Draft Environmental Assessment
and
Regulatory Impact Review
Regulatory Flexibility Act Analysis
on Restrictions of Pound Net Leaders
to Enhance Sea Turtle Protection
in Virginia Waters of the Chesapeake Bay

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National Marine Fisheries Service
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Contents

1.0 INTRODUCTION

All sea turtles that occur in U.S. waters are listed as either endangered or threatened under the Endangered Species Act of 1973 (ESA). The Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) are listed as endangered. The loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

Under the ESA and its implementing regulations, taking sea turtles--even incidentally--is prohibited, with exceptions identified in 50 CFR 223.206. The incidental take of endangered species may only legally be authorized by an incidental take statement or an incidental take permit issued pursuant to section 7 or 10 of the ESA. Existing sea turtle conservation regulations at 50 CFR 223.206(d) exempt the incidental take of threatened sea turtles in fishing activities and scientific research from the prohibition on takes under certain conditions.

Fisheries that operate exclusively in state waters cannot receive incidental take authorizations through section 7 of the ESA, which applies only to Federal actions, and few state-managed fisheries are presently covered by section 10 permits. No incidental take of endangered sea turtles is currently authorized in Virginia state water fisheries. Therefore, when state water fisheries take sea turtles, particularly endangered Kemp s ridleys, leatherbacks, or hawksbills, NMFS frequently must impose temporary restrictions and even closures on state fisheries. These temporary restrictions are usually reactive, and while they have been effective at reducing further mortality, they have often come after significant elevated mortality has already occurred. As such, proactive rulemaking is the most effective option to reduce sea turtle mortality in state water fisheries at this time.

2.0 PURPOSE AND NEED

The purpose of this Environmental Assessment is to examine the environmental impacts that would result from the issuance of a proposed rule restricting the use of pound net leaders in the Virginia waters of the mainstem Chesapeake Bay. This proposed action is necessary to protect threatened and endangered turtles from incidental

take in the Virginia pound net fishery during the spring and aid in the enforcement of the ESA.

2.1 BACKGROUND

The Sea Turtle Salvage and Stranding Network (STSSN) has reported high sea turtle strandings in Virginia each spring for 23 years, most notably during the second half of May and the month of June. The magnitude of the stranding event has increased in recent years, with the total reported Virginia sea turtle strandings during May and June equaling 84 in 1995, 85 in 1996, 164 in 1997, 181 in 1998, 129 in 1999, and 155 in 2000. Strandings during the spring of 2001 were exceptionally high; preliminary data indicates that 265 sea turtles stranded on Virginia beaches during May and June. Most of the stranded sea turtles in Virginia have been loggerheads, but endangered Kemp s ridley and leatherback sea turtles have also stranded. Out of 1,067 total strandings in May and June from 1995 to 2001, 958 loggerheads, 59 Kemp s ridleys, 17 leatherbacks, 1 green, and 32 unidentified turtles were found. The majority of the stranded turtles have been of the juvenile/immature life stage.

No single, specific cause of mortality can be determined for the majority of turtles that strand in Virginia. Natural or non-fishing related anthropogenic causes are not consistent with the nature of the annual sea turtle mortality event. The absence of other species in the most recent stranding events and the absence of high sea turtle strandings in other Atlantic states during the time period when turtles are migrating are inconsistent with cold stunning, a toxic algae bloom, epizootic or other disease. Further, the stranded turtles exhibited no major traumatic injuries such as might be caused by dredging or blasting. Conversely, the circumstances surrounding the spring strandings are consistent with fishery interactions, which include relatively healthy dead turtles, a large number of strandings in a short time period, no external wounds on the majority of the turtles, no common characteristic among stranded turtles that would suggest disease as the main cause of death, and turtles with fish in their stomach. Sea turtles are generally not agile enough to capture fish under natural conditions, and thus would only consume large quantities of finfish by interacting with fishing gear or bycatch (Mansfield et al. 2002, Bellmund et al. 1987, Shoop and Ruckdechel 1982).

In response to the long term trend in elevated sea turtle strandings, NMFS instituted a program in 2001 to investigate interactions between sea turtles and Virginia fisheries during the historical stranding period. This program included inshore and offshore aerial surveys, traditional and alternative platform observer coverage of gillnet and pound net fisheries, and sonar surveys of pound net leaders. There is a complex mix of fisheries operating in Virginia Chesapeake Bay and ocean waters during May and June, including large and small mesh gillnet fisheries, whelk and crab pot fisheries, haul seine fisheries, scallop dredge and trawl fisheries, and the pound net fishery (Table 2.1.1). However, at the time of the 2001 strandings, NMFS observed a number of the fisheries active in Virginia and did not detect significant sea turtle mortality. However, additional observer coverage is necessary to conclusively determine the level of sea turtle interactions with the fisheries active in Virginia during the spring.

Table 2.1.1. Chesapeake Bay and Ocean landings in the state of Virginia for May and June 2001 by gear type.

May and June 2001	Virginia Chesapeake Bay		Ocean	
	Landings(mt)	Percent	Landings(mt)	Percent
Bottom Longline	6.1	0.1	0	-
Haul Seine	534.8	10.5	0	-
Conch Pots	6.1	0.1	57	0.4
Fish Pots	152.9	3.0	29.9	0.2
Pound Nets	2,012.9	39.6	0	-
Blue Crab Pots	1,815.7	35.8	0	-
Scallop Dredge	0	-	10,677.7	77.7
Scallop Trawl	0	-	2,456.1	17.9
Fish Trawl	0	-	2.2	-
Gillnets	549.6	10.8	516.4	3.8
Total	5,078.1	100.0	13,739.3	100.0

While a number of fisheries may contribute to sea turtle strandings, available data indicate that large mesh and stringer pound net leaders result in sea turtle entanglement and that the pound net fishery was a likely cause of a significant portion of the sea turtle mortality in the Chesapeake Bay during the spring of 2001. Previously, high turtle

mortalities in late May and early June in Virginia have been attributed to entanglement in large mesh pound net leaders in the Chesapeake Bay (Lutcavage 1981, Bellmund et al. 1987). Data collected in 1983 and 1984 found turtle entanglement in pound nets with small mesh leaders (8 to 12 inches stretched mesh) to be insignificant, but in 173 pound nets examined with large mesh leaders (defined as >12 to 16 inches stretched mesh), 0.2 turtles per net were found entangled (30 turtles; Bellmund et al. 1987). This study also found that in 38 nets examined with stringer mesh, 0.7 turtles per net were documented entangled (27 turtles).

The majority of strandings in 2001 (approximately 65 percent) and a concentration of strandings in 1998 and 1999 occurred along the southern tip of the Eastern shore of Virginia, where pound nets are the dominant fishing gear. Additionally, approximately 10 sea turtles were documented in association with pound net leaders in the spring of 2001. Based on nature and location of turtle strandings, the type of fishing gear in the vicinity of the greatest number of strandings, the lack of observed takes in other fisheries operating in Virginia waters during the 2001 stranding period, the known interactions between sea turtles and large mesh and stringer pound net leaders, and several documented sea turtle entanglements in pound net leaders, NMFS concluded that pound nets were a likely cause of a significant number of the high sea turtle strandings in Virginia in May and June 2001. While fishery interactions may vary from year to year, NMFS believes it is likely that pound nets contribute to the high sea turtle strandings documented every spring.

As a result, pursuant to 50 CFR 223.206(d)(4), NMFS implemented an emergency rule that required all pound net leaders measuring 8 inches or greater stretched mesh and all pound net leaders with stringers to be tied up in the Virginia waters of the mainstem Chesapeake Bay and the tidal waters of the James, York, and Rappahannock Rivers from June 19 to July 19, 2001. Sea turtle strandings decreased after this rule was in effect, but the rule was enacted after the period of highest sea turtle strandings in Virginia. The emergency measures likely reduced subsequent entanglements in pound net leaders. NMFS chose to restrict the use of leaders with greater than or equal to 8 inches stretched mesh in 2001 because there is some anecdotal information from other states indicating that turtle entanglements may occur in leaders with 8 inches stretched mesh and an unprecedented number of loggerheads had already stranded in the spring of 2001 at the time of the emergency rule.

The annual high mortality in Virginia in May and June is of concern for the following reasons: (1) the level of spring strandings in Virginia has been high for approximately 20 years and elevated for the last 5 years, and it is believed that high strandings will continue to occur during this time period; (2) strandings over the past 4 years have been concentrated along the southern tip of the eastern shore, suggesting a potential localized interaction; (3) approximately 50 percent of the Chesapeake Bay loggerhead foraging population is composed of the northern subpopulation, a subpopulation that may be declining; and (4) most of the stranded turtles have been juveniles, a life stage found to be critical to the long term survival of the species.

On August 22, 2001, the Virginia Marine Resources Commission (VMRC) convened a meeting with NMFS, representatives from the pound net industry, and the Virginia Institute of Marine Science (VIMS) to begin discussing options for reducing sea turtle interactions with pound nets in the spring of 2002. On September 12, 2001, VMRC convened another meeting in which representatives from the pound net industry and VIMS were invited. At this meeting, VMRC, industry, and VIMS developed a plan with the intent of reducing sea turtle interactions with pound net leaders in Virginia. NMFS conducted a preliminary evaluation of the VMRC/industry plan and concluded that it was uncertain how this plan would result in a significant reduction in sea turtle interactions with pound nets, and thus subsequent strandings.

3.0 ALTERNATIVES

Several alternatives were considered to reduce potential sea turtle interactions with pound nets in Virginia waters of the Chesapeake Bay. The alternatives considered are within the scope of NMFS authority and are technically feasible. NMFS utilized all available scientific data and reports from the pound net industry and VMRC to develop the Preferred Alternative (PA) and the Non-Preferred Alternatives (NPAs) described below.

3.1 PROPOSED ACTION

Under this alternative, NMFS would issue a proposed rule that would restrict the use of certain pound net leaders in the Virginia waters of the Chesapeake Bay. The proposed action, or PA, includes prohibiting the use of all pound net leaders measuring 12 inches or greater stretched mesh and all pound net leaders with stringers in the

Virginia waters of the mainstem Chesapeake Bay and portions of the Virginia tributaries from May 8 to June 30. The area where this gear restriction would apply includes the Virginia waters of the mainstem Chesapeake Bay from the Maryland-Virginia State line (approximately 38 N. lat.) to the COLREGS line at the mouth of the Chesapeake Bay; the James River downstream of the Hampton Roads Bridge Tunnel (I-64); the York River downstream of the Coleman Memorial Bridge (Route 17); and the Rappahannock River downstream of the Robert Opie Norris Jr. Bridge (Route 3).

In addition to establishing the restriction on leader mesh size and leaders with stringers, this proposed action would also create a framework mechanism by which NMFS may make changes to the restrictions and/or their effective dates on an expedited basis in order to respond to new information and protect sea turtles. Under this framework mechanism, if NMFS believes based on, for example, water temperature and the timing of sea turtles migration,that sea turtles may still be vulnerable to entanglement in pound net leaders after June 30, NMFS may extend the effective dates of this regulation. Should an extension of the effective dates of the prohibition of pound net leaders measuring 12 inches or greater stretched mesh and pound net leaders with stringers be necessary, NMFS would issue a final rule to be effective upon publication in the Federal Register explicitly stating the duration of the extension. The extension would not exceed 30 days.

