarely cause serious injury or mortality to marine mammals. Category III fisheries have a serious injury/mortality rate of one percent or less of a stock's PBR (NOAA, February 2002).

The List of Fisheries indicates which fisheries NMFS may regulate under the ALWTRP.¹⁰ Specific fisheries were initially identified for inclusion under the ALWTRP based on documented whale interactions. In 1996, NMFS announced its intention to regulate the following Category I or II fisheries under the ALWTRP, based on the following documented whale interactions (61 FR 40819-40821):

- **Gulf of Maine, U.S. Mid-Atlantic lobster trap/pot fishery:**¹¹ One record of a serious injury and/or mortality of a northern right whale, and 11 records of a serious injury and/or mortality of humpback whales were reported for this fishery from 1990 to 1994. In addition, NMFS received several reports of right whale entanglements prior to 1990 and after 1994 which are or may be attributable to the lobster fishery.
- **U.S. Mid-Atlantic coastal gillnet fishery:**¹² Between 1989 and 1992, 31 humpback whales stranded from New Jersey through Virginia. Twenty-five percent of the stranded whales had scars consistent with net entanglement. Between 1990 and 1996, 10 humpbacks stranded in Virginia; three animals had rope abrasion injuries consistent with the type of injury expected to result from entanglement in gillnets.
- **New England multispecies sink-gillnet fishery:**¹³ As of 1996, strategic marine mammal species/stocks seriously injured or killed in this fishery included several humpback whales and a northern right whale.
- **Southeastern U.S. Atlantic shark gillnet fishery:** A right whale calf was observed in February, 1994, approximately ten miles off Jacksonville, Florida, with severe cuts and other injuries. Researchers believe, based on the observed injuries, that the calf was entangled in gillnet gear and hauled back into the fishing vessel's propeller as the gear was being retrieved. This method of gear retrieval is consistent with the shark gillnet fishery.

This list has evolved since 1996, reflecting both changes in nomenclature and modification of the ALWTRP to address additional fisheries. At present, the fisheries regulated under the ALWTRP include the Northeast anchored float gillnet fishery; the Northeast/Mid-Atlantic American lobster

¹⁰ Marine mammal take reduction plans relevant to Category I and II fisheries in the Atlantic Ocean include the Harbor Porpoise Take Reduction Plan (50 CFR 229.34), the Atlantic Large Whale Take Reduction Plan (50 CFR 229.32), and the Bottlenose Dolphin Take Reduction Plan.

¹¹ Currently the Northeast/Mid-Atlantic American lobster trap/pot fishery.

¹² Currently the U.S. Mid-Atlantic gillnet fishery.

¹³ Currently the Northeast multispecies fishery.

trap/pot fishery; the Northeast sink gillnet fishery; the Northeast drift gillnet fishery; the Atlantic blue crab fishery; the Atlantic mixed species trap/pot fisheries (fish, crabs, conch, whelk, shrimp, and other species); the Southeast Atlantic gillnet fishery; the Southeastern U.S. Atlantic shark gillnet fishery; and the U.S. Mid-Atlantic gillnet fishery.

10.5 REGULATORY ALTERNATIVES

NMFS has identified seven regulatory alternatives for consideration. The first of these (Alternative 1) is the No Action Alternative, which would make no changes to the ALWTRP. The remaining alternatives propose modifications to the ALWTRP that include some combination of the following:

- **Gear Configuration Requirements** – All of the alternatives propose area-specific minimum trawl lengths for trap/pot fisheries in the Northeast; the minimums specified vary by alternative (see below). Additional provisions mandate the use of single traps or pots and specify weak link, vertical line strength, and vertical line composition requirements for trap/pot fisheries in the Southeast; these requirements are the same for all action alternatives.
- **Closures** – Several alternatives would prohibit ALWTRP trap/pot vessels from fishing in designated areas during designated periods (see below).
- **Gear Marking** – Each of the action alternatives includes revised gear marking requirements for vessels subject to the ALWTRP. The proposed gear marking scheme calls for three 12-inch marks per vertical line, adhering to a regional color-coding system. Under Alternatives 2 through 6 (Draft), the requirements would apply to all gear set in non-exempt waters, as well as to gear set in exempt waters of Maine and New Hampshire. Alternative 6 (Preferred) would impose similar requirements, but would not require gear set landward of Maine’s exemption line to be marked.

Exhibit 10-3 provides an overview and comparison of the alternatives. With the exception of Alternative 6 (Preferred), all of the alternatives, were considered in NMFS’ Draft Environmental Impact Statement (DEIS). Alternative 6 (Preferred) is similar to Alternative 6 (Draft), but differs from it in several respects. As noted above, Alternative 6 (Preferred) would not require gear set landward of Maine’s exemption line to be marked. In addition:

- Alternative 6 (Preferred) would permit two-trap trawls in Maine pocket waters (see Chapter 3 for a description of these areas).
- Alternative 6 (Preferred) would permit the use of single traps within a quarter-mile buffer area surrounding three Maine islands (Monhegan, Ragged, and Matinicus).

- Alternative 6 (Preferred) would maintain existing ALWTRP requirements in New Hampshire state waters, including the requirement to use sinking groundline.
- Alternative 6 (Preferred) would permit the use of two-trap trawls in Rhode Island state waters.

Exhibit 10-4 describes the gear configuration requirements of the action alternatives in greater detail, showing how they vary. Most notably, Alternatives 3, 5, 6 (Draft), and 6 (Preferred) modify the minimum trawl length restrictions incorporated under Alternative 2; the trawling requirements under Alternative 4 are equivalent to those specified in Alternative 2.

Alternatives 2 through 6 (Preferred) include a set of special requirements for the blue crab and OTP fisheries operating in ALWTRP-regulated waters off the coasts of South Carolina, Georgia, and Florida. In waters off South Carolina and Georgia, the alternatives require affected vessels to fish singles; use weak links with a breaking strength no greater than 600 pounds; use vertical line with a breaking strength no greater than 2,200 pounds; and use vertical line that is free of weights, knots, and splices. The requirements for waters off Florida are similar, but specify 200-pound weak links and the use of sink rope with a breaking strength no greater than 1,500-pounds over the entire length of each vertical line.

Exhibit 10-3			
SUMMARY OF PROPOSED ALTERNATIVES			
Alternative	Gear Restrictions	Closures	Gear Marking
Alternative 1 (No Action)	- No change	- None	- No change
Alternative 2	- Area-specific trawling requirements in Northeast - Southeast gear restrictions (weak links, line strength, line composition, singles)	- None	- New system requiring three 12-inch marks per vertical line, adhering to a regional color-coding system - Required in non-exempt waters and ME/NH exempt waters
Alternative 3	- Area-specific trawling requirements with modifications in Maine Zones A-G and exemptions in NH state waters - Southeast: Same as Alternative 2	- CCB Restricted Area	- Same as Alternative 2
Alternative 4	- Same as Alternative 2	- Jordan Basin - Jeffreys Ledge - Massachusetts Restricted Area #1	- Same as Alternative 2
Alternative 5	- Same as Alternative 3	- Jordan Basin - Jeffreys Ledge - Massachusetts Restricted Area #1	- Same as Alternative 2
Alternative 6 (Draft)	- Same as Alternative 3, but with revised trawling requirement in MA state waters (2 traps per trawl rather than 3 traps per trawl)	- Massachusetts Restricted Area #2	- Same as Alternative 2
Alternative 6 (Preferred)	- Same as Alternative 6 (Draft), but with pairs allowed in ME pocket waters and RI state waters; buffer for ME islands; modified exemption for NH state waters	- Massachusetts Restricted Area #2	- Same as Alternative 2, but not required in Maine exempt waters