From May 8 to June 30, NMFS intends to continue to closely monitor sea turtle stranding levels and other fisheries active in the Chesapeake Bay and nearshore and offshore Virginia waters, including pound net leaders with a stretched mesh size measuring less than 12 inches. If monitoring of pound net leaders reveals that one sea turtle is entangled alive in a pound net leader less than 12 inches (30.5 cm) stretched mesh or that one sea turtle is entangled dead and NMFS determines that the entanglement contributed to its death, then NMFS may determine that additional restrictions are necessary to conserve sea turtles and prevent entanglements. Such additional restrictions may include reducing the allowable mesh size for pound net leaders or prohibiting all pound net leaders regardless of mesh size in the Virginia waters of the mainstem Chesapeake Bay and portions of the Virginia tributaries from the date of publication to June 30. Should NMFS determine that an additional restriction is warranted, NMFS would immediately file a final rule with the Office of the Federal Register. Such a rule would explicitly state the new mandatory gear restriction as well as the time period. The area where additional gear

restrictions would apply includes the same area as the initial restriction, namely the Virginia waters of the mainstem Chesapeake Bay from the Maryland-Virginia State line (approximately 38 N. lat.) to the COLREGS line at the mouth of the Chesapeake Bay, and portions of the James River, the York River, and the Rappahannock River.

As with the prohibition of leaders greater than or equal to 12 inches stretched mesh and leaders with stringers, the proposed action would also include a provision to extend the additional restrictions if NMFS believes that sea turtles may still be vulnerable to entanglement in pound net leaders after June 30. Should an extension of the additional restrictions be necessary, NMFS will file a final rule with the Office of the Federal Register explicitly stating the duration of the extension.

3.2 NO ACTION ALTERNATIVE

The No Action alternative would allow all pound net leaders in the Virginia waters of the Chesapeake Bay and tributaries to be fished in the same manner and to the same extent as in years past. This alternative would not impose any Federal measures to minimize potential sea turtle entanglement in the pound net fishery.

3.3 PROHIBITION OF LEADERS GREATER THAN OR EQUAL TO 8 INCHES STRETCHED MESH

Under this alternative, NMFS would issue a proposed rule that would prohibit the use of all pound net leaders measuring 8 inches or greater stretched mesh and all pound net leaders with stringers in the Virginia waters of the mainstem Chesapeake Bay and portions of the Virginia tributaries from May 8 to June 30. The area where this gear modification would apply includes the Virginia waters of the mainstem Chesapeake Bay from the Maryland-Virginia State line (approximately 38 N. lat.) to the COLREGS line at the mouth of the Chesapeake Bay; the James River downstream of the Hampton Roads Bridge Tunnel (I-64); the York River downstream of the Coleman Memorial Bridge (Route 17); and the Rappahannock River downstream of the Robert Opie Norris Jr. Bridge (Route 3).

3.4 PROHIBITION OF ALL POUND NET LEADERS

Under this alternative, NMFS would issue a proposed rule that would prohibit the use of all pound net leaders regardless of mesh size in the Virginia waters of the mainstem Chesapeake Bay and portions of the

Virginia tributaries from May 8 to June 30. The area where this gear modification would apply includes the Virginia waters of the mainstem Chesapeake Bay from the Maryland-Virginia State line (approximately 38 N. lat.) to the COLREGS line at the mouth of the Chesapeake Bay; the James River downstream of the Hampton Roads Bridge Tunnel (I-64); the York River downstream of the Coleman Memorial Bridge (Route 17); and the Rappahannock River downstream of the Robert Opie Norris Jr. Bridge (Route 3).

3.5 IMPLEMENTATION OF VMRC/INDUSTRY PLAN

This alternative would involve implementing the plan proposed by VMRC, VIMS, and the pound net industry, developed at their September 12, 2001, meeting. This alternative consists of prohibiting the use of pound net leaders with greater than 16 inches stretched mesh, dropping the mesh of all leaders using stringers 9 feet below mean low water so that the stringers attach from the mesh to a lead line at the surface, and spacing stringer lines at least 3 feet apart. The proposed restrictions would apply to the Virginia waters of the mainstem Chesapeake Bay from the Maryland-Virginia State line (approximately 38 N. lat.) to the COLREGS line at the mouth of the Chesapeake Bay, the James River downstream of the Hampton Roads Bridge Tunnel (I-64); the York River downstream of the Coleman Memorial Bridge (Route 17); and the Rappahannock River downstream of the Robert Opie Norris Jr. Bridge (Route 3). This alternative would be in effect for a 3 to 4 week period, starting approximately on May 15.

4.0 AFFECTED ENVIRONMENT

4.1 Physical Environment

The geographical area that would be affected by all of the alternatives is the Virginia waters of the mainstem Chesapeake Bay from the Maryland-Virginia State line (approximately 37° 55' N. lat., 75° 55' W. long.) to the COLREGS line at the mouth of the Chesapeake Bay; the James River downstream of the Hampton Roads Bridge Tunnel (I-64; approximately 36° 59.55' N. lat., 76° 18.64' W. long.); the York River downstream of the Coleman Memorial Bridge (Route 17; approximately 37° 14.55' N. lat, 76° 30.40' W. long.); and the Rappahannock River downstream of the Robert Opie Norris Jr. Bridge (Route 3; approximately 37° 37.44' N. lat, 76° 25.40' W. long.).

The Chesapeake Bay is the largest estuary in the United States, and hosts a complex ecosystem. While the affected environment of the PA

includes only Virginia waters, the Chesapeake Bay also extends into the State of Maryland. The entire Bay watershed is 64,000 square miles and the Bay proper is approximately 200 miles long, stretching from Havre de Grace, Maryland, to Norfolk, Virginia. Its widest point is 35 miles near the mouth of the Potomac River, and including its tidal tributaries, the entire Chesapeake Bay has approximately 11,684 miles of shoreline (Chesapeake Bay Program 2002). On average, the Chesapeake Bay holds more than 15 trillion gallons of water. Although the Bay's length and width are dramatic, the average depth is only about 21 feet. Because the Chesapeake Bay is so shallow, its capacity to store heat over time is relatively small. As a result, water temperature fluctuates throughout the year, ranging from 34 to 84 degrees F.

The Chesapeake Bay is a mixture of freshwater and saltwater from the Atlantic Ocean. Fifty major tributaries pour water into the Chesapeake Bay every day. Eighty to 90 percent of the freshwater entering the Bay comes from the northern and western sides. The remaining 10 to 20 percent is contributed by the eastern shore. Nearly an equal volume of saltwater enters the Bay from the ocean. Salinity levels within the Chesapeake Bay vary widely, both seasonally and from year to year, depending on the volume of freshwater flowing into the Bay.

4.2 Biological Environment

4.2.1 Fishery Resources

The biological resources potentially affected by this action include fishery resources. A number of commercial and recreational fisheries exist in the Virginia waters of the Chesapeake Bay. In addition to finfish resources, clam, crab, oyster, and conch are also targeted in Virginia waters. Appendix A identifies Virginia commercial landings from April through June 2001 and the species targeted. These species are landed by a variety of gear types, including gillnets, pound nets, pots, and haul seines.

4.2.2 Endangered and Threatened Species

Species listed as endangered or threatened under the ESA are found in the geographical area that would be affected by the PA and NPAs. All five species of threatened and endangered sea turtle, endangered shortnose sturgeon, and endangered whales occur in Virginia waters.

Loggerhead turtles are the most abundant sea turtle species in the affected area, followed by Kemp s ridley and green turtles. These species appear to use the Chesapeake Bay waters as important developmental and foraging habitats, as it is primarily juveniles of these species that are encountered. Leatherback and hawksbill turtles are infrequent visitors to the Chesapeake Bay, but they have been documented in Virginia waters. A few leatherbacks strand on Virginia beaches each year. Several publications discuss the five species of sea turtles potentially impacted by this proposed action. NMFS has prepared a comprehensive review of the status of each species of sea turtle (NMFS and USFWS, 1991a, 1991b, 1992, 1993, 1995, USFWS and NMFS, 1992). A more recent, in-depth analysis of the status of Kemp s ridley and loggerhead sea turtles -- the species most likely to be encountered in Virginia waters -- was conducted by the Turtle Expert Working Group (TEWG; 1998, 2000), and an additional stock assessment of loggerhead and leatherback sea turtles was also recently prepared (NMFS SEFSC 2001). The National Academy of Sciences Report, The Decline of the Sea Turtles: Causes and Prevention (NRC, 1990) reviewed the scientific and technical information pertaining to the conservation of sea turtles and the causes and significance of turtle mortality. The following sections provide a summary of the status of each of the five sea turtle species found in the geographical area that would be affected by the proposed action.

Shortnose sturgeon have been historically documented in Virginia waters, but most of the recent reported encounters have been in Maryland waters. Nevertheless, this endangered species may be present in the geographical area affected by the proposed action. While a summary of the status of shortnose sturgeon is provided in section 4.2.2.6, additional information may be obtained from the Shortnose Sturgeon Recovery Plan (NMFS 1998b).

Endangered right, humpback, and fin whales have been documented in Virginia waters, but it is highly unlikely that these species would be present in the geographical area affected by this proposed action. More information on the endangered whale species that could potentially transit the affected area can be found in the 2000 Marine Mammal Stock Assessments (Waring et al., 2000) and the species recovery plans (NMFS 1991a, 1991b, 1998a).

4.2.2.1 Loggerhead sea turtle

Loggerhead sea turtles occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans in a wide range of

habitats. These include open ocean, continental shelves, bays, lagoons, and estuaries (NMFS and USFWS, 1995), foraging primarily on benthic species including crustaceans and mollusks (Wynne and Schwartz, 1999). It is the most abundant species of sea turtle in U.S. waters, commonly occurring throughout the inner continental shelf from Florida through Cape Cod, Massachusetts. The loggerhead sea turtle was listed as threatened under the ESA on July 28, 1978, but is considered endangered by the World Conservation Union (IUCN).

Loggerhead sea turtles are generally grouped by their nesting locations. The largest known nesting aggregations of loggerhead sea turtles occurs on Masirah and Kuria Muria Islands in Oman (Ross and Barwani 1982). The southeastern U.S. nesting aggregation is the second largest and represents about 35 percent of the nests of this species.

In the western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the gulf coast of Florida. In 1996, the TEWG met on several occasions and produced a report assessing the status of the loggerhead sea turtle population in the western North Atlantic. Based on analysis of mitochondrial DNA, which the turtle inherits from its mother, the TEWG theorized that nesting assemblages represent distinct genetic entities, and that there are at least four loggerhead subpopulations in the western North Atlantic separated at the nesting beach (TEWG 1998, 2000). A fifth subpopulation was identified in NMFS SEFSC 2001. The subpopulations are divided geographically as follows: (1) a northern nesting subpopulation, occurring from North Carolina to northeast Florida, about 29° N (approximately 7,500 nests in 1998); (2) a south Florida nesting subpopulation, occurring from 29° N on the east coast to Sarasota on the west coast (approximately 83,400 nests in 1998); (3) a Florida panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida (approximately 1,200 nests in 1998); (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (approximately 1,000 nests in 1998); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (approximately 200 nests per year). Natal homing to the nesting beach is believed to provide the genetic barrier between these nesting aggregations, preventing recolonization from turtles from other nesting beaches. Although NMFS has not formally recognized subpopulations of loggerhead sea turtles under the ESA, based on the most recent reviews of the best scientific and commercial data on the population genetics of loggerhead sea turtles and analyses of their population trends (TEWG 1998, 2000),

NMFS treats the loggerhead turtle nesting aggregations as nesting subpopulations whose survival and recovery is critical to the survival and recovery of the species.