Exhibit 10-4

SUMMARY OF GEAR RESTRICTION PROVISIONS

Region	Subarea ¹	Component	Alt. 2 ²	Alt. 3	Alt. 4	Alt. 5	Alt. 6 (Draft)	Alt. 6 (Preferred)
North-east	ME Zones A-G: State Waters	Trawl Length	2 to 4	2	= Alt. 2	= Alt. 3	= Alt. 3	= Alt. 3, ¼ mile island buffer
	ME Zones A-G: (3-12 mile)	Trawl Length	5 or 10	N.A.	= Alt. 2	N.A.	N.A.	N.A.
	ME Zones A-G: (12+ mile)	Trawl Length	10 or 20	15	= Alt. 2	= Alt. 3	= Alt. 3	= Alt. 3
	ME Zones A-G: (3-6 mile)	Trawl Length	N.A.	3	N.A.	= Alt. 3	= Alt. 3	= Alt. 3
	ME Zones A-G (6-12 mile)	Trawl Length	N.A.	5 or 10	N.A.	= Alt. 3	= Alt. 3	= Alt. 3
	MA State Waters	Trawl Length	3	= Alt. 2	= Alt. 2	= Alt. 2	2	2
	NH State Waters	Trawl Length	3	Exempt	= Alt. 2	= Alt. 3	= Alt. 3	= Alt. 3 ³
	RI State Waters	Trawl Length	3	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	2
	LMA 1 Other (3-12 mile)	Trawl Length	10	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
	LMA 1 Other (12+ mile)	Trawl Length	20	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
	LMA OC (3-12 mile)	Trawl Length	10	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
	LMA OC (12+ mile)	Trawl Length	20	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
	LMA 2 (3-12 mile)	Trawl Length	10	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
	LMA 2 (12+ mile)	Trawl Length	20	15	= Alt. 2	= Alt. 3	= Alt. 3	= Alt. 3
	LMA 2/3 Overlap (12+mile)	Trawl Length	20	= Alt. 2	= Alt. 2	=Alt. 2	=Alt. 2	=Alt. 2
LMA 3 (3-12 mile)	Trawl Length	10	= Alt. 2	= Alt. 2	=Alt. 2	=Alt. 2	=Alt. 2	
LMA 3 (12+ mile)	Trawl Length	20	= Alt. 2	= Alt. 2	=Alt. 2	=Alt. 2	=Alt. 2	
South-east	Florida State Waters	Weak links	≤ 200 lbs.	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	
		Vertical Line	Breaking strength ≤ 1,500 lbs., one continuous piece of sinking line	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
		Other	One buoy line with one trap, gear mark	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
	Georgia and South Carolina State Waters	Weak Links	≤ 600 lbs.	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
		Vertical Line	Breaking strength ≤ 2,200 lbs., one continuous piece of sinking line	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
		Other	One buoy line with one trap, gear mark	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
	Federal Waters	Weak links	Status quo	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
		Vertical Line	Must be one continuous piece of sinking line	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2
		Other	Must use one buoy line with one trap, gear mark, bring gear back to shore at conclusion of trip	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2	= Alt. 2

Notes:

1. LMA – Lobster Management Area; OC – Outer Cape.
2. Trawls with 5 or fewer traps may have only one endlines.
3. Gear set in New Hampshire state waters would be exempt from trawling requirements, but must satisfy existing ALWTRP requirements.

As noted, some of the alternatives under consideration would introduce the seasonal closure of designated areas to trap/pot gear. Exhibit 10-5 summarizes the basic parameters of each closure, while Exhibit 10-6 presents a series of maps illustrating the location of the areas in which fishing would be restricted. The objective of these provisions is to reduce the concentration of fishing gear when whales are likely to congregate in the areas designated for closure, thus reducing the risk of entanglement. Chapter 3 provides additional detail on the rationale for each closure.

Exhibit 10-5			
SUMMARY OF AREA CLOSURE PROVISIONS			
Closure	Regulatory Alternative	Closure Period	Size (square miles)
CCB Restricted Area	3	February - April	644
Jordan Basin	4 & 5	November - January	725
Jeffreys Ledge	4 & 5	October - January	607
Massachusetts Restricted Area #1	4 & 5	January - April	2,464
Massachusetts Restricted Area #2	6 (Draft) & 6 (Preferred)	January - April	2,161

Exhibit 10-6

LOCATION OF RESTRICTED AREAS

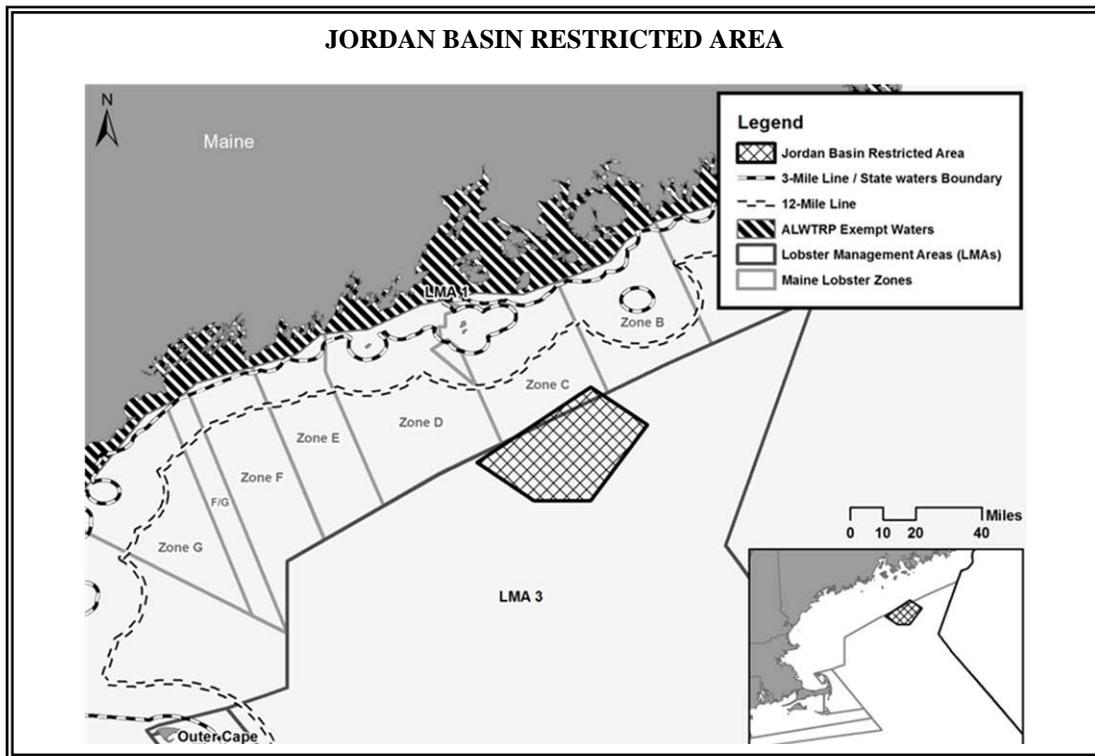
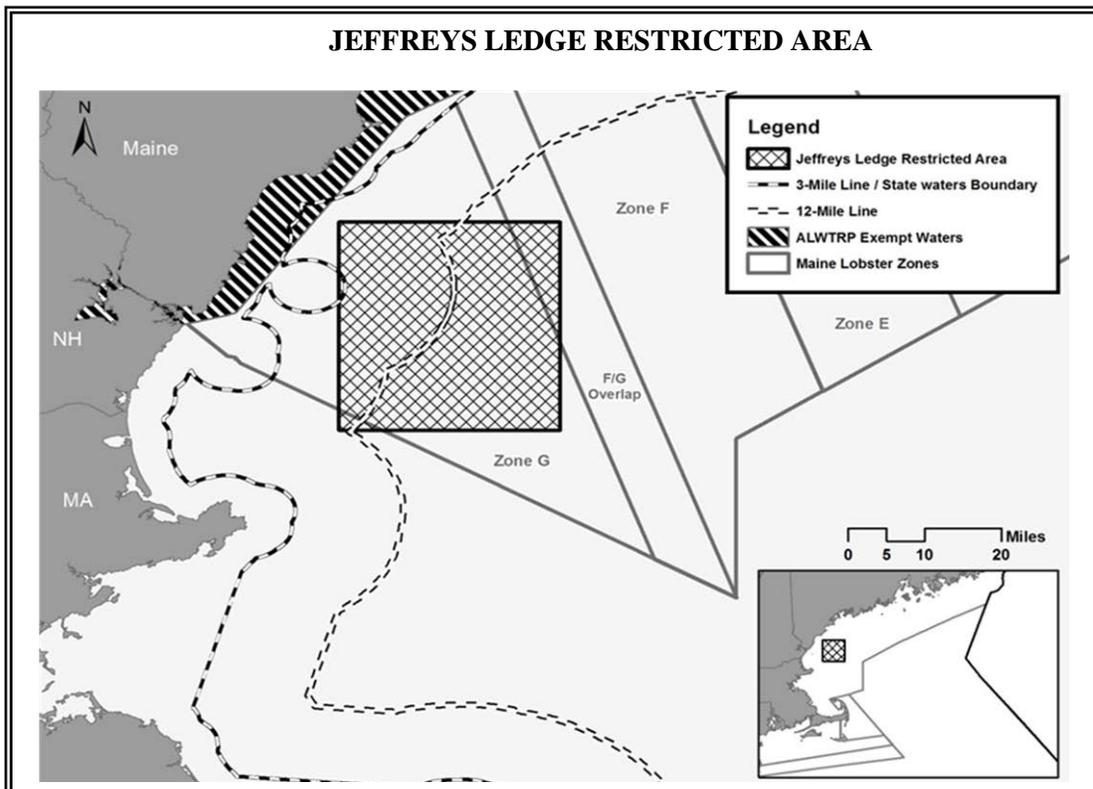
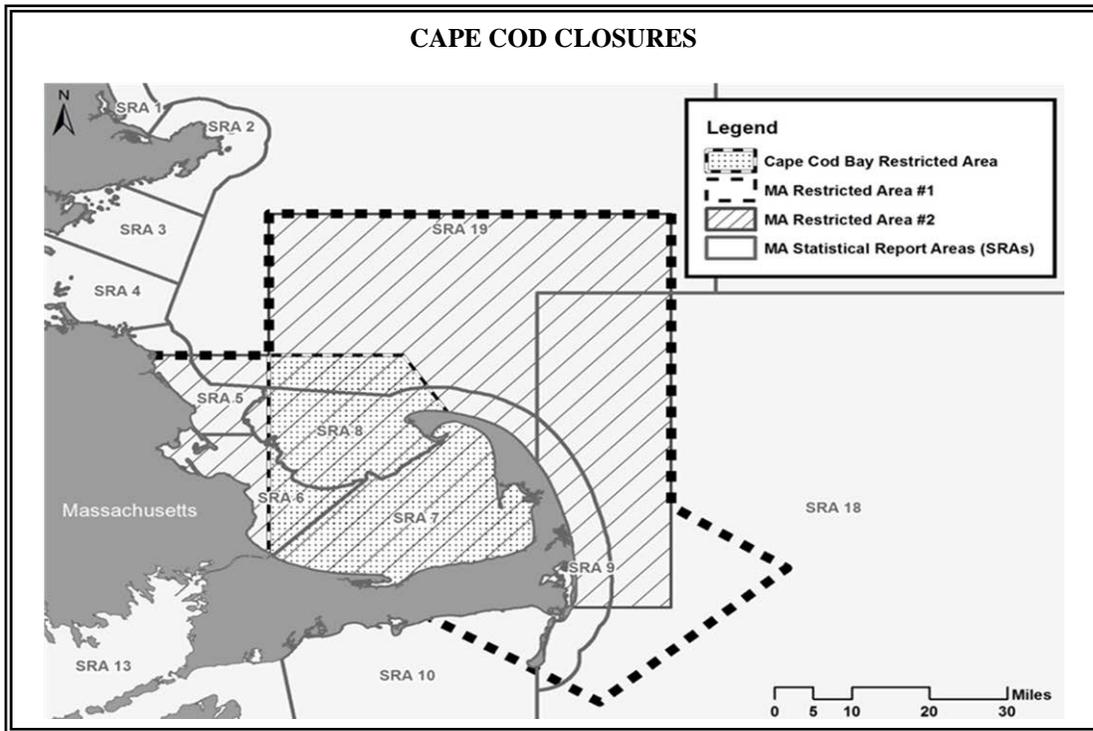