The loggerhead sea turtles in the affected geographical area likely represent turtles that have hatched from any of the five western Atlantic nesting sites, but are probably composed primarily of turtles that hatched from the northern nesting subpopulation and the south Florida nesting subpopulation. Although genetic studies of benthic immature loggerheads on the foraging grounds have shown the foraging areas to be comprised of a mix of individuals from different nesting areas, there appears to be a preponderance of individuals from a particular nesting area in some foraging locations. For example, although the northern nesting group (North Carolina to northeast Florida) produces only about 9 percent of the loggerhead nests, loggerheads from this nesting area comprise between 25 and 59 percent of the loggerhead sea turtles found in foraging areas from the northeastern U.S. to Georgia (NMFS SEFSC 2001; Bass et al. 1998; Norrgard, 1995; Rankin-Baransky 1997; Sears 1994, Sears et al. 1995). Loggerheads that forage from Chesapeake Bay southward to Georgia are nearly equally divided in origin between the southern and northern subpopulations (TEWG 1998).

Based on the data available, it is difficult to estimate the size of the loggerhead sea turtle population in the U.S. or its territorial waters. There is, however, general agreement that the number of nesting females provides a useful index of the species population size and stability at this life stage. Nesting data collected on index nesting beaches in the U.S. from 1989-1998 represent the best dataset available to index the population size of loggerhead sea turtles. However, an important caveat for population trends analysis based on nesting beach data is that this may reflect trends in adult nesting females, but it may not reflect overall population growth rates. Given this, between 1989 and 1998, the total number of nests laid along the U.S. Atlantic and Gulf coasts ranged from 53,014 to 92,182 annually, with a mean of 73,751. Since a female often lays multiple nests in any one season, the average adult female population of 44,780 was calculated using the equation [(nests/4.1) * 2.5]. These data provide an annual estimate of the number of nests laid per year while indirectly estimating both the number of females nesting in a particular year (based on an average of 4.1 nests per nesting female, Murphy and Hopkins (1984)) and of the number of adult females in the entire population (based on an average remigration interval of 2.5 years; Richardson et al., 1978)). On average, 90.7 percent of

these nests were of the south Florida subpopulation, 8.5 percent were from the northern subpopulation, and 0.8 percent were from the Florida Panhandle nest sites. There is limited nesting throughout the Gulf of Mexico west of Florida, but it is not known to what subpopulation the turtles making these nests belong. Based on the above, there are only an estimated approximately 3,800 nesting females in the northern loggerhead subpopulation, and approximately 40,000 nesting females in southern loggerhead subpopulation. The status of this northern population based on number of loggerhead nests, has been classified as stable or declining (TEWG 2000).

4.2.2.2 Kemp s ridley sea turtle

The Kemp s ridley is the most endangered of the world s sea turtle species. Of the world s seven extant species of sea turtles, the Kemp's ridley has declined to the lowest population level. Kemp s ridleys nest primarily on Rancho Nuevo in Tamaulipas, Mexico, where nesting females emerge synchronously during the day to nest in aggregations known as arribadas. Most of the population of adult females nest in this single locality (Pritchard 1969).

Preliminary analysis of data collected Texas A&M University suggests that subadult Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud, NMFS Galveston Laboratory, pers. comm.). However, at least some juveniles will travel northward as water temperatures warm to feed in productive coastal waters of Georgia through New England (USFWS and NMFS, 1992).

Juvenile Kemp s ridleys use northeastern and mid-Atlantic coastal waters of the U.S. Atlantic coastline as primary developmental habitat during summer months, with shallow coastal embayments serving as important foraging grounds. Ridleys found in mid-Atlantic waters are primarily post-pelagic juveniles averaging 16 inches in carapace length, and weighing less than 44 pounds (Terwilliger and Musick 1995). Next to loggerheads, they are the second most abundant sea turtle in mid-Atlantic waters, arriving in these areas typically during late May and June (Keinath et al., 1987; Musick and Limpus, 1997). In the Chesapeake Bay, where the juvenile population of Kemp s ridley sea turtles is estimated to be 211 to 1,083 turtles (Musick and Limpus 1997), ridleys frequently forage in shallow embayments, particularly in areas supporting submerged aquatic vegetation (Lutcavage and Musick 1985; Bellmund et al., 1987; Keinath et al., 1987; Musick and Limpus 1997). Post-pelagic ridleys feed primarily on

crabs, consuming a variety of species, and mollusks, shrimp, and fish are consumed less frequently (Bjorndal 1997).

When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963), but the population has been drastically reduced from these historical numbers. However, the TEWG (1998, 2000) indicated that the Kemp's ridley population appears to be in the early stage of exponential expansion. Nesting data, estimated number of adults, and percentage of first time nesters have all increased from lows experienced in the 1970 s and 1980 s.From 1985 to 1999, the number of nests observed at Rancho Nuevo and nearby beaches has increased at a mean rate of 11.3 percent per year, allowing cautious optimism that the population is on its way to recovery. For example, data from nests at Rancho Nuevo, North Camp and South Camp, Mexico, have indicated that the number of adults declined from a population that produced 6,000 nests in 1966 to a population that produced 924 nests in 1978 and 702 nests in 1985, then increased to produce 1,940 nests in 1995 and about 3,400 nests in 1999. Estimates of adult abundance followed a similar trend from an estimate of 9,600 in 1966 to 1,050 in 1985 and 3,000 in 1995. The increased recruitment of new adults is illustrated in the proportion of neophyte, or first time nesters, which has increased from 6 to 28 percent from 1981 to 1989 and from 23 to 41 percent from 1990 to 1994. The population model in the TEWG report projected that Kemp s ridleys could reach the intermediate recovery goal identified in the Recovery Plan, of 10,000 nesters by the year 2020, if the assumptions of age to sexual maturity and age specific survivorship rates plugged into their model are correct. The population growth rate does not appear as steady as originally forecasted by the TEWG, but annual fluctuations, due in part to irregular internesting periods, are normal for other sea turtle populations. Also, as populations increase and expand, nesting activity would be expected to be more variable.

4.2.2.3 Green sea turtle

Green turtles are the largest chelonid (hard-shelled) sea turtle, with an average adult carapace of 36 inches SCL and weight of 330 pounds. Based on growth rate studies of wild green turtles, greens have been found to grow slowly with an estimated age of sexual maturity ranging from 18 to 40 years (Balazs 1982, Frazer and Ehrhard 1985 in NMFS and USFWS 1991b, B. Schroeder pers. comm.). In 1978, the green turtle was listed as threatened under the ESA, except for the breeding populations in Florida and on the Pacific coast of Mexico, which were

listed as endangered (NMFS and USFWS 1991b).

Green turtles are distributed circumglobally. In the western Atlantic they range from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean (Wynne and Schwartz, 1999). As is the case for loggerhead and Kemp sridley sea turtles, green sea turtles use mid-Atlantic and northern areas of the western Atlantic Ocean as important summer developmental habitat. Green turtles are found in estuarine and coastal waters as far north as Long Island Sound, Chesapeake Bay, and North Carolina sounds (Musick and Limpus 1997). Limited information is available regarding the occurrence of green turtles in the Chesapeake Bay, although they are presumably present in very low numbers. Like loggerheads and Kemp s ridleys, green sea turtles that use northern waters during the summer must return to warmer waters when water temperatures drop, or face the risk of cold stunning. Cold stunning of green turtles may occur in southern areas as well (i.e., Indian River, Florida), as these natural mortality events are dependent on water temperatures and not solely geographical location.

In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Occasional nesting has been documented along the Gulf coast of Florida, at southwest Florida beaches, as well as the beaches on the Florida Panhandle (Meylan et al., 1995). Certain Florida nesting beaches where most green turtle nesting activity occurs have been designated index beaches. Index beaches were established to standardize data collection methods and effort on key nesting beaches. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of the index beaches in 1989, perhaps due to increased protective legislation throughout the Caribbean (Meylan et al., 1995). Increased nesting has also been observed along the Atlantic Coast of Florida, on beaches where only loggerhead nesting was observed in the past (Pritchard 1997). Recent population estimates for green turtles in the western Atlantic area are not available.

Pelagic juveniles are assumed to be omnivorous, but with a strong tendency toward carnivory during early life stages. At approximately 8 to 10 inches carapace length, juveniles leave pelagic habitats and enter benthic foraging areas, shifting to a chiefly herbivorous diet (Bjorndal 1997). Green turtles appear to prefer marine grasses and algae in shallow bays, lagoons and reefs (Rebel 1974), but also consume jellyfish, salps, and sponges.

Fibropapillomatosis, an epizootic disease producing lobe-shaped tumors on the soft portion of a turtle s body, ha been found to infect green turtles, most commonly juveniles. The occurrence of fibropapilloma tumors, most frequently documented in Hawaiian green turtles, may result in impaired foraging, breathing, or swimming ability, leading potentially to death.

4.2.2.4 Leatherback sea turtle

The leatherback is the largest living turtle and ranges farther than any other sea turtle species, exhibiting broad thermal tolerances (NMFS and USFWS 1995). Leatherback turtles feed primarily on cnidarians and tunicates and are often found in association with jellyfish. These turtles are predominantly pelagic, but they periodically occur in the Chesapeake Bay and in places such as Cape Cod Bay and Narragansett Bay during certain times of the year, particularly the fall.

Nest counts are the only reliable population information available for leatherback turtles. Recent declines have been seen in the number of leatherbacks nesting worldwide (NMFS and USFWS 1995). The leatherback population was estimated to number approximately 115,000 adult females in 1980 and only 34,500 by 1995 (Spotila et al. 1996). The decline can be attributed to many factors including fisheries as well as intense exploitation of the eggs. Spotila et al. (1996) record that adult mortality has increased significantly, particularly as a result of driftnet and longline fisheries. The status of leatherbacks in the Atlantic is relatively unclear. In 1996, it was reported to be stable, at best (Spotila et al. 1996), but numbers in the Western Atlantic at that writing were reported to be on the order of 18,800 nesting females. According to Spotila (2000, pers. comm.), the Western Atlantic population currently numbers about 15,000 nesting females, whereas current estimates for the Caribbean (4,000) and the Eastern Atlantic (i.e., off Africa, numbering ~ 4,700) have remained consistent with numbers reported by Spotila et al. in 1996. With regard to repercussions of these observations for the U.S. leatherback populations in general, it is unknown whether they are stable, increasing, or declining, but it is certain that some nesting populations (e.g., St. John and St. Thomas, U.S. Virgin Islands) have been extirpated.

4.2.2.5 Hawksbill sea turtle

The hawksbill turtle is relatively uncommon in the waters of the

continental United States. Hawksbills prefer coral reefs, such as those found in the Caribbean and Central America. However, there are accounts of hawksbills in south Florida and a surprising number are encountered in Texas. Many captures or strandings are of individuals in an unhealthy or injured condition (Hildebrand 1982). In the north Atlantic, small hawksbills have stranded as far north as Cape Cod, Massachusetts (STSSN database). Many of these strandings were observed after hurricanes or offshore storms. Although there have been no reports of hawksbills in the Chesapeake Bay, one has been observed taken incidentally in a fishery just south of the Chesapeake Bay (Anonymous 1992).

Hawksbills feed primarily on a wide variety of sponges but also consume bryozoans, coelenterates, and mollusks. The Culebra Archipelago of Puerto Rico contains especially important foraging habitat for hawksbills. Nesting areas in the western North Atlantic include Puerto Rico and the Virgin Islands.

4.2.2.6 Shortnose sturgeon

Shortnose sturgeon occur in large rivers along the western Atlantic coast from the St. Johns River, Florida (possibly extirpated from this system), to the Saint John River in New Brunswick, Canada. The species is anadromous in the southern portion of its range (i.e., south of Chesapeake Bay), while northern populations are amphidromous (NMFS 1998b). Population sizes vary across the species range. From available estimates, smallest populations occur in the Cape Fear (~8 adults; Moser and Ross 1995) and Merrimack Rivers (~100 adults; M. Kieffer, United States Geological Survey, personal communication), while the largest populations are found in the Saint John (~100,000; Dadswell 1979) and Hudson Rivers (~61,000; Bain et al. 1998).

Shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. They feed on a variety of benthic and epibenthic invertebrates including molluscs, crustaceans, and oligochaete worms (Vladykov and Greeley 1963; Dadswell 1979). Shortnose sturgeon are long-lived (30 years) and, particularly in the northern extent of their range, mature at late ages. In the north, males reach maturity at 5 to 10 years, while females mature between 7 and 13 years.

Shortnose sturgeon historically occurred in the Chesapeake Bay, but prior to 1996, the best available information suggested that the species was either extirpated or very rare from the area. However,

the presence of shortnose sturgeon in the Chesapeake Bay has recently been detected (Skjeveland et al. 2000) due to the initiation of a U.S. Fish and Wildlife Service (FWS) reward program for Atlantic and shortnose sturgeon in Maryland waters of the Chesapeake Bay in 1996. Before the reward program, there were only 15 published historic records of shortnose sturgeon in the Chesapeake Bay, and most of these were based on personal observations from the upper Chesapeake Bay during the 1970s and 1980s (Dadswell et al. 1984). From 1996 to April 2001, approximately 46 sturgeon have been reported in Maryland waters. Most of the shortnose sturgeon were caught in waters in the upper Chesapeake Bay north of Hart-Miller Island (Skjeveland et al. 2000).

In the Chesapeake Bay, this species has been more frequently encountered in Maryland waters, but shortnose sturgeon have historically been found as far south as the Rappahannock River (Skjeveland et al. 2000). From February through November 1997, a FWS reward program was in effect for Atlantic sturgeon in Virginia s major tributaries (James, York, and Rappahannock Rivers). A sturgeon captured from the Rappahannock River in May 1997 was confirmed as a shortnose sturgeon (Spells 1998). Nevertheless, distribution and movements of shortnose sturgeon in the Chesapeake Bay are poorly understood, in part because this species is often confused with Atlantic sturgeon. No population estimates for shortnose sturgeon in the Chesapeake Bay area are available at this time.

4.2.3 Marine Mammals

While endangered whales may infrequently occur in the affected geographical area, the marine mammal species most commonly found in the Virginia waters of the Chesapeake Bay is the Western North Atlantic stock of coastal bottlenose dolphin (*Tursiops truncatus*). The Gulf of Maine/Bay of Fundy stock of harbor porpoise (*Phocoena phocoena*) and the Western North Atlantic stock of harbor seal (*Phoca vitulina*) may occur in Virginia Chesapeake waters during May and June, but these occurrences would be uncommon. The bottlenose dolphin, harbor porpoise, and harbor seal are subject to protection under the Marine Mammal Protection Act, and the harbor porpoise is listed as a candidate species under the ESA.

The bottlenose dolphin has a medium sized, robust body, a moderately falcate dorsal fin and dark coloration, ranging from light gray to black dorsally and laterally, with a light belly. Adult lengths range from 6.5 to 13 feet, and are reached after approximately 12 years for males and 7 to 10 years for females (NMFS web site 2002). Females

reach sexual maturity at approximately age 5 to 12, and males reach sexual maturity at age 10 to 13. Calves may be born at any time during the year, but are primarily born in the spring or summer. The gestation period is approximately one year, with calves averaging about 46 inches in length at birth. Life spans longer than 40 years for males and longer than 50 years for females have been documented. Limits to the range appear to be directly temperature related, or indirectly through distribution of prey. The stock tends to inhabit waters with surface temperatures ranging from about 50°F to 90°F. They migrate seasonally, with a more southerly distribution in the winter. The minimum population size estimate for the coastal bottlenose dolphin stock is 2,482 dolphins (Waring et al. 2000). The 2000 Marine Mammal Stock Assessments (Waring et al. 2000) provides additional information about the stock and geographical range of the coastal bottlenose dolphin.

Harbor porpoise are short, stocky animals with blunt heads, triangular-shaped dorsal fins and short, somewhat rounded pectoral flippers. This species reaches approximately six feet long and 170 pounds in weight. Coloration of this species is variable, but is usually dark brown or gray on the back, fading to white on the belly. Calves are born between spring and mid-summer and are believed to wean at around 6 to 8 months. Lifespan is likely around 15 years. The stock is believed to be composed of approximately 50,000 animals. Harbor porpoise are limited to temperate and subpolar waters in the Northern Hemisphere. They are generally found over the continental shelf and in nearshore waters such as bays and estuaries, but may also travel in deeper, offshore waters. During the fall (October-December) and spring (April-June), harbor porpoises are widely dispersed from New Jersey to Maine, with lower densities farther north and south. During the winter (January-March), harbor porpoise can be found in waters off New Jersey to North Carolina (Waring et al. 2000). While it is unlikely that harbor porpoise will be prevalent in the geographical area affected by the proposed action in May and June, this species may periodically occur in the Virginia Chesapeake Bay during that time. For example, stranded harbor porpoise were documented on Chesapeake Bay beaches in May of 1997 and 1999. The 2000 Marine Mammal Stock Assessments (Waring et al. 2000) provides additional information about the stock and geographical range of the harbor porpoise.

Harbor seals have a rounded head with short, concave snouts. Adults range from approximately 5 to 6 feet in length, and harbor seals become sexually mature at 3 to 6 years. The pupping season occurs

from mid-May through June along the Maine Coast. Harbor seals are distributed from the eastern Canadian Arctic and Greenland south to southern New England and New York, and occasionally to the Carolinas. Harbor seals are unlikely to occur in Virginia waters during May and June, but there is the potential for this species to be in the geographical area affected by the proposed alternative. For example, from 1996 to 2000, two harbor seals were documented on Chesapeake Bay beaches; one on May 8, 1996, and another on June 14, 1998. This stock is believed to be composed of approximately 30,000 individuals. The 2000 Marine Mammal Stock Assessments (Waring et al. 2000) provides additional information about the stock and geographical range of the harbor seal.

4.2.4 Birds

A variety of avian species inhabit the Virginia area, and may potentially be affected by the PA. Ospreys, bald eagles, great blue herons, laughing gulls, wood ducks, Canada geese and American oystercatchers are a few of the most visible resident and migratory birds. The great blue heron is one of six species of colonial nesting waterbirds that inhabit the Chesapeake Bay region. Along with the great egret, the snowy egret, the little blue heron, the green-backed heron and the night heron, the great blue hunts in the shallows, feeding mainly on small fish, amphibians and arthropods.

Bald eagles and ospreys are the Bay s mostfamiliar raptors. The osprey builds its nests along the Bay shoreline and on navigation markers, utility poles or dead trees near the water, and dives for its main food source, finfish. Since the DDT ban in the early 1970s, the population has steadily increased. It has been estimated that more than 500 nesting pairs make their home in the Chesapeake Bay area (Chesapeake Bay Program 2002). The bald eagle is listed as threatened on the ESA, but is included in this section on birds for the purposes of this assessment. These predator-scavengers nest in trees, often loblolly pines, close to a food and water source. The bald eagle is as likely to eat carrion as it is to hunt for live prey.

Dozens of species of waterfowl (ducks and geese), from the mallard and the Canada goose to the wood duck and red-breasted merganser, also live in the Chesapeake Bay region, or at least for a short period during their migration between Canada and southern habitats. Many other species inhabit the Bay region, including other "aerial gleaners" that consume fish or insects, such as gulls, terns, barn swallows, brown pelicans and cormorants. Other wading birds include

the sandpiper, sanderling, willet, black-bellied plover, ruddy turnstone, dowitcher and glossy ibis.

Loss of habitat along waterways poses the biggest threat to most bird species in the Bay watershed. Deforestation, shoreline development and shoreline erosion disrupt nesting activities, and chemical contaminants in the water damage the food source of many Bay birds.

4.2.5 Habitat

The Virginia waters of the Chesapeake Bay are considered Essential Fish Habitat (EFH) for various life stages of the following species: Atlantic butterfish, Atlantic sea herring, Atlantic sharpnose shark, black sea bass, bluefish, cobia, dusky shark, king mackerel, red drum, red hake, sand tiger shark, sandbar shark, scup, Spanish mackerel, summer flounder, whiting, windowpane flounder, and winter flounder. EFH refers to those waters and substrate necessary for fish to spawn breed, feed, or grow to maturity (Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 *et seq.*).

The shallow Virginia waters of the Chesapeake Bay contain submerged aquatic vegetation, or SAV. Underwater grasses provide food and shelter for various species of fish, shellfish, invertebrates and waterfowl. There are 16 species of SAV commonly found in the Chesapeake Bay (both Maryland and Virginia waters) or nearby rivers. The distribution of these species in the shallow waters of the Bay depends greatly on their individual habitat requirements, in which salinity is a primary factor affecting SAV distribution. The submerged grasses commonly found in areas of higher salinity in the Bay include eelgrass (*Zostera marina*) and widgeon grass (*Ruppia maritima*). Other habitat conditions influencing SAV distribution include temperature, light penetration, water depth, water currents and wave action. Historically, up to 600,000 acres of SAV grew along the shoreline of Chesapeake Bay (the first aerial surveys were in the 1930s). But by 1978, surveys of SAV documented only 41,000 acres. Bottom sediment SAV appeared to be making a comeback recently, but grasses decreased by 5,740 acres, or eight percent, in 1998 (Chesapeake Bay Program 2002).

4.3 Economic and Social Environment

The fishing industry that would be affected by this proposed action is the pound net fishery in the aforementioned geographical area. The pound net fishery has been previously described in various documents

(Kirkely et al. 2001, Mansfield et al. 2000, Bellmund et al. 1987, Dumont and Sundstrom 1961), and the following will serve as a brief summary.

A pound net is a fixed entrapment gear consisting an arrangement of fiber netting supported upon stakes or piling with the head ropes or lines above the water. Typically, there are three distinct segments: the pound, which is the enclosed end with a netting floor where the fish entrapment takes place; the heart, which is a net in the shape of a heart that aids in funneling the fish into the pound; and the leader, which is a long straight net that leads the fish offshore towards the pound. There may also be an outer compartment or heart, and pound nets fished in deeper water may have a middle compartment (round pound). Fish swimming along the shore are turned towards the pound by the leader (sometimes a mile long), guided in the heart, and then into the pound where they are removed periodically by devices such as dip nets. Pound net leaders can consist of mesh, stringers, and/or buoys. A pound net leader with stretched mesh greater than 12 inches is considered to be a large mesh leader. A stringer leader consists of vertical lines spaced apart in a portion of the leader and mesh in the rest of the leader. Alternatively, a leader that does not have a stringer fishes the first row of mesh at the water surface.

Pound nets are passive fishing devices, as they will trap the fish that swim into the pound. Species of fish that are caught within a net depend upon a variety of factors, including the season and the location of the pound net. Appendix B identifies the species of fish that have been landed using pound net gear in Virginia. Landings by pound nets represented approximately 40 percent of the total landings in the Virginia Chesapeake Bay during May and June 2001 (Table 2.1.1). Based upon data from 1999 to 2001, Virginia pound net fishermen landed 353,300 pounds of fish annually on average.