Exhibit 10-6

LOCATION OF RESTRICTED AREAS (continued)



10.6 ECONOMIC ANALYSIS OF ALTERNATIVES

10.6.1 Benefit-Cost Framework

Benefit-cost analysis (BCA) is the preferred method for analyzing the consequences of a regulatory action such as modifying the requirements of the ALWTRP.¹⁴ BCA is a well-established procedure for assessing the "best" course or scale of action, where "best" is that course which maximizes net benefits (i.e., benefits minus costs).¹⁵ Because BCA assesses the value of an activity in net benefit terms, it requires that a single metric, most commonly dollars, be used to gauge both benefits and costs. The data and economic models necessary to estimate costs may be difficult or costly to gather and develop, and a comprehensive analysis of the costs associated with a regulatory action is not always feasible. Nonetheless, the principle is straightforward, and it is generally possible in practice to develop a monetary estimate of at least some portion of regulatory costs. This is the case for costs stemming from changes to the ALWTRP, which would impose additional restrictions on commercial fishing operations.

Assessing the benefits of changes to the ALWTRP in a BCA framework is also straightforward in principle but much more difficult in practice. To the extent that new regulations would reduce the risk that whales will suffer serious injury or mortality as a result of entanglement in commercial fishing gear, they would produce real benefits. Ideally, these benefits would be measured first by a biological metric, and then by a dollar metric. A biological metric could take the form of the expected decrease in extinction risk, increase in the annual growth of the population, or similar measures. A BCA would then value these quantified biological benefits in terms of willingness-to-pay, the standard economic measure of economic value recommended by the Office of Management and Budget (OMB).¹⁶ This would produce a dollar estimate of the benefits of the change in regulations, which could then be compared directly to the costs. In the case of the ALWTRP, however, the data required to complete such an analysis are not available. Estimation of the economic benefits attributable to each of the regulatory alternatives that NMFS is considering would require a more detailed understanding of the biological impacts of each measure than current models can provide. It also would require more extensive research than economists have conducted to date on the relationship between conservation and restoration of these species and associated economic values.

In the absence of the information required to conduct a full BCA, the discussion that follows presents qualitative information on the benefits that may stem from improved protection of endangered whales, coupled with a quantitative indicator of the potential impact of each alternative. It then presents estimates of the costs attributable to each alternative. As discussed later in this chapter, the analysis uses this information to evaluate the cost-effectiveness of the regulatory alternatives under consideration. Because the alternatives vary with respect to the benefits they would achieve, it is not possible to identify a superior option based on cost-

¹⁴ U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at <http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf>.

¹⁵ Zerbe, R., and D. Dively, 1994. *Benefit Cost Analysis in Theory and Practice*, New York: HarperCollins.

¹⁶ OMB, 2003.

effectiveness alone.¹⁷ Nonetheless, the cost-effectiveness figures provide a useful means of comparing the relative impacts of the regulatory provisions that each alternative incorporates.

10.6.2 Benefits of Large Whale Protection

Since the suspension of commercial whaling in the U.S., there has been no conventional market for the consumptive use of products derived from whales. Nonetheless, whale protection and associated increases in whale populations may generate two types of benefits: (1) non-consumptive use benefits; and (2) non-use benefits.

10.6.2.1 Non-Consumptive Use Benefits

A variety of recreational activities involve the non-consumptive use of natural resources, either in a market or non-market context. The opportunity to enjoy one such activity, whale watching, has fostered the development of the commercial whale watching industry. Although current data on the industry are lacking, a study by Hoyt (2000) suggests that roughly half of all commercial whale watching worldwide occurs in the U.S., and that much of this activity is centered in New England.¹⁸ As shown in Exhibit 10-7, the Hoyt study identified 36 whale watching businesses in New England, with most operating multiple vessels. Hoyt estimated that over one million individuals each year take whale watching tours in the region, generating over \$30 million in annual revenue for the industry. Because these figures only apply to permitted and registered operations, the full scale and economic impact of whale watching activity is likely to be greater.

Exhibit 10-7				
NEW ENGLAND WHALE WATCHING INDUSTRY				
State	Number of Operations	Number of Vessels	Annual Ridership	Annual Revenue (millions \$)
Massachusetts	17	30-35	1,000,000	\$24.0
New Hampshire	4	6-10	80,000	\$1.9
Maine	14	18-24	137,500	\$4.4
Rhode Island	1	1	12,500	\$0.3
TOTAL	36	55-70	1,230,000	\$30.6
Source: Hoyt, 2000.				

The development of the commercial whale watching industry provides a valuable source of information on individuals' willingness to pay for the opportunity to experience whales in their natural environment. This in turn makes it feasible, at least in theory, to evaluate the potential impact of changes in willingness to pay on surplus values in this market, i.e.:

¹⁷ OMB, 2003.

¹⁸ Although whale watching operations exist in the Mid- and South Atlantic states, the level of activity is lower and cannot be reliably distinguished from tours to view other species, such as dolphins.

- **Consumer Surplus** – the difference between the maximum amount that consumers would be willing to pay to go on a whale watch and the price they actually pay;
- **Producer Surplus** – the difference between the payments commercial whale watching enterprises receive for their services and the economic costs they incur to provide them.¹⁹

Any increase in consumer or producer surplus represents a gain in economic welfare, and thus a benefit to society.

A number of studies have demonstrated substantial levels of consumer surplus in the commercial whale watching market. For example, a study of the demand for whale watching at the Stellwagen Bank National Marine Sanctuary found that tour customers realized an average consumer surplus of approximately \$26 per trip (Hoagland and Meeks, 2000). Several studies have noted that customer enjoyment is positively correlated with the number of whales sighted. The Stellwagen Bank study asked respondents to cite the most attractive features of a whale watch; the top responses included the number of whales seen as well as the number of species seen. Likewise, Loomis and Larson (1994) determined that whale watch customers viewing gray whales were willing to pay more for the experience when populations increased. This suggests that an increase in the population of whales could lead to increased demand for commercial whale watching tours, and a concomitant increase in consumer and/or producer surplus values in the market for these services.

It is not feasible at present to estimate the impact of potential modifications to the ALWTRP on producer or consumer surplus values in the whale watching market. Estimation of these impacts would require the ability to forecast the impact of various management measures on the population of whales, coupled with a far more detailed understanding of the relationship between an increase in this population and demand for viewing opportunities. Given the level of activity in the industry, however, it is reasonable to assume that the benefits associated with additional opportunities to see, photograph, and otherwise experience whales in their natural environment could be substantial.