Virginia has maintained a limited entry system for pound nets in the mainstem Chesapeake Bay and near reaches of the tributaries since 1994. According to the 2001 VMRC survey data, only approximately 160 pound net licenses are issued in Virginia, where one license is assigned to each pound net, and 72 licenses are fishing in the waters potentially affected by this proposed action. Annual attrition of licenses results in licenses being transferred to new participants, so it appears that the number of licenses has been relatively stable since 1994. In 2001, the Virginia counties with the highest number of issued pound net licenses were Northumberland (50), followed by Northampton (43), Lancaster (13), Westmoreland (10), and Mathews (10).

According to VMRC, pound nets are set almost exclusively offshore of the county in which the license was purchased.

In Virginia, the majority of pound net stands are located around the southern Virginia shore of the mouth of the Potomac River (south of Smith Point), around the mouth of the Rappahannock River, around the mouth of the York River/Mobjack Bay, and along the eastern shore of Virginia. The choice of leader mesh size depends heavily on the currents where the nets are located. Large mesh leaders are utilized in the areas of strong tidal currents to prevent flotsam from washing into the leaders and causing the overburdened nets to drift away. In the southern area of the eastern shore, large mesh leaders (approximately 12-14 inch mesh) are set in deeper waters (approximately 20-35 ft), while small mesh leaders (approximately 6-8 inch mesh) are set closer to shore in up to 15 ft of water.

Stringer leaders are used in the locations with the highest currents, typically found in the western bay, around the tip of Mobjack Bay and just south of the mouth of the Potomac River, near Reedville. The pounds for those stringer leaders are set in 12 to 30 feet of water. Nets in shallower protected areas are usually equipped with smaller mesh leaders (8 inches stretched mesh and smaller). Only a few pound nets are set upriver of the first bridge in the Virginia Chesapeake Bay tributaries. In the Potomac River, three pound nets with 5 inch stretched mesh leaders are located above the Harry W. Nice Memorial Bridge (Route 301), and in the Rappahannock River, nine pound nets with small mesh leaders (approximately 4 inch stretched mesh) are set above the Robert Opie Norris Bridge (Route 3). There are currently no pound nets above the first bridge in the James River and York River.

5.0 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

This section outlines the scientific and analytic basis for the comparisons of the alternatives, as well as describes the probable consequences of each alternative on selected environmental resources. The environmental consequences will be addressed by each alternative outlined in section 3.0. As described in section 4.0, the biological resources potentially affected by this action include fishery resources, endangered and threatened species (sea turtles, shortnose sturgeon, whales), marine mammals, birds, and habitat. The main purpose of the PA is to conserve sea turtles listed under the ESA by reducing incidental take in the commercial pound net fishery in Virginia. Therefore, the general effect of this action on sea turtles is expected to be beneficial. Marine mammals present in the area

subject to gear restrictions would also likely benefit from the reduced probability of entanglement. Non-marine mammal species known to be affected by the passive fishing gear are the fish species for which the gear is targeted, and birds, which have also been found to become entangled in pound net leaders. The fishing industry directly impacted is the pound net fishery.

For the purposes of the biological, economic, and social analyses in the following sections, we assume fishermen are fishing with the minimum mesh size that is operational. That is, if a fisherman chose a smaller mesh size in the pound net leader to comply with regulations, the leader would be washed away due to strong currents and debris becoming entangled. This is also assumed for fishermen fishing with stringers. This assumption was required since the data provided by VMRC does not give the exact position of where pound nets were located within large water areas. Currents may be stronger in a position below a river versus above a river out flow. This scenario is assumed to be the worst case. Since the leader guides fish into the heart of the pound net, its removal will likely result in a loss of catch. Fishermen will then incur revenue losses and labor costs associated with the removal and replacement of the leader. However, this assumption that fishermen use the minimum mesh size that is operational may not necessarily hold true for all fishermen. It is possible that fishermen choose mesh size based upon a variety of factors, such as cost, selectivity for certain finfish species, and local environmental conditions. Under this scenario, some fishermen may be able to use smaller mesh sizes, but they may also incur an additional expense they might not otherwise and may not be able to select for specific species of fish as well. There may be unknown revenue differences (either positive or negative) between fishing with larger mesh and smaller mesh leaders. This assumption is identified in the following sections when appropriate.

5.1 PROPOSED ACTION

The specific gear modifications contained in the proposed action are described in the Biological Impacts Section with a description of the risk reduction benefit. The economic and social impacts are also discussed in the associated sections.

5.1.1 Biological Impacts

5.1.1.1 Fishery Resources

The proposed action involves prohibiting pound net leaders with stretched mesh 12 inches or greater and leaders with stringers in the Virginia Chesapeake Bay. Those fishermen that use leaders affected by this alternative have the option to remove their leaders from the water during the proposed time period of the regulation or switch to a smaller mesh size. Should the fishermen choose to remove their leaders, fewer fish would likely be caught in these pounds. If fewer fish are caught in pound nets, the fishery resources may benefit as there may be more fish in Virginia waters. However, these fish may continue to be caught by other pound nets with smaller mesh sizes, or other commercial and recreational fishing gear. As such, it is unlikely that the proposed action, which could reduce fish catches in a relatively small number of pound nets (if fishermen choose to remove their leaders instead of switching to smaller leaders), would greatly improve the fish stocks in Virginia waters. Furthermore, should the affected industry participants switch to smaller leader mesh sizes instead of electing to not fish with leaders, they may catch the same amount of fish as with large mesh leaders. Switching to a smaller mesh leader should not have any notable impacts to fishery resources.

However, switching to a smaller mesh size may not be possible for all leaders given the location of the affected pound nets, because larger mesh leaders are used in areas with high currents to prevent debris from clogging the nets and the current carrying away the leader. The potential impacts to fishery resources are difficult to determine because they depend on the actions taken by the affected industry participants. NMFS assumes that fishermen are using the minimum size mesh that is operational, so fishermen will likely remove their leaders, virtually curtailing fishing activity, rather than switching to a smaller mesh size.

Some fish species have been found entangled in the pound net leaders themselves, rather than captured in the pounds. During a VIMS pound net survey from June to October 2001, several fish species were found entangled in pound net leaders (Mansfield et al. 2002). These species included red drum, weakfish, blue crab, black tip shark, sandbar shark, and several unidentified species of shark. If the affected fishermen elect to curtail the use of leaders rather than switching to smaller mesh leaders, as assumed, reducing the number of leaders in the water may have a beneficial effect on fishery resources by reducing the threat of entanglement in leaders greater than or equal to 12 inches stretched mesh. However, while the leader mesh size of most of the fish entanglements was not presented in the 2002 VIMS report, there were three fish species caught in leaders with 0.8 inch

stretched mesh. Several small blue crabs were also found stuck in leaders measuring 6 inch stretched mesh. It appears that fishery resources may become entangled in a range of leader mesh sizes. Therefore, restricting large mesh and stringer leaders may benefit fishery resources to some extent, but those benefits are not expected to be extensive as fish may still become entangled in smaller mesh leaders, or be caught by pound net fishermen or other commercial or recreational fishermen.

If NMFS believes that sea turtles may still be vulnerable to entanglement in pound net leaders after June 30 and the regulations are extended, the impacts of the extension on fishery resources should not differ from the original gear restriction.

If NMFS implements additional restrictions to further protect sea turtles, such as either the restriction of leaders greater than or equal to 8 inches stretched mesh or all pound net leaders regardless of mesh size, it is possible that fishery resources will be impacted in a positive manner. There are more fishermen who fish with leaders greater than or equal to 8 inches, than those who fish with leaders greater than or equal to 12 inches. If NMFS obtains information that warrants a restriction of pound net leaders greater than or equal to 8 inches, those fishermen may either switch to a smaller mesh leader or elect to stop fishing with leaders. It is likely that these fishermen will decide to remove their leaders if the strong water currents and net fouling potential would make switching to a smaller leader mesh size impossible. Should the fishermen choose to remove their leaders, fewer fish would likely be caught in these pounds. If fewer fish are caught in pound nets, there may be more fish in Virginia waters. However, these fish may continue to be caught by other pound nets with smaller mesh sizes, or other commercial and recreational fishing gear. As such, it is unlikely that the implementation of additional restrictions on 8 inches or greater stretched mesh, which could reduce fish catches in certain pound nets (if fishermen choose to remove their leaders instead of switching to smaller leaders), would greatly improve the fish stocks in Virginia waters. Furthermore, should the affected industry participants switch to smaller leader mesh sizes instead of electing to not fish, they may catch the same amount of fish as with leaders smaller than 8 inches stretched mesh.

Conversely, if NMFS determines that a prohibition of all pound net leaders is required, all pound net fishermen in the affected area would be required to remove their leaders from the water. While the heart(s) and pound may still be set, resulting in some level of fish

catch, it is likely that the catch will be drastically reduced. If the use of all pound net leaders in the affected area is curtailed, fish would not be caught by pounds and would be more plentiful in Virginia waters. Again, these fish may continue to be caught by other commercial and recreational fishing gear. As such, it is unlikely that the prohibition of all pound net leaders would noticeably improve the fish stocks in Virginia waters.

5.1.1.2 Endangered and Threatened Species

The proposed action has the potential to impact threatened and endangered sea turtles, and to a minimal extent endangered shortnose sturgeon. This PA was developed to reduce sea turtle interactions with pound net leaders. While threatened loggerheads are the most common species found both entangled in pound nets and stranded on Virginia beaches, endangered Kemp s ridley, leatherback, and green sea turtles have also been documented in Virginia state waters and may become entangled in pound net leaders as well. While hawksbill turtles are not common in the affected area, this species would have the same likelihood of entanglement in pound net leaders should the species occur in Virginia waters. As such, the biological impacts of the PA (and all other alternatives) will be addressed for all sea turtles combined, rather than by each individual species.

High turtle mortalities in late May and early June in Virginia have previously been attributed to entanglement in large mesh pound net leaders in the Chesapeake Bay (Lutcavage 1981, Bellmund et al. 1987). Specifically, pound net entanglement may account for up to 33 percent of sea turtle mortality in the Chesapeake Bay during some summers (Lutcavage and Musick 1985), but more turtles are likely entangled in Virginia pound net leaders and drown than are reported (Lutcavage 1981). A pound net survey in the 1980s documented many dead loggerheads and one [Kemp s] ridley hung by heads or limbs in area poundnet hedging [leaders] (Lutcavage 1981). This study also determined that based upon constriction features on stranded turtles, some beached carcasses had previously floated free of pound net leaders and that it was plausible that unidentified pound net leader deaths could account for many of the carcasses for which no mortality sources have been identified. However, if a turtle is moderately to severely decomposed, it is unlikely that constriction wounds would be visible. Five turtles entangled in pound net leaders were examined during 1984 and none of these turtles became disentangled by natural causes, but instead completely decomposed in situ within five weeks (Bellmund et al. 1987). While additional information is necessary to

adequately determine how often sea turtles become disentangled from pound net leaders, it is plausible that turtles may become dislodged from pound net leaders either by the strong current in certain areas of the Chesapeake Bay, by the decomposition process, or by fishermen disentangling dead sea turtles if detected. This theory needs to be explored. Based upon information such as the decomposition stage of the sea turtle, the position of the turtle in the leader, and the monitoring schedule of pound net leaders, some sea turtles found in association with pound net leaders may have washed into the leader post-mortem. However, they may also have become entangled and drowned in a neighboring pound net leader and drifted into a different leader. Nevertheless, there have been several documented sea turtle entanglements in large mesh leaders that were determined to have caused mortality by drowning, and there have been observations of live turtles entangled in leaders under water.

Bellmund et al. (1987) states that entanglements in pound net leaders began in mid-May, increased in early June, and reached a plateau in late June. In 1984, no entanglements were observed after late June. Data collected in 1983 and 1984 found turtle entanglement in pound nets with small mesh leaders (defined as 8 to 12 inch stretched mesh) to be insignificant, but in 173 pound nets examined with large mesh leaders (defined as >12 to 16 inch stretched mesh), 0.2 turtles per net were found entangled (30 turtles; Bellmund et al., 1987). This study also found that in 38 nets examined with stringer mesh, 0.7 turtles per net were documented entangled (27 turtles). The sampling area was concentrated in the western Chesapeake Bay, with some sampling occurring in other portions of the Virginia Chesapeake Bay. Surveys conducted in Virginia Chesapeake Bay waters in 1979 and 1980 also found that most pound net leaders that captured sea turtles had large mesh (12 to 16 inches) and were found in the lower Bay (Lutcavage 1981).

NMFS recognizes that the majority of scientific information on Virginia pound net interactions dates back to the 1980s. However, the factors involved in entanglement, namely the size of sea turtles heads and flippers relative to mesh size and stringers, are the same today as they were in the 1980s. NMFS anticipates that sea turtles will continue to interact with large mesh and stringer leaders in the Chesapeake Bay. In fact, during the spring of 2001, several sea turtles were documented in pound net leaders. A NMFS observer reported finding five moderately to severely decomposed loggerhead turtles against four different large mesh pound net leaders (approximately 13 inch) off Sunset Beach on the eastern shore in early

June. The turtles were not conclusively determined to be entangled in the leaders, and the cause of death was uncertain. The four pound nets were set in deep water (approximately 25 feet) and were the farthest out in the water relative to the other smaller mesh nets in the area. VMRC law enforcement agents also documented one live and three dead sea turtles in pound net leaders along the eastern shore during the spring of 2001. The live turtle was entangled in a leader with greater than 12 inches stretched mesh, but the leader mesh size of the other entanglements was not documented. Additionally, during June of 2000, VMRC law enforcement agents reported disentangling two live sea turtles from two eastern shore leaders with greater than 12 inches stretched mesh.

NMFS also recognizes that the data on observed sea turtle entanglements in pound net leaders are limited, and that other factors likely contribute to spring sea turtle mortality in Virginia. The level of sea turtle interactions with other potential mortality sources (e.g., other fisheries) has not yet been determined, but NMFS has data indicating that pound net leaders result in some level of sea turtle entanglement. NMFS believes that it is likely that pound nets are a large contributor to the high sea turtle strandings documented each spring on Virginia beaches. By implementing the PA which would prohibit the gear type known to result in sea turtle entanglements, pound net leaders greater than or equal to 12 inches stretched mesh and pound net leaders with stringers, in the aforementioned geographical area, sea turtle interactions with pound net gear would be reduced and spring sea turtle strandings in Virginia should decline.

The dates of the proposed gear restriction were determined from previous sea turtle strandings data collected on Virginia beaches. In some years, the first documented stranding was on May 2 (1994), while in other years, sea turtles were not reported on Virginia beaches until May 19 (2001). From 1994 to 2001, the average date of the first reported stranding in Virginia was May 15. However, sea turtle mortality would have occurred before the animals stranded on Virginia beaches. It is unknown exactly how long it takes a sea turtle in Virginia to strand once the mortality incident has occurred, as the stranding would be dependent upon a number of factors including the location of the mortality, wind patterns, and water currents. An 1 week estimate from the mortality incident to stranding date appears to be realistic for Virginia Chesapeake Bay waters. In order for the proposed pound net restrictions to reduce sea turtle interactions with pound net leaders and reduce any subsequent strandings on Virginia

beaches, the proposed measures must go into effect at least 1 week prior to the stranding commencement date, or on May 8. Based upon STSSN strandings data, strandings in Virginia typically remain elevated until June 30, indicating that turtles may be vulnerable to entanglement in pound net leaders until this time. Enacting the proposed gear restriction during this time period should prevent the reoccurrence of sea turtle takes in the pound net fishery during the spring and high numbers of strandings in Virginia.

This alternative would also include a framework provision to extend the regulation if NMFS believes that sea turtles may still be vulnerable to entanglement in pound net leaders after June 30. It is difficult to predict whether this regulation will be extended, as a variety of factors go into determining the potential occurrence of sea turtle/pound net interactions past June 30 (e.g., water temperature, status of sea turtle migrations). Nevertheless, if the prohibition of pound net leaders greater than or equal to 12 inches and leaders with stringers is extended, for any amount of time, this will serve to provide additional protection to sea turtles by minimizing any other entanglements.

There is the potential for sea turtles to continue to interact with pound net leaders with stretched mesh smaller than 12 inches, but the likelihood of entanglement has not been as adequately documented as entanglements in mesh 12 inches and greater, and leader mesh greater than or equal to 12 inch stretch likely accounts for the largest number of turtle entanglements in pound net gear in the Chesapeake Bay. As such, NMFS has also proposed a framework approach in the PA that outlines the requirements for additional action. Under the PA, NMFS intends to monitor pound net leaders smaller than 12 inches stretched mesh to document any interactions between sea turtles and smaller mesh leaders, as limited information currently exists on these potential interactions. By prohibiting the use of 12 inches and greater stretched mesh and monitoring the smaller mesh leaders, sea turtle entanglements would likely be reduced while NMFS would simultaneously monitor any sea turtles interactions with smaller mesh sizes to gain needed information. Should the monitoring of pound net leaders during May and June document turtle entanglement, NMFS may implement additional restrictions, including the prohibition of pound net leaders with stretched mesh greater than or equal to 8 inches, or the prohibition of all pound net leaders regardless of mesh size. Both of these potential restrictions (or other mesh size restrictions that fall within the range between 12 inch stretched mesh and total prohibition) would be in effect for the same geographical area as the

initial restriction.

The restriction of leaders with stretched mesh greater than or equal to 8 inches will also likely reduce sea turtle entanglement in Virginia pound nets. While NMFS recognizes that the specific conditions between waterbodies may vary, anecdotal information from North Carolina fishermen indicates that turtle entanglement with approximately 8 inch mesh leaders can and has occurred. In the 1980s, North Carolina pound netters switched to mesh smaller than or equal to 7 inches, a coarser webbing (24-30 strand), and floating leaders, largely as a result of interactions with sea turtles, and found that entanglements were reduced. While turtle entanglement in small mesh leaders may be lower than large mesh or stringer leaders and has not been scientifically documented, it may occur. Bellmund et al. (1987) reported that turtle entanglement was found to be insignificant in small mesh leaders (<12 inch stretch). It appears that turtles were documented entangled in small mesh leaders during the 1983 and 1984 VIMS sampling seasons, but this report does not identify the number of turtles entangled in small mesh nets that VIMS considered insignificant. While NMFS recognizes that the majority of sea turtle entanglement in pound net leaders likely occurs in leaders greater than or equal to 12 inches stretched mesh and leaders with stringers, turtle entanglement in leaders less than 12 inches stretched mesh may occur and the implementation of a restriction on the use of these leaders would further reduce potential sea turtle entanglement and benefit these species.

Additionally, the prohibition of all pound net leaders would eliminate any potential sea turtle interactions with pound net leaders. While information on sea turtle interactions with pound net leaders smaller than 8 inches stretched mesh is unavailable, sea turtles may theoretically become entangled in gear with openings large enough to fit their flipper or head. The monitoring program NMFS is proposing for the spring of 2002 should provide additional information on the interactions between sea turtles and small mesh pound net leaders in Virginia waters. As sea turtle entanglements in leaders less than 8 inches have not been documented but may occur nonetheless, this additional measure would serve to further protect sea turtles that may be entangled in smaller mesh leaders.

Similar to the restriction of leaders with 12 inches stretched mesh and greater, if NMFS believes that sea turtles may still be vulnerable to entanglement in pound net leaders after June 30, the additional restrictions implemented under the framework may be extended. If the

prohibition of pound net leaders greater than or equal to 8 inches stretched mesh or all pound net leaders is extended, for any amount of time, this will serve to provide additional protection to sea turtles by minimizing any other entanglements.

The PA includes the enactment of a phased approach in which NMFS prohibits the use of pound net leaders with the most substantial data on sea turtle entanglement, collects data on pound net leaders less than 12 inches stretched mesh to document potential sea turtle interactions with smaller mesh leaders, and retains the option to impose additional restrictions if sea turtle take is observed in leaders less than 12 inches stretched mesh. This alternative appears to be protective of sea turtles while allowing the fishery to continue, and will result in additional information on pound net and sea turtle interactions.

It is unlikely that endangered shortnose sturgeon will be significantly impacted by the proposed action. The occurrence of shortnose sturgeon in Virginia waters is rare. NMFS is not aware of any instances or reports documenting shortnose sturgeon entangled in pound net leaders of any mesh size. However, the potential exists for shortnose sturgeon to become trapped by the pound net like other fish species. From 1996 to 2002, as a result of the U.S. Fish and Wildlife Service reward program, shortnose sturgeon have been reported taken in pounds in the Maryland waters of the Chesapeake Bay. If shortnose sturgeon are present in Virginia waters, they may become trapped in the pounds of pound nets. NMFS is not aware of the documentation of such a take in Virginia, but there is not a shortnose sturgeon or Atlantic sturgeon reward program currently in Virginia that may ensure such documentation. Nevertheless, should shortnose sturgeon be subject to entrapment by pound nets or entanglement in pound net leaders, the proposed action would minimize this potential because prohibiting leaders greater than or equal to 12 inches and leaders with stringers will likely reduce fish catch in pound nets in the Virginia Chesapeake Bay. Should the affected fishermen choose to switch to smaller mesh leaders instead of electing to remove their leaders, the potential benefits to shortnose sturgeon would be negated to an unknown amount.

Endangered right, humpback, and fin whales are unlikely to be in the project area. If they do enter the Chesapeake Bay, they will probably not interact with the fixed pound net gear. As such, the proposed alternative should not affect endangered whales.

5.1.1.3 Marine Mammals

Prohibiting the use of pound net leaders greater than or equal to 12 inches stretched mesh and leaders with stringers may have a beneficial effect on marine mammals, in particular bottlenose dolphin. The species most affected by this proposed action is the Western North Atlantic stock of coastal bottlenose dolphin (bottlenose dolphin). Harbor porpoise and harbor seals may be in the Virginia Chesapeake Bay waters during May and June and may be affected by the PA, but their occurrence is anticipated to be relatively infrequent.

Bottlenose dolphin have been found entangled in pound net leaders in Virginia, and stranding data from 1993 to 1997 suggest that this fishery has occasional takes of coastal bottlenose dolphin. Stranding network members who have observed dolphin behavior around pound nets report that dolphins play and feed around pound nets and can become entangled in the leader part of the nets. Stranding network members have never observed a bottlenose dolphin in the pound itself (M. Swingle, pers. comm.).

Two bottlenose dolphin carcasses were found entangled in pound net leaders in Virginia from 1993 to 1997. The leader mesh size for these observed entanglements is not available. A third record of an entangled bottlenose dolphin in Virginia in 1997 may have been attributable to this fishery, but this information is not conclusive. This incident involved a bottlenose dolphin carcass found stranded near a pound net with twisted line marks consistent with the twine in the nearby pound net lead rather than with monofilament gillnet gear. Note that marine mammals exhibit fishing gear entanglement marks much more frequently than sea turtles, due to the differences in body composition.