10.6.2.2 Non-Use Benefits

The protection and restoration of populations of endangered whales may also generate non-use benefits.²⁰ Economic research has demonstrated that society places economic value on (relatively) unique environmental assets, whether or not those assets are ever directly exploited. For example, society places real (and potentially measurable) economic value on simply

¹⁹ The economic cost of the resources (raw materials, capital, and labor) used to provide a particular good or service to consumers is the opportunity cost of that use; i.e., the value of the goods and services those resources could otherwise produce. Market distortions may yield differences between the costs that producers bear and the true economic costs of the resources they employ.

²⁰ The discussion of non-use benefits is based in part on NMFS, *Steller Sea Lion Protection Measures, Final Supplemental Environmental Impact Statement*, November 2001.

knowing that large whale populations are flourishing in their natural environment (often referred to as “existence value”) and will be preserved for the enjoyment of future generations.²¹ Using survey research methods, economists have developed several studies of non-use values associated with protection of whales or other marine mammals. Exhibit 10-8 summarizes these studies. In each, researchers surveyed individuals on their willingness to pay (WTP) for programs that would maintain or increase marine mammal populations. The most recent of the studies (Wallmo and Lew, 2012) employed a stated preference method to estimate the value of recovering or down-listing eight ESA-listed marine species, including the North Atlantic right whale. Through a survey of 8,476 households, the authors estimated an average WTP (per household per year, for a 10-year period) of \$71.62 for full recovery of the species and \$38.79 for recovery sufficient to down-list the species from “endangered” to “threatened.” While the other studies noted do not focus specifically on the North Atlantic populations of right, humpback, fin, or minke whales, they do demonstrate that individuals derive economic value from the protection of marine mammals.

Exhibit 10-8		
STUDIES OF NON-USE VALUE ASSOCIATED WITH MARINE MAMMALS		
Author	Title	Findings
Giraud et al. (2002)	Economic Benefit of the Protection of the Steller Sea Lion	Estimated WTP for an expanded Steller sea lion protection program. The average WTP for the entire nation amounted to roughly \$61 per person.
Hageman (1985)	Valuing Marine Mammal Populations: Benefit Valuations in a Multi-Species Ecosystem	Per-household WTP for Gray and Blue Whales, Bottlenose Dolphins, California Sea Otters, and Northern Elephant Seals estimated to be \$23.95, \$17.73, \$20.75, and \$18.29 per year, respectively (1984 dollars).
Loomis and Larson (1994)	Total Economic Values of Increasing Gray Whale Populations: Results From a Contingent Valuation Survey of Visitors and Households	Mean WTP of U.S. households for an increase in gray whale populations estimated to be \$16.18 for a 50 percent increase and \$18.14 for a 100 percent increase.
Day (1985), cited in Rumage (1990)	The Economic Value of Whalewatching at Stellwagen Bank. The Resources and Uses of Stellwagen Bank	Non-use value of the presence of whales in the Massachusetts Bays system estimated to be \$24 million.
Samples et al. (1986)	Information Disclosure and Endangered Species Valuation	Estimated individual WTP for protection of humpback whales of \$39.62 per year.
Samples and Hoyller (1989)	Contingent Valuation of Wildlife Resources in the Presence of Substitutes and Complements	Respondents’ average WTP (lump sum payment) to protect humpback whales in Hawaii ranged from \$125 to \$142 (1986 dollars).
Wallmo and Lew (2012)	Public Willingness to Pay for Recovering and Downlisting Threatened and Endangered Marine Species	Per-household mean WTP annually over 10 years for increase in North Atlantic right whale populations estimated to be \$71.62 (for recovery) and \$38.79 (for down-listing to threatened status) (2010 dollars).

²¹ Non-use values such as those measured in these studies are closely related to “spiritual” or “ethical” values emphasized by some whale conservation advocates. These observers argue that whales deserve protection from human interference, and that such protection provides an intellectual or spiritual benefit to mankind.

10.6.2.3 Relative Ranking of Alternatives

As noted above, it is not feasible at present to estimate the economic benefits attributable to each of the regulatory alternatives that NMFS is considering. It is possible, however, to develop a relative ranking of the alternatives with respect to potential benefits, based on the estimated impact of each alternative on the potential for whales to become entangled in commercial fishing gear.

The biological impacts analysis presented in Chapter 5 relies primarily on NMFS' Vertical Line Model to examine how the regulatory alternatives might reduce the possibility of interactions between whales and fishing gear. As discussed in that chapter, the model integrates information on fishing activity, gear configurations, and whale sightings to provide indicators of the potential for entanglements to occur at various locations and at different points in time. The fundamental measure of entanglement potential is co-occurrence. The co-occurrence value estimated in the model is an index figure, integrated across the spatial grid, indicating the degree to which whales and the vertical line employed in gillnet or trap/pot fisheries coincide in the waters subject to the ALWTRP. Biological impacts are characterized with respect to the percentage reduction in the overall co-occurrence indicator each alternative would achieve.

Exhibit 10-9 summarizes the estimated change in co-occurrence under each action alternative relative to the no-action alternative (Alternative 1). Separate results are provided for Northeast waters and all ALWTRP waters coastwide. Alternative 2, which includes trawling requirements but no closures, is estimated to yield a reduction in co-occurrence of approximately 36 percent. Alternatives 3 through 6 (Preferred) add incrementally to this reduction through closure of high-risk areas at various times of year. The estimated impact of these closures is greater when affected vessels are assumed to suspend fishing rather than relocate to alternative fishing grounds. The greatest reduction in co-occurrence is achieved under Alternative 5, which includes modified trawling requirements as well as three closures (Jeffreys Ledge, Massachusetts Restricted Area #1, and Jordan Basin). Under this alternative, the estimated reduction in co-occurrence ranges from approximately 40 to 42 percent. Under Alternative 6 (Preferred), the estimated reduction in co-occurrence is approximately 38 percent in Northeast waters and 37 percent coastwide.

Exhibit 10-9		
ANNUAL CHANGE IN CO-OCCURRENCE		
Alternative	Percent Reduction in Co-Occurrence Score	
	Northeast Waters	Coastwide
Alternative 1 (No Action)	0.0%	0.0%
Alternative 2	-36.1%	-35.8%
Alternative 3 (100% Suspend)	-37.7%	-37.4%
Alternative 3 (Relocation)	-37.4%	-37.2%
Alternative 4 (100% Suspend)	-40.8%	-40.5%
Alternative 4 (Relocation)	-39.0%	-38.7%
Alternative 5 (100% Suspend)	-42.0%	-41.7%
Alternative 5 (Relocation)	-40.0%	-39.7%
Alternative 6 – Draft (100% Suspend)	-38.2%	-38.0%
Alternative 6 – Draft (Relocation)	-37.7%	-37.4%
Alternative 6 – Preferred (100% Suspend)	-38.2%	-37.9%
Alternative 6 – Preferred (Relocation)	-37.7%	-37.4%

10.6.3 Fishing Industry Compliance Costs

The costs attributable to the introduction of new regulations on the fisheries subject to the ALWTRP would be borne primarily by commercial fishermen, particularly those in the lobster fishery. This fishery includes thousands of licensed participants, none of whom account for a substantial share of the market. As a result, those in the harvest sector lack the ability to raise prices to cover any increase in their operating costs; the price they receive for their catch is dictated by market conditions, which can vary considerably from season to season. Thus, the costs of complying with new regulatory requirements are likely to be reflected in reductions in producer surplus in the harvest sector.²²

The economic impact analysis developed for this EIS provides detailed estimates of the compliance costs associated with potential changes to the ALWTRP. The analysis estimates compliance costs for model vessels and extrapolates from these findings to estimate the overall cost to the commercial fishing industry of complying with the regulatory changes under consideration. The analysis measures the cost of complying with new requirements relative to the status quo – i.e., a baseline scenario that assumes no change in existing ALWTRP requirements. Thus, all estimates of compliance costs are incremental to those already incurred in complying with the ALWTRP. All costs are presented on an annualized basis and reported in 2011 dollars. The calculation of annualized costs is based on a real annual discount rate of seven percent, consistent with current OMB guidelines.

The discussion that follows summarizes the estimated cost of complying with each of the regulatory alternatives that NMFS is considering, including both the average cost for affected vessels and industry-wide compliance costs. Additional detail on the methods and results of the economic impact analysis can be found in Chapter 6.

10.6.3.1 Compliance Cost Estimation Methods

As discussed above, Alternatives 2 through 6 (Preferred) propose modifications to the ALWTRP that include some combination of gear configuration requirements, the seasonal closure of designated areas, and gear marking requirements. The methods employed to estimate the costs attributable to these requirements are described below.