Data from the Chesapeake Bay suggest that the likelihood of bottlenose dolphin entanglement in pound net leaders may be influenced by the mesh size of the leader but the information is not conclusive (Bellmund et al. 1997 in NMFS 2001). A study conducted in North Carolina from 1988 to 1999 observed pound nets with 8 inches and smaller stretched mesh leaders for sea turtles; no bottlenose dolphin entanglements were observed. While speculative, bottlenose dolphin appear to be more likely to become entangled in leaders with larger mesh due to their body morphology. If the leader is stretched tight between the poles and has small stretched mesh, these characteristics may preclude bottlenose dolphin entanglements.

Prohibiting leaders with stretched mesh greater than or equal to 12 inches should serve to limit the interactions between pound net gear and bottlenose dolphin and any subsequent entanglements. As bottlenose have been found entangled in pound net leaders in Virginia waters, any measure that limits the amount of gear in the water should benefit these marine mammals. Under this alternative, fishermen have the potential to switch to leaders smaller than 12 inches stretched mesh, but NMFS assumes fishermen are using the minimum mesh size that is operational and will elect to remove their leaders. Nevertheless, as the leader mesh size resulting in the most bottlenose dolphin entanglements has not been conclusively determined, if fishermen switch to smaller mesh sizes, bottlenose dolphin entanglement could still occur.

This alternative would also include a provision to extend the gear restriction if NMFS believes that sea turtles may still be vulnerable to entanglement in pound net leaders after June 30. NMFS is not aware of any seasonal differences in bottlenose dolphin entanglements in pound net leaders from the spring to summer. While the enactment and duration of this extension are difficult to predict, the extension of the leader restriction will likely provide additional protection to bottlenose dolphin by minimizing any other entanglements. The magnitude of the additional protection would be dependent upon the duration of the extension.

If NMFS implements additional restrictions to further protect turtles, such as either the restriction of leaders greater than or equal to 8 inches or all pound net leaders regardless of mesh size, it is probable that bottlenose dolphin entanglements will further be reduced. It appears that bottlenose dolphin are more prone to entanglements in pound net leaders greater than 8 inches stretched mesh, but this information is not conclusive. While the restriction of pound net leaders greater than or equal to 12 inches stretched mesh may provide more protection to bottlenose dolphin than a smaller mesh restriction, restricting the use of smaller mesh leaders should provide additional protection to this species. NMFS anticipates monitoring pound net leaders during May and June 2002 and this effort should also provide additional information on the potential interactions between bottlenose dolphin and Virginia pound net leaders with stretched mesh smaller than 12 inches.

Harbor porpoise and harbor seals may interact with pound net leaders, but there is no documentation of these species entanglements in pound net leaders. These species are not likely to be frequent visitors to

the Virginia Chesapeake Bay during May and June, but there remains the potential for harbor porpoise and harbor seals to interact, and potentially become entangled, in pound net leaders with greater than or equal to 12 inches stretched mesh and stringers should the species occur in this area. As such, it is likely that this alternative will provide some benefit to these species, but the magnitude of the benefit cannot be determined.

5.1.1.4 Birds

Prohibiting leaders with greater than or equal to 12 inches stretched mesh and leaders with stringers should benefit birds that inhabit the Chesapeake Bay area. However, not all avian species have the potential to interact with pound nets and those that do not forage for fish or come in contact with the water should not be impacted by the PA. While all birds spending some time in the water may interact with pound net leaders, the species that would benefit the most from the PA include brown pelicans and cormorants. From September to October 2000, brown pelicans and cormorants were observed to have become entangled in pound nets on several occasions (Mansfield et al. 2000). These interactions occurred within all parts of the pound net including the pound, heart, and leader, regardless of mesh size. During these surveys, cormorants were commonly observed to be swimming and fishing within the pound. When approached by the boat, the birds would attempt to take flight, but many did not appear to have enough water for take-off and would become entangled or struggle with the mesh of the pound. Additionally, while traversing a pound net leader offshore the southern portion of the eastern shore in August 2001, NMFS staff observed an entangled brown pelican. The mesh size was not determined.

While avian entanglements may still occur in other parts of the pound net, prohibiting leader mesh size and leaders with stringers may reduce some of the brown pelican and cormorant entanglement that has previously been documented. The PA would benefit these species and any other birds that may interact with pound nets. NMFS assumes fishermen are using the minimum mesh size that is operational, but under this alternative, fishermen have the potential to switch to leaders smaller than 12 inches stretched mesh. If affected fishermen decide to switch to a smaller mesh leader, there would not be any change in the number of pound net leaders, rather just a change in the mesh size of those pound net leaders. NMFS is not aware of any data supporting differences in brown pelican and cormorant entanglements between leader mesh sizes, so if fishermen switch to a smaller leader,

entanglements of birds in those leaders could still occur.

If NMFS believes that sea turtles may still be vulnerable to entanglement in pound net leaders after June 30 and the regulations are extended, the interactions between large mesh and stringer pound net leaders and birds would be further minimized. NMFS is not aware of any seasonal differences in brown pelican or cormorant entanglements, so extending this regulation, while difficult to predict if it will occur, should provide additional protection to birds. The magnitude of the additional protection would be dependent upon the duration of the extension. If NMFS implements additional restrictions to protect turtles, such as either the restriction of leaders greater than or equal to 8 inches or all pound net leaders regardless fo mesh size, it is probable that brown pelican and cormorant entanglements will further be reduced.

5.1.1.5 Habitat

NMFS believes that the PA would have only minor impacts on bottom vegetation and habitat. If any impact occurs, it may result when the fishermen remove their leaders to comply with the restriction. Removing leaders is a difficult task since the bottom of the mesh is typically buried in the bottom. The fishermen may disrupt bottom habitat (EFH or SAV) for a short period of time while they remove their leaders (typically taking approximately 1 to 2 days). This disruption would also occur when fishermen replace their leaders after the restriction period has expired. Nevertheless, the duration of this disruption is extremely short. Fishermen replace their leaders on a periodic basis (usually every year), so these bottom habitat disruptions occur during normal fishing activities. Therefore, PA would not impose any different impacts to habitat other than those that would occur during normal fishing activities. The magnitude of the habitat disruption is also relatively small; the PA would impact approximately 24 pound net leaders throughout the Virginia Chesapeake Bay waters. Further, it does not appear that these pound nets are set in pristine areas of notable concern for EFH or SAV. As such, the preferred alternative may result in some temporary disruption of already affected bottom habitat to a nature and degree (that is, removal of the leaders) that already occurs in the industry. Cumulative impacts are not expected because the leaders would need to be eventually replaced regardless of the proposed regulation. Consequently, the PA is unlikely to adversely impact EFH or SAV.

If NMFS believes that sea turtles may still be vulnerable to

entanglement in pound net leaders after June 30 and the regulations are extended, the impacts of the extension on EFH or SAV should not differ from the original gear restriction.

If NMFS implements additional restrictions to further protect turtles, such as either the restriction of leaders greater than or equal to 8 inches or all pound net leaders regardless of mesh size, the impacts to EFH and SAV should be the same as the original restriction.

5.1.2 Economic Impacts

Aside from the alternative prohibiting the use of any leader, all four of the alternatives involve restricting pound nets with leaders and stringers. Under all four alternatives harvesters can continue to fish with leaders in the area if they convert their gear. The four alternatives have different leader mesh size restrictions. Stringers are completely prohibited in 3 out of 4 alternatives. Specifically, the PA prohibits pound nets with leader mesh sizes 12 inches and greater, as well as those using stringers. The non-preferred alternative 1 prohibits pound nets with leader mesh sizes 8 inches and greater, as well as those using stringers. The non-preferred alternative 2 prohibits all pound net leaders. Finally, the non-preferred alternative 3 prohibits pound nets with leader mesh sizes greater than 16 inches, and it requires stringers to drop the mesh to 9 feet below mean low water and to space stringer lines at least 3 feet apart.

The absolute magnitude of sea turtle protection provided by these regulatory alternatives can not be quantified, but they can be ranked. The non-preferred alternative 2 provides the greatest protection to sea turtles, followed by the non-preferred alternative 1 and PA. The non-preferred alternative 3 provides the least protection to sea turtles. The reasoning is as follows. We assume larger mesh in pound net leaders is equivalent to a increased rate of entanglement. That is, the rate of entanglement is reduced as the mesh size is reduced. The non-preferred alternative 2 provides the most protection because all pound net leaders are prohibited and therefore the rate of entanglement in these leaders is zero, since they are completely removed. Since the non-preferred alternative 1 prohibits leader mesh sizes at 8 inches or greater, and the PA plan prohibits the same mesh to 12 inches or greater, the non-preferred alternative 1 provides more protection to sea turtles compared to the PA. Finally, the non-preferred alternative 3 provides the least protection due to prohibiting the leader mesh to 16 inches or greater.

Under the PA, all pound net leaders measuring 12 inches or greater stretched mesh and all pound nets with stringer leaders in the Virginia waters of the Chesapeake Bay are prohibited from May 8 to June 30. To continue fishing in this area, the mesh size of the leader must be reduced and all stringers must be removed. For the purposes of this economic analysis, we assume all pound net leaders are fishing with the minimum mesh size that is operational. That is, the use of smaller mesh sizes may not be operationally feasible. Therefore, we further assume from May 8 to June 30, harvesters will remove their leaders, with or without stringers, and not be able to fish. This scenario is considered to be the worst case scenario and the assumption may not apply to all harvesters. Since the leader guides fish into the heart of the pound net, its removal will result in a loss of catch. Harvesters will then incur revenue losses and labor costs associated with the removal and replacement of the leader.

Both consumer surplus and producer surplus for seafood products supplied by the pound net fisheries will be affected by these sea turtle protection measures. For the purposes of this analysis, we assume harvesters are currently operating with the minimum mesh size possible. Therefore, these sea turtle protection measures will result in revenue losses due to not fishing, plus labor costs for removing and replacing leaders from May 8 to June 30. A decrease in earned revenues will result in a reduction in quantities of seafood supplied to seafood markets which may result in higher prices to consumers. The magnitude of these changes and how the surpluses will be redistributed between consumers and producers will depend on the slopes of the respective supply and demand functions. In any case, as long as demand functions are downward sloping and supply functions are upward sloping, there is always a loss in economic surplus when regulatory costs are imposed. However, this loss in economic surplus will be minimized by selecting the least costly regulatory alternative which provides the maximum protection.

Data

The following data sources were used in this analysis: 1) 2001 pound net survey data collected by VMRC which includes the mesh size of the pound net leader fished, and whether stringers were used and; 2) trip level data from VMRC which includes fishing effort, landings and the value of each species sold. The landings and effort data do not include gear characteristics such as leader mesh size. Both sources have data reported by Virginia water area codes within the Chesapeake Bay. The proposed action affects pound net harvesting in the following water areas within the Chesapeake Bay: 306, 307, 308, 309, 358, 346

and 353 (VMRC/NMFS water area codes).

These data are used to estimate the potential number of harvesters that may be affected by the PA, the quantity of gear and potential revenue losses. These data do not provide any information on the cost of removing leaders from the water.

Pound Net Fishery

In the 2001 Virginia pound net fishery there were 160 licenses assigned, where one license is equivalent to one pound net. There were 72 pound net licenses potentially fishing in water areas affected by this proposed action. Of these 72 assigned pound net licenses, 42 were surveyed by the state of Virginia (Table 5.1.2.1). Data indicates 14 percent (=6/42) of the harvesters surveyed, use pound nets leaders with a mesh size greater than 12 inches, and 14 percent use stringers. Pound nets that use stringers generally have a leader mesh size of 7 inches or less, and stringers are typically spaced 6 inches apart.