Gear Configuration Requirements

A major component of Alternatives 2 through 6 (Preferred) is a minimum trawl length requirement – i.e., prohibiting trawls of less than a specified number of traps or pots – for

²² As noted later in this chapter, the action alternatives under consideration could have a modest impact on the annual lobster catch. If this occurs, retail prices could rise, resulting in a reduction in consumer surplus. Such an increase in prices would, at least in theory, help to offset the costs that fishermen would incur in complying with new regulations. Whether this would in fact be the case depends on the extent to which an increase in prices at the retail level would translate to an increase in ex-vessel prices, or would instead be absorbed in higher profits elsewhere in the supply chain. Given these uncertainties, the analysis focuses on compliance costs in the harvest sector as a reasonable approximation of the social costs attributable to potential changes in ALWTRP requirements.

trap/pot fisheries in Northeast waters. The exact nature of this requirement varies by alternative and location. The costs that fishermen are likely to incur in complying with such requirements are primarily composed of *gear conversion* costs and *catch impacts*.

Vessels fishing shorter configurations (e.g., singles, doubles) would need to reconfigure their gear to comply with trawling requirements. These changes may require expenditures on new equipment as well as investments of fishermen's time. Analysis of the economic impact of the trawling requirements entails comparing the baseline configuration of gear assigned to model vessels in NMFS' Vertical Line Model with the minimum trawl length that would be required under each regulatory alternative. The analysis identifies instances in which the reconfiguration of gear would be required, estimates the material and labor necessary to bring all gear into compliance, and calculates the resulting cost. Equipment costs are a function of the quantity of gear to be converted and the unit cost of the materials needed to satisfy the trawling requirement. Labor costs are a function of the time required to implement a specific modification, the quantity of gear to be converted, and the implicit labor rate. All costs are calculated on an incremental basis, taking into account any savings in material or labor costs that might result from efforts to comply with new ALWTRP regulations.

In addition to the direct cost of gear conversion, catch rates may decline for vessels that are required to convert from shorter sets to longer trawls, reducing the revenues of affected operations. To estimate impacts in the lower bound, the analysis assumes that vessels implementing a major increase in trawl length (an increase of a factor of two or more in the number of traps in each set) would experience a five percent reduction in their annual catch. In the upper bound, the analysis assumes that these vessels would experience a ten percent reduction in catch, while all other vessels would experience a five percent reduction. The resulting impact on each vessel's annual revenues is based on prevailing ex-vessel prices for lobster or other trap/pot species.

Seasonal Closure Requirements

The analysis of the costs associated with the seasonal closure of designated areas begins by using the Vertical Line Model to estimate the number and type of vessels ordinarily active in each area during the proposed closure period. The remainder of the analysis is organized around two scenarios. In the upper bound, the analysis assumes that these vessels would remove all affected gear from the water for the duration of the closure. In this scenario, economic losses are estimated as the net loss in vessel revenue (i.e., the loss in gross revenue adjusted to take into account estimated savings in operating costs). In the lower bound, the analysis uses available data to identify alternative fishing grounds and the likely subset of vessels that would relocate their gear to alternative areas. In this scenario, estimates of economic losses are based on estimated changes in fuel use, time on the water, and catch per trap.

Gear Marking Requirements

Alternatives 2 through 6 (Preferred) specify revised gear marking requirements for vessels that are subject to the ALWTRP, including those in the lobster, OTP, blue crab, and gillnet fisheries. The requirements apply to all gear set in non-exempt waters. Under

Alternatives 2 through 6 (Draft), the new requirements would also apply to gear set in exempt areas of Maine and New Hampshire state waters. In contrast, under Alternative 6 (Preferred), gear set in Maine waters landward of the ALWTRP exemption line would remain exempt from gear marking requirements. For each alternative, the analysis of gear marking costs is based on the Vertical Line Model's estimates of the number of affected vessels and the number of vertical lines fished by those vessels (taking proposed trawling requirements into account). To model these costs, the analysis assumes that lines would be marked using gear marking whips woven into the line, each of which takes roughly five minutes to install. Annualized material and time costs are estimated for each model vessel, then extrapolated to the broader population of affected vessels.

10.6.3.2 Economic Impact Results

Of the fisheries subject to the requirements of the ALWTRP, the lobster fishery would bear the largest share of impacts from the regulatory alternatives under consideration. As Exhibit 10-10 shows, the lobster fishery accounts for the greatest number of vessels that would be required to reconfigure their gear to comply with trawling requirements. This is true across all action alternatives. In addition, the analysis indicates that the lobster fishery alone would be affected by the seasonal closure of fishing grounds. In contrast, all vessels fishing gear subject to ALWTRP requirements would be affected by the gear marking provisions. Under Alternatives 2 through 6 (Draft), this includes gear fished in Maine and New Hampshire waters that otherwise would be exempt from ALWTRP requirements. Alternative 6 (Preferred) would not require gear set in Maine's exempt waters to be marked; as a result, the number of vessels projected to be affected by this alternative (approximately 4,000) is substantially lower than the estimate provided for the other action alternatives (approximately 6,100).

Exhibit 10-10						
NUMBER OF VESSELS AFFECTED BY NEW REQUIREMENTS, BY FISHERY						
Regulatory Provisions	Regulatory Alternative	Fishery				Total
		Lobster Trap/Pot	Other Trap/Pot	Blue Crab	Gillnet	
Gear Configuration	Alternative 1 (No Action)	0	0	0	0	0
	Alternative 2	1,679	139	0	0	1,817
	Alternative 3	1,256	136	0	0	1,392
	Alternative 4	1,695	139	0	0	1,834
	Alternative 5	1,263	136	0	0	1,400
	Alternative 6 (Draft)	1,228	136	0	0	1,364
	Alternative 6 (Preferred)	1,221	136	0	0	1,357
Closures	Alternative 1 (No Action)	0	0	0	0	0
	Alternative 2	0	0	0	0	0
	Alternative 3	16	0	0	0	16
	Alternative 4	184	0	0	0	184
	Alternative 5	184	0	0	0	184
	Alternative 6 (Draft)	109	0	0	0	109
	Alternative 6 (Preferred)	109	0	0	0	109
Gear Marking	Alternative 1 (No Action)	0	0	0	0	0
	Alternative 2	5,300	282	48	499	6,129
	Alternative 3	5,300	282	48	499	6,129
	Alternative 4	5,300	282	48	499	6,129
	Alternative 5	5,300	282	48	499	6,129
	Alternative 6 (Draft)	5,300	282	48	499	6,129
	Alternative 6 (Preferred)	3,186	274	48	498	4,006
All	Alternative 1 (No Action)	0	0	0	0	0
	Alternative 2	5,300	282	48	499	6,129
	Alternative 3	5,300	282	48	499	6,129
	Alternative 4	5,300	282	48	499	6,129
	Alternative 5	5,300	282	48	499	6,129
	Alternative 6 (Draft)	5,300	282	48	499	6,129
	Alternative 6 (Preferred)	3,186	274	48	498	4,006

Note: Values may not sum to the totals shown due to rounding.

Exhibit 10-11 summarizes estimated compliance costs for each of the regulatory alternatives, breaking the results down by major regulatory component. Several findings are noteworthy:

- Of the action alternatives, estimated costs are lowest for Alternative 3. This alternative incorporates less stringent trawling requirements than specified under Alternative 2 and includes only the CCB Restricted Area closure, which affects relatively few vessels and poses limited costs.
- Alternative 4 is likely to pose the greatest costs. It includes three closures, all of which cover large areas. The estimated impact of the closures

specified under this alternative ranges from \$1.3 million to \$2.1 million per year.

- The cost of complying with Alternative 5 is likely to be somewhat less than that of complying with Alternative 4. The difference is attributable to a difference in trawling requirements, which are slightly less stringent under Alternative 5.
- In general, compliance with gear configuration requirements imposes the greatest costs, with estimates ranging as high as \$4.4 million per year. The costs attributable to the seasonal closure of restricted areas also contribute substantially to the estimate of total compliance costs under Alternatives 4, 5, 6 (Draft), and 6 (Preferred). Gear marking requirements add approximately \$1 million annually to the estimated cost of complying with most of the action alternatives.
- Gear marking costs are substantially lower under Alternative 6 (Preferred) because it does not require gear in Maine waters landward of the ALWTRP exemption line to be marked. In the lower bound scenario, this leads the estimate of total compliance costs for Alternative 6 (Preferred) to be lower than the corresponding figures for the other action alternatives. In the upper bound scenario, the overall estimate for Alternative 6 (Preferred) is slightly higher than that for Alternative 3, but lower than the estimates for the other action alternatives.

Research suggests that current practices are largely consistent with the gear configuration requirements proposed for Southeast trap/pot fisheries. Therefore, the cost of complying with them is unlikely to be substantial and these costs are not analyzed in detail.

Exhibit 10-11							
ESTIMATE OF ANNUAL COMPLIANCE COSTS BY REGULATORY COMPONENT							
(2011 dollars)							
Regulatory Alternative	Gear Configuration		Closures		Gear Marking	Total	
	Lower	Upper	Lower	Upper		Lower	Upper
Alternative 1 (No Action)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Alternative 2	\$1,241,000	\$4,392,000	\$0	\$0	\$1,014,000	\$2,255,000	\$5,407,000
Alternative 3	\$1,003,000	\$3,349,000	\$21,000	\$49,000	\$1,047,000	\$2,070,000	\$4,445,000
Alternative 4	\$1,213,000	\$4,288,000	\$1,340,000	\$2,113,000	\$1,010,000	\$3,562,000	\$7,411,000
Alternative 5	\$996,000	\$3,240,000	\$1,340,000	\$2,113,000	\$1,043,000	\$3,379,000	\$6,396,000
Alternative 6 (Draft)	\$1,009,000	\$3,323,000	\$557,000	\$831,000	\$1,054,000	\$2,620,000	\$5,208,000
Alternative 6 (Preferred)	\$1,015,000	\$3,316,000	\$557,000	\$831,000	\$338,000	\$1,910,000	\$4,484,000

Note: Values may not sum to the totals shown due to rounding.

Exhibit 10-12 summarizes the estimate of annual compliance costs by regulatory alternative and fishery. Depending on the alternative and scenario (upper versus lower bound) in question, the analysis indicates that the lobster fishery would incur roughly 80 percent to 90 percent of estimated costs under Alternatives 2 through 6 (Preferred). OTP vessels would also incur a substantial share of costs under these alternatives, primarily because of the proposed minimum trawl-length requirements. The impact of the action alternatives on other fisheries is likely to be minor, reflecting the costs associated with meeting new gear marking requirements.

Exhibit 10-12								
DISTRIBUTION OF ESTIMATED ANNUAL COMPLIANCE COSTS BY FISHERY								
(2011 dollars)								
Regulatory Alternative	Fishery						Total	
	Lobster Trap/Pot		Other Trap/Pot		Blue Crab	Gillnet		
	Lower	Upper	Lower	Upper			Lower	Upper
Alternative 1 (No Action)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Alternative 2	\$1,814,000	\$4,546,000	\$430,000	\$849,000	\$7,000	\$5,000	\$2,255,000	\$5,407,000
Alternative 3	\$1,645,000	\$3,600,000	\$414,000	\$833,000	\$7,000	\$5,000	\$2,070,000	\$4,445,000
Alternative 4	\$3,121,000	\$6,550,000	\$430,000	\$849,000	\$7,000	\$5,000	\$3,562,000	\$7,411,000
Alternative 5	\$2,954,000	\$5,551,000	\$414,000	\$833,000	\$7,000	\$5,000	\$3,379,000	\$6,396,000
Alternative 6 (Draft)	\$2,192,000	\$4,361,000	\$416,000	\$836,000	\$7,000	\$5,000	\$2,620,000	\$5,208,000
Alternative 6 (Preferred)	\$1,482,000	\$3,637,000	\$416,000	\$835,000	\$7,000	\$5,000	\$1,910,000	\$4,484,000

Note: Values may not sum to the totals shown due to rounding.

As noted above, the analysis suggests that the lobster fishery would bear the majority of the costs of complying with Alternatives 2 through 6 (Preferred). To provide additional context, Exhibit 10-13 presents the estimates of annual compliance costs for the lobster fishery as a percentage of ex-vessel revenues for the fishery in 2011; these revenues totaled approximately \$423.8 million. As the exhibit indicates, the estimated impact ranges from 0.4 percent of revenue under Alternative 3 (lower bound scenario) to 1.5 percent of revenue under Alternative 4 (upper bound scenario). Under Alternative 6 (Preferred), the estimate of compliance costs ranges from 0.3 percent to 0.9 percent of 2011 revenue.

Exhibit 10-13				
ESTIMATE OF ANNUAL COMPLIANCE COSTS FOR THE LOBSTER FISHERY AS A PERCENT OF 2011 EX-VESSEL REVENUES (2011 dollars)				
Alternative	Annual Compliance Costs		Compliance Costs as a Percent of Revenue	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Alternative 1 (No Action)	\$0	\$0	0.0%	0.0%
Alternative 2	\$1,814,000	\$4,546,000	0.4%	1.1%
Alternative 3	\$1,645,000	\$3,600,000	0.4%	0.8%
Alternative 4	\$3,121,000	\$6,550,000	0.7%	1.5%
Alternative 5	\$2,954,000	\$5,551,000	0.7%	1.3%
Alternative 6 (Draft)	\$2,192,000	\$4,361,000	0.5%	1.0%
Alternative 6 (Preferred)	\$1,482,000	\$3,637,000	0.3%	0.9%

Other trap/pot vessels would also bear a substantial share of the costs of complying with Alternatives 2 through 6 (Preferred). This category, however, covers a range of disparate fisheries. As a result, a comparison of compliance costs to revenue for this category is more difficult to develop and potentially less meaningful. Rather than present such a comparison, the analysis relies on a more detailed examination of the impact of the alternatives relative to estimated revenues for groups of vessels that would be most heavily affected by the introduction of new regulations. This examination is incorporated into the analysis of the social impacts of the alternatives, which is summarized below.

10.7 SOCIAL IMPACTS OF ALTERNATIVES

The analysis of social impacts considers how compliance with the regulatory alternatives could affect the socioeconomic viability of fishing and fishermen's quality of life. The method and results described here are presented in greater detail in Chapter 7.

10.7.1 Potentially Affected Communities

The social impact analysis first uses county-level data on affected fishing vessels to identify the communities at greatest risk of experiencing adverse social impacts stemming from the ALWTRP modifications under consideration. The analysis uses additional county-level socioeconomic data to characterize key features of the at-risk communities, examining economic, demographic, and social features that may influence the impact of the regulations on the region.

Communities in mid-coast and Downeast Maine are the most vulnerable to adverse social impacts as a result of changes to the ALWTRP. Washington, Hancock, and Knox counties in particular are highly exposed to the effects of regulation due to the importance of the lobster fishery to these communities. The value of ALWTRP-affected landings in these communities is substantial, and the highest of all affected communities. Additionally, the total number of

affected vessels in these three counties is higher than in any other county in the affected region. These communities are also highly sensitive to the proposed regulations, as evidenced by their substantial social, cultural, and economic dependence upon fishing. The rural nature of the economy in these counties, coupled with high unemployment and poverty rates, suggest that they may have a relatively low capacity to adapt to economic impacts induced by new ALWTRP regulations.

More than 50 percent of ex-vessel revenues in Maine's other coastal counties is attributable to landings made with ALWTRP gear. In some instances, however, such as Waldo County, the overall value of these landings is relatively low. In others, such as Lincoln, Sagadahoc, Cumberland, and York, the value of potentially affected landings is substantial, but the economy as a whole is more diversified. As a result, these counties are somewhat less sensitive to adverse impacts that may stem from changes in ALWTRP regulations. The same is true of New Hampshire's Rockingham County. There, 85 percent of ex-vessel revenues are derived from landings made with ALWTRP gear, which suggests that the county's harvesting sector is highly exposed. The sensitivity of the county's economy as a whole, however, is tempered by a relatively high degree of diversification. In addition, Rockingham County's unemployment rate is the lowest reported among the counties analyzed; this suggests that its economy has a relatively strong capacity to respond to change, and that the region is less vulnerable to adverse impacts than areas where unemployment is higher.

In Massachusetts and Rhode Island, the situation is more varied. In general, the value of landings made with ALWTRP gear in the counties of these states is lower than that reported for counties in Maine and New Hampshire, both on an absolute and a relative basis. In addition, the economies of the counties in Massachusetts and Rhode Island tend to be more diversified and less dependent on the commercial fishing sector. Nonetheless, ALWTRP gear accounts for ex-vessel revenues of more than \$15 million per year in Essex (MA), Barnstable (MA), and Bristol (MA) counties, suggesting that exposure to adverse impacts in these counties may be substantial. Dependence on commercial fishing is moderate in Essex and Bristol counties, but is high in Barnstable County. With an unemployment rate that exceeds 10 percent, Barnstable County may be particularly vulnerable to adverse impacts stemming from the introduction of new ALWTRP regulations.

10.7.2 Comparison of Vessel Compliance Costs to Ex-Vessel Revenues

To identify potentially hard-hit sectors of the commercial fishing industry, the analysis compares estimates of average vessel compliance costs to estimates of average gross revenue per vessel. There is no clearly-defined threshold at which annualized costs represent a large enough percent of annual revenues that a vessel operator would cease fishing, or would otherwise suffer social and economic hardship. For purposes of discussion, however, the analysis highlights two impact categories, which are consistent with those employed in previous analyses of the impacts of new ALWTRP regulations:²³

²³ See National Marine Fisheries Service, *Final Environmental Impact Statement for Amending the Atlantic Large Whale Take Reduction Plan: Broad-Based Gear Modifications*, August 2007.

- **Heavily-Affected Vessels** – Segments of a fishery for which the estimated upper bound compliance costs exceed 15 percent of annual revenues.
- **At-Risk Vessels** – Segments of a fishery for which estimated compliance costs range between 5 and 15 percent of annual revenues.

The number of vessels identified as heavily affected ranges from zero under Alternatives 2 and 3 to 163 under Alternatives 4 and 5 (see Exhibit 10-14). For the latter two alternatives, the vessels in the heavily affected category are lobster vessels that would be displaced either by the closure of Jeffreys Ledge or the closure of Massachusetts Restricted Area #1. In contrast, under Alternatives 6 (Draft) and 6 (Preferred), the analysis identifies 90 vessels as heavily affected; this group consists of lobster vessels that would be displaced by the closure of Massachusetts Restricted Area #2.

10.7.3 Other Socioeconomic Impacts

As Exhibit 10-14 indicates, the regulatory alternatives under consideration could generate additional socioeconomic impacts beyond the direct effect of compliance costs on vessel operation. For example:

- To the extent that compliance reduces lobster landings, the dealer and processing sectors of the economy could be affected. The estimated reduction in landings of lobster is greatest under Alternative 4 (2.1 million pounds per year) and smallest under Alternative 3 (1.0 million pounds per year). Even in the case of Alternative 4, however, the estimated effect on landings is less than two percent of total landings in 2011. Because the reduction is substantially less than the annual fluctuation in total landings in recent years, adverse impacts on the dealer and processing sectors under any of the alternatives are unlikely to be substantial.
- Competition for fishing grounds may increase if changes to the ALWTRP include the seasonal closure of certain fishing grounds. Most notably, fishermen who would otherwise fish in the closed area may relocate their effort to new grounds, increasing competition in those areas. Competition for fishing grounds may also increase to the extent that fishermen relocate from their traditional fishing grounds to exempted waters or waters that are subject to more moderate regulation.

Exhibit 10-14							
SUMMARY OF SOCIOECONOMIC IMPACTS BY ALTERNATIVE							
Parameter	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 6 (Preferred)
Number of Heavily Affected Vessels (Upper Bound Scenario)	0	0	0	163	163	90	90
Total Employment on Heavily Affected Vessels (Upper Bound Scenario)	NA	NA	NA	330	330	179	179
Anticipated Reduction in Lobster Landings (Upper Bound Scenario)	0	1,283,000 lbs.	997,000 lbs.	2,112,000 lbs.	1,807,000 lbs.	1,235,000 lbs.	1,231,000 lbs.
Impacts on Dealers	No change	Minor short-term supply disruptions possible	Minor short-term and seasonal supply disruptions possible	Minor short-term and seasonal supply disruptions possible	Minor short-term and seasonal supply disruptions possible	Minor short-term and seasonal supply disruptions possible	Minor short-term and seasonal supply disruptions possible
Impacts on Processors	No change	Minor short-term supply disruptions possible	Minor short-term and seasonal supply disruptions possible	Minor short-term and seasonal supply disruptions possible	Minor short-term and seasonal supply disruptions possible	Minor short-term and seasonal supply disruptions possible	Minor short-term and seasonal supply disruptions possible
Other Potential Negative Social Impacts	No change	Minor	Some potential for increased congestion and gear conflict	Greater potential for increased congestion and gear conflict	Greater potential for increased congestion and gear conflict	Moderate potential for increased congestion and gear conflict	Moderate potential for increased congestion and gear conflict
Positive Social Impacts (Reduction in Baseline Co-occurrence Score, Upper Bound Scenario)	No change (0.0 percent change in baseline co-occurrence score)	Public welfare benefits of increased whale protection (36.1 percent reduction in baseline co-occurrence score)	Public welfare benefits of increased whale protection (37.7 percent reduction in baseline co-occurrence score)	Public welfare benefits of increased whale protection (40.8 percent reduction in baseline co-occurrence score)	Public welfare benefits of increased whale protection (42.0 percent reduction in baseline co-occurrence score)	Public welfare benefits of increased whale protection (38.2 percent reduction in baseline co-occurrence score)	Public welfare benefits of increased whale protection (38.2 percent reduction in baseline co-occurrence score)

- Increased congestion in certain areas may increase the incidence of gear conflicts. Gear conflicts may also arise because of ALWTRP regulations that require fishermen in some cases to use trawls with a single endline, which prevents other fishermen from visually determining the direction in which a trawl or string is set.
- Minimum trawl-length requirements implemented under the ALWTRP may pose safety issues for fishermen. Some industry representatives have suggested that hauling or setting trawls from a small vessel can be dangerous due to the increased quantity of groundline lying on and deploying from a crowded deck, increasing the risk of a crew member becoming entangled and possibly pulled overboard. Furthermore, sources suggest that hauling gear with sinking groundline may pose a danger when fishermen attempt to free fouled line from a snag on bottom structure – an occurrence that could become more common with the introduction of minimum trawl-length requirements.
- Some small vessels may find it infeasible to comply with minimum trawl-length requirements due to limitations on deck space and related issues. To the extent that smaller vessels have difficulty competing, trends toward consolidation and increased corporate ownership of fishing vessels may be reinforced.

Because new gear configuration requirements under Alternatives 2 through 6 (Preferred) would affect roughly the same number of vessels, the impacts related to such requirements under each of these alternatives is likely to be similar. The potential for increased crowding, competition and gear conflicts, however, is greatest under Alternatives 4 and 5, which include the most extensive seasonal area closures.

The public welfare benefits associated with increased whale protection are likely to be similar across all action alternatives. As noted, the analysis measures the change in whale protection offered by a given alternative as a change in the co-occurrence of whales and vertical lines. By this measure, Alternative 5 offers the greatest protection to whales, with a reduction in co-occurrence (upper bound scenario) of 42 percent. Alternative 2 offers the least benefit, with a reduction in co-occurrence (upper bound scenario) of 36 percent. These biological benefits have socioeconomic implications for the general public. An increase in the abundance of whales would have a positive impact on the consumer surplus derived from whale watching (a use benefit) and may increase producer surplus for operators of whale watch vessels. Likewise, whale conservation may enhance intrinsic values that society holds for healthy, flourishing whale populations.

10.8 INTEGRATION OF RESULTS

As previously noted, the inability to quantify and value the benefits of potential changes to the ALWTRP prohibits the use of BCA to identify the regulatory alternative that would provide the greatest net benefit. Instead, Exhibit 10-15 summarizes the estimated cost of

complying with each regulatory alternative, coupled with the estimated impact of each alternative on the Vertical Line Model's co-occurrence indicator. It also presents estimates of the cost-effectiveness of each alternative in reducing co-occurrence, both in the aggregate and for its major components (i.e., gear marking, gear reconfiguration, and seasonal area closures). Because the alternatives vary with respect to the reduction in co-occurrence they achieve, it is not possible to identify a superior option based on cost-effectiveness alone.²⁴ Nonetheless, the cost-effectiveness figures provide a useful means of comparing the relative impacts of the regulatory provisions that each alternative incorporates. The exhibit reveals several noteworthy findings:

- The minimum trawl-length requirements yield the greatest reduction in co-occurrence for the associated compliance cost. In contrast, closures are less cost-effective, as evidenced by their greater cost per unit reduction in co-occurrence.
- Alternative 3 is cost-effective relative to most of the other alternatives (\$56,000 to \$119,000 per unit of co-occurrence reduction). This is in part because the costs attributed to the seasonal closure of the Cape Cod Bay Restricted Area are relatively low. In addition, this alternative includes modifications to the gear reconfiguration requirements specified in Alternative 2 that are estimated to have a greater impact on co-occurrence at a lower total cost.
- The cost-effectiveness estimates for the remaining closures – Jeffreys Ledge, Jordan Basin, Massachusetts Restricted Area #1, and Massachusetts Restricted Area #2 – range from \$194,000 to \$573,000 per unit of co-occurrence reduction.
- Overall, the least cost-effective alternative is Alternative 4. It includes the same gear reconfiguration requirements specified under Alternative 2, plus three closures with relatively high costs per unit of co-occurrence reduction. Alternative 5 appears to be superior to Alternative 4, achieving a greater estimated impact on co-occurrence at a lower total cost.
- Alternative 6 (Preferred) is the most cost-effective of the alternatives (\$51,000 to \$118,000 per unit of co-occurrence reduction). It eliminates gear marking requirements for vessels in Maine exempt waters, lowering costs without affecting the estimated co-occurrence reductions. Like Alternative 6 (Draft), it includes only one closure (Massachusetts Restricted Area #2), further improving overall cost-effectiveness relative to alternatives that include more extensive closures.

²⁴ OMB, 2003.

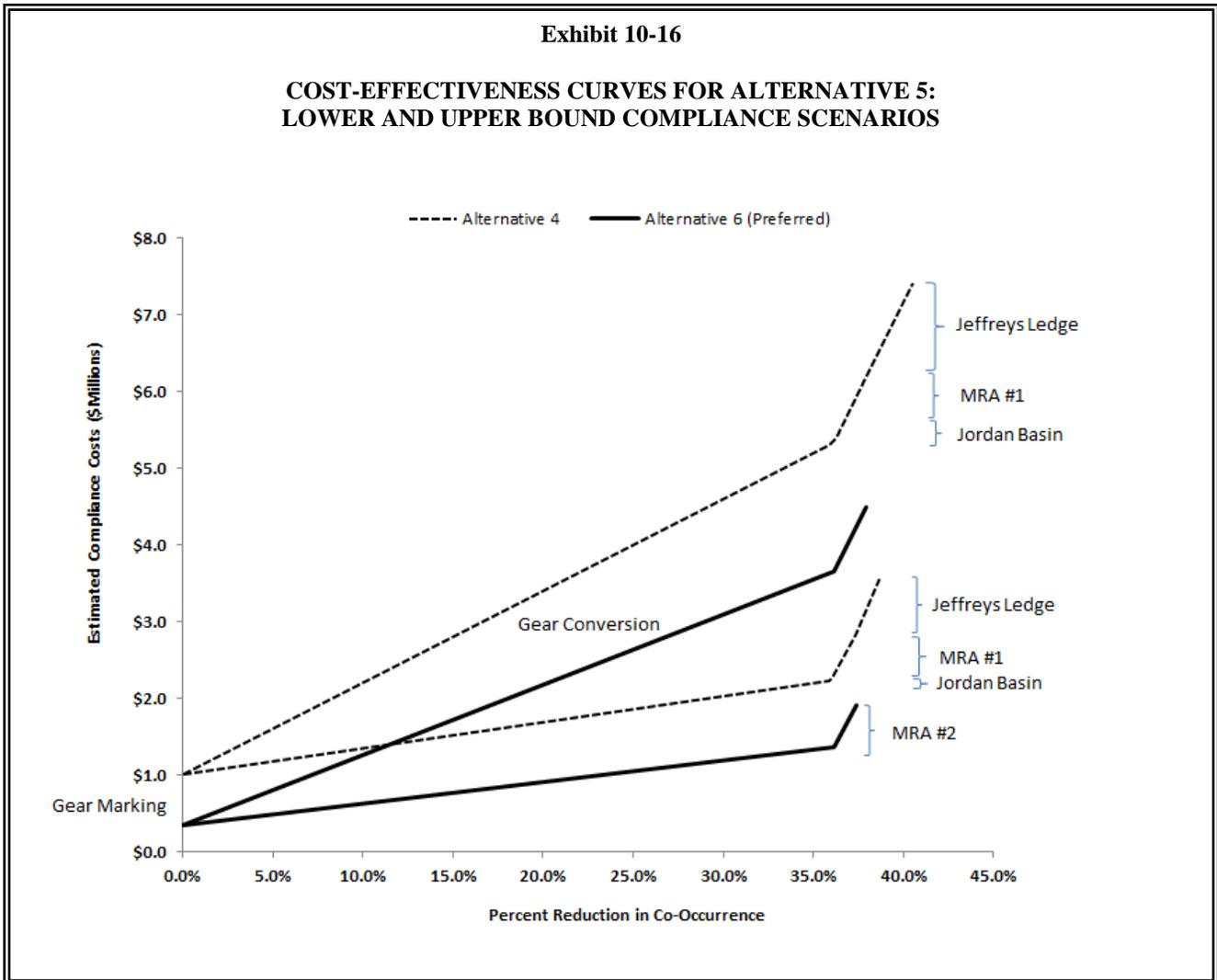
Exhibit 10-15							
COST-EFFECTIVENESS OF ALTERNATIVES							
Alter- native	Regulatory Component	Lower Bound Scenario			Upper Bound Scenario		
		Cost	Co- Occurrence Benefit	Cost per Unit of Co- Occurrence Reduction	Cost	Co- Occurrence Benefit	Cost per Unit of Co- Occurrence Reduction
1	NA	\$0	0.0%	NA	\$0	0.0%	NA
2	Gear Marking	\$1,014,000	0.0%		\$1,014,000	0.0%	
	Gear Reconfiguration	\$1,241,000	35.8%	\$34,625	\$4,392,000	35.8%	\$122,540
	Total	\$2,255,000	35.8%	\$62,916	\$5,407,000	35.8%	\$150,859
3	Gear Marking	\$1,047,000	0.0%		\$1,047,000	0.0%	
	Gear Reconfiguration	\$1,003,000	37.0%	\$27,096	\$3,349,000	37.0%	\$90,474
	CCB CH	\$21,000	0.2%	\$137,538	\$49,156	0.4%	\$124,059
	Total	\$2,070,000	37.2%	\$55,692	\$4,445,000	37.4%	\$118,811
4	Gear Marking	\$1,010,000	0.0%		\$1,010,000	0.0%	
	Gear Reconfiguration	\$1,213,000	35.8%	\$33,844	\$4,288,000	35.8%	\$119,638
	Jordan	\$43,000	0.2%	\$194,464	\$103,000	0.5%	\$226,983
	MRA #1	\$553,000	1.3%	\$435,448	\$839,000	1.8%	\$470,735
	Jeffreys	\$743,000	1.4%	\$547,456	\$1,172,000	2.5%	\$475,733
	Total	\$3,562,000	38.7%	\$92,066	\$7,411,000	40.5%	\$182,802
5	Gear Marking	\$1,043,000	0.0%		\$1,043,000	0.0%	
	Gear Reconfiguration	\$996,000	37.0%	\$26,907	\$3,240,000	37.0%	\$87,529
	Jordan	\$43,000	0.2%	\$274,178	\$103,000	0.3%	\$296,740
	MRA #1	\$553,000	1.3%	\$435,404	\$839,000	1.8%	\$470,701
	Jeffreys	\$743,000	1.3%	\$573,414	\$1,172,000	2.5%	\$464,491
	Total	\$3,379,000	39.7%	\$85,030	\$6,396,000	41.7%	\$153,495
6 (Draft)	Gear Marking	\$1,054,000	0.0%		\$338,000	0.0%	
	Gear Reconfiguration	\$1,009,000	36.2%	\$27,879	\$3,316,000	36.2%	\$91,622
	MRA #2	\$557,000	1.2%	\$447,644	\$831,000	1.8%	\$471,979
	Total	\$2,620,000	37.4%	\$69,985	\$5,208,000	38.0%	\$137,222
6 (Preferred)	Gear Marking	\$338,000	0.0%		\$338,000	0.0%	
	Gear Reconfiguration	\$1,015,000	36.2%	\$28,057	\$3,316,000	36.2%	\$91,661
	MRA #2	\$557,000	1.2%	\$447,644	\$831,000	1.8%	\$471,979
	Total	\$1,910,000	37.4%	\$51,041	\$4,484,000	37.9%	\$118,195

Notes:

- By improving understanding of the nature of entanglements, gear marking requirements could in the long-term have a beneficial impact on the cost-effectiveness of regulations specified under the ALWTRP; however, they would have no direct or immediate impact on the co-occurrence indicator.
- Values may not sum to the totals shown due to rounding.

Exhibit 10-16 further illustrates these findings, using cost-effectiveness curves to compare the impacts of Alternative 6 (Preferred) to those of Alternative 4, the least cost-effective of the alternatives analyzed. The exhibit displays co-occurrence reduction on the horizontal axis and compliance costs on the vertical axis for both the upper and lower bound scenarios for each

alternative. The segments of each curve show the marginal impacts of the two alternatives' major regulatory provisions. As the exhibit shows, gear-marking costs under Alternative 6 (Preferred) are estimated to be approximately one-third of those under Alternative 4, reflecting the exemption from gear-marking requirements the preferred alternative provides for gear in Maine's exempt waters. This shifts the cost-effectiveness curves for Alternative 6 (Preferred) downward from those for Alternative 4, as reflected in the lower y-intercept. The marginal impacts of the two alternatives' gear reconfiguration provisions are similar, although these impacts are estimated to be slightly more effective and less costly under Alternative 6 (Preferred). In contrast, the provisions for seasonal area closures under Alternative 4 are more extensive than those under Alternative 6 (Preferred), yielding a greater reduction in co-occurrence scores. The benefits associated with these closures, however, come at a relatively high cost, as reflected in the steeper slope of the segments of the cost-effectiveness curves that represent these impacts.



NMFS has considered the benefit and cost information presented above and believes that Alternative 6 (Preferred) offers the best option for achieving compliance with MMPA and ESA requirements. By excluding vessels in Maine exempt waters from gear marking requirements, Alternative 6 (Preferred) reduces compliance costs with no direct or immediate effect on the estimated reduction in co-occurrence. In addition, Alternative 6 (Preferred) provides most of the benefits that would be achieved under more stringent alternatives, sacrificing only the relatively costly additional reduction in co-occurrence that would be achieved by the closure of Jeffreys Ledge, Jordan Basin, and Massachusetts Restricted Area #1. Based on these considerations, NMFS has identified Alternative 6 (Preferred) as its proposed approach to achieving the goals of the ALWTRP.

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