Virginia landings and effort data show a total of 27 harvesters fishing pound nets between May 8 and June 30 in 2001 (Table 5.1.2.1). Harvesters fished between a low of 1.8 (CV=33) pound nets (in water area 309) and a high of 3.7 (CV=66) pound nets (water area 306) on average during this time period. A total of 63.9 pound nets were fished in all water areas affected by this PA, according to the 2001 Virginia landings data. From May 8 to June 30, 2001, the pound net fishery landed 1,801,000 pounds of fish. The majority of landings were bait (30%), Atlantic croaker (28%), menhaden (19%), sea trout (8%), and Spanish mackerel (3%).

Table 5.1.2.1 Number of harvesters surveyed (2001), number of harvesters fishing by leader mesh sizes (>12", > 8" and >16") and number using stringers, the number of harvesters fishing from May 8 to June 30, 2001 with the average pound nets (PN) fished per harvester with the coefficient of variation (CV) and total pound nets fished in Chesapeake Bay by water area.

NEM Areas	Surveyed Harvesters	Fishing May 8 to June 30		
		Harvesters	Pound Nets Fished	Total PN Fished

	No. Surveyed	Leaders with mesh > 12	> 8	> 16	With Stringers	Avg	CV	
306	12	4	7	0	0	6	3.7	66	22.3
307	2	0	0	0	2	4	2.0	38	7.8
308	5	0	0	0	0	0			0.0
309	16	2	3	0	3	12	1.8	73	21.8
346346,346,353,378346,0353,3058					0	1	5	2.4	33	11.9
Total	42	6	10	0	6	27			63.9

Method

Two sources of data were used to estimate the number of harvesters affected by the PA and their potential revenue losses. VMRC survey data identified a subset of harvesters fishing pound nets. Details of the survey included the harvester (with unique license numbers) identifying where they fished (by water area), the mesh size of leaders, whether or not they fished with stringers and the corresponding distance between stringers. Harvesters with license numbers were not identified in the trip level fishing effort data. Therefore, these two data sets could not be merged by harvester. VMRC substituted the harvester s name and license number with a unique identifier in the trip data, and this identifier could not be mapped to the survey data. However, the identifier linked an individual harvester across several years and gear types. That is, one could track each harvester s revenues, catch, type of gear fished and quantity of gear fished by water area over several years.

To determine the number of harvesters affected by the PA, results from the VMRC survey data were used to prorate harvesters in the trip level data. For example, if 30 percent of harvesters surveyed in water area 306 used leaders with a mesh size greater than 12 inches, then 30 percent of harvesters fishing from May 8 to June 30 were assumed to use 12" mesh in their leader. Total revenue losses were then equal to the number of harvesters affected in a water area times the average revenue earned per harvester. The average revenue earned was based on a three year average.

Data was not available on the cost of removing leaders from a pound net. It is noted that removal of leaders is difficult task since the bottom of the mesh is typically buried into the bottom. Anecdotal evidence suggests the time to remove a leader depending on location would require 3 to 6 persons for 1 to 2 days. We assume it takes 3

persons at 8 hours per day to remove one leader from a pound net. According to the U.S. Bureau of Labor, a manufacturing position earns $14.05 per hour.

Revenue and Landings

According to the 1999 to 2001 VMRC data, there were 27 harvesters fishing pound nets from May 8 to June 30. In this period harvesters earned revenues of $16,700 (CV=100) and landed 69,300 (CV=110) pounds of fish, on average (Table 5.1.2.2). Revenues per harvester ranged between a low of $12,000 (CV=67) in water areas 346, 353, and 358, and a high of $23,900 (CV=37) in water area 306, in this period.

On an annual time frame without the PA, harvesters earned $84,300 (CV=101) in revenues and landed 352,300 (CV=110) pounds of fish on average in 2001. Annual revenues ranged between a low of $64,400 (CV=88) in water area 309, to a high of $119,700 (CV=88) in water area 306 (Table 5.1.2.3).

Results of PA

Under the PA, a harvester fishing pound nets will incur revenue losses of $16,700 (CV=100) on average (Table 5.1.2.2). Over all water areas, harvesters fish 2.4 pound nets. The cost of removing and replacing a pound net leader is approximately $1,600 ($1,618 = 2.4 pound net leaders * 3 persons * 8 hours * 14.05 per hour * 2). Under the PA, a harvester s annual revenue would have been reduced by 22 percent on average, given annual revenues were $84,300 (CV=101) (Table 5.1.2.3).

There were approximately 10.5 harvesters fishing 23.7 pound nets that would be affected from May 8 to June 30, 2001, under the PA. Total industry revenue losses are $192.0K and the cost of removing pound net leaders is $16.7K ($16,743 = 10.5 * $1,600), for a total of $209K if the PA is imposed (Table 5.1.2.2).

Table 5.1.2.2. Number of harvesters fishing from May 8 to June 30 (seasonal), number harvesters and pound nets affected by the PA, average landings and revenues per harvester with coefficient of variation (CV), and total industry revenue losses by water area.

PA

	Seasonal Harvesters		Pound nets affected	Seasonal Landings per Harvester (lbs)		Seasonal Revenues ($1)		
Water Areas	Fishing	Affected by PA	by PA	Avg	CV	Harvester Revenue	CV	Industry Revenue
306306	66	2.0	7.4	559,59,00086,023,900			37	47,800
307	4	4.0	7.8	75,00	117	21,900	63	87,600
308	0	0.0	0					0
309309	1212	3.8	6.8	8181,981,9005811,2,0799			38	47,996
346,3346,35346,353,35358346,7353,358.7				5858,70058,25012,000			67	8,571
Total	27	10.5	23.7					191,968
Average				69,69,30691300169,700			100	

Table 5.1.2.3 Seasonal (May 8 to June 30) and annual revenues per harvester with the corresponding coefficient of variation (CV), cost of removing and replacing (R&R) the leader, and revenue reductions per harvester under the PA, by water area.

	Revenues per Harvester ($1)				
Water Areas	Seasonal	Annual	CV	Cost of R&R Leader	Reduction
306	23,900	91,500	88	1,600	0.279
307307	21,90021,19000		102	1,600	0.196
308					
309	12,799	64,400	88	1,600	0.224
346,353,358	12,000	70,500	88	1,600	0.193
Average	16,700	84,300	101	1,600	0.217

5.1.3 Social Impacts

The economic analysis demonstrates the pound net fishing community will be impacted by this alternative. The proposed action does not prohibit fishing with pound nets entirely but places additional restrictions on the practices. Only those fishing pound nets with leaders measuring 12 inches or greater stretched mesh and leaders with stringers will be affected by the PA. Under the proposed action, fishermen may switch to leader mesh less than 12 inches and continue to fish. Should this occur, the social impacts of this alternative will be minimal. However, large mesh and stringer leaders are used in

areas with high current to prevent fouling of the nets, so small mesh leaders may not be practical for these offshore nets. If industry does switch to smaller leader mesh, there is the possibility that the leaders would become fouled with debris and the leader net could be washed away. This would result in additional social impacts to replace the leader. NMFS assumes, for the purposes of this analysis, that the fishermen are using the minimum mesh size that is operational, as a worst case scenario. As a result, the proposed gear restriction could prevent those pound net fishermen using leaders greater than or equal to 12 inches and leaders with stringers from fishing from May 8 to June 30. If several fishermen cannot fish with their preferred leaders, this could result in a net negative social impact on fishermen and fishing communities. For example, with a loss in revenue from approximately 2 months of unemployment, the fishermen may experience marital or domestic problems (e.g., increase in alcoholism, stress in relationship). However, positive social impacts may also occur with this alternative, as fishermen may spend more time with their families and friends if they are not working. If fishermen choose to remove their leaders, fish dealers and processors would also be impacted by the leader restrictions, as there would be a much lower level of fish catch passing through their facilities and available for purchase. While target species catch rates will likely decrease due to the inability to use the leaders on the pound nets, the heart(s) and pound may still be set, which may result in a small amount of catch. This may negate the negative impacts to the fishing community.

Those fishermen who use large mesh (greater than or equal to 12 inch stretched mesh) leaders are primarily found on the eastern shore. As such, any social impacts would be concentrated in this area. Those fishermen that use stringer leaders are concentrated in the western Bay, restricting the social impacts to communities in this area. The relatively short duration of this gear restriction also minimizes the social impacts of the preferred alternative. The pound net fishery operates generally from March to December, and the preferred alternative restricts the use of certain leaders for less than two months. These spring months may provide a notable portion of the pound net fish catch for the year, but fishermen may continue to fish throughout the remainder of the year. The fishermen may also switch to smaller leaders during that time.

Social benefits may be realized if these gear modifications are effective at reducing the entanglement risk to sea turtles, bottlenose dolphin, and birds. If this reduced risk increases the potential for sea turtle recovery then society will benefit by preventing a loss of

a species and preserving biodiversity. While these gear restrictions place an economic burden on the fishing community, they do not prohibit fishing all together. Social benefits are realized from the application of management practices that demonstrate that fishing practices and sea turtles can co-exist.

If NMFS believes that sea turtles may still be vulnerable to entanglement in pound net leaders after June 30 and the regulations are extended, the impacts of the extension on the pound net fishing community will be magnified. The implementation and duration of a potential extension is difficult to predict, as a variety of factors will need to be assessed prior to enacting such an extension. Nevertheless, if the prohibition of pound net leaders greater than or equal to 12 inches and leaders with stringers is extended, for any amount of time, the adverse impacts on the social structure of the pound net fishing community will be magnified while the benefits to sea turtles will be increased. The amplitude of the impacts are dependent upon the duration of the extension.

If NMFS implements additional restrictions to further protect turtles, such as either the restriction of leaders greater than or equal to 8 inches or all pound net leaders regardless fo mesh size, the impacts to the fishing community will likely be greater than the original restriction. There are more fishermen who fish with stretched mesh leaders greater than or equal to 8 inches, than those who fish with leaders greater than or equal to 12 inches. As such, more fishermen, more families, and a larger portion of the community will be impacted by a restriction of 8 inches and greater stretched mesh leaders. If NMFS does obtain information that warrants an additional restriction of pound net leaders greater than or equal to 8 inches stretched mesh, those fishermen may either switch to a smaller mesh leader or elect to stop fishing. It is likely that these fishermen will decide to remove their leaders if the water currents and potential fouling would make switching to a smaller mesh size impractical. Should the fishermen choose to remove their leaders, the social impacts would be higher than if the affected industry participants switched to smaller leader mesh sizes and they were operational.

If NMFS determines that a prohibition of all pound net leaders is required, all pound net fishermen in the affected area would not be allowed to use their leaders. While the heart(s) and pound may still be set, resulting in some level of fish catch, it is likely that the catch will be drastically reduced. If all use of pound net leaders in the affected area is curtailed, the entire pound net fishery will be

impacted and the social impacts of this gear prohibition would be higher than under other alternatives. Fish dealers and processors would be impacted with a complete prohibition of all pound net leaders, as there would be a lower level of fish catch passing through their facilities and available for purchase. As such, the prohibition of all pound net leaders would have a greater social impact than restricting certain leader mesh sizes.

5.2 NO ACTION ALTERNATIVE

The no action alternative would result in no additional restrictions to the pound net industry in the Virginia waters of the Chesapeake Bay. As such, the fishery would operate under the same management regime as in previous years. The anticipated biological consequences of this alternative are described in the Biological Impacts Section, and the economic and social impacts are also discussed in the associated sections.

5.2.1 Biological Impacts

5.2.1.1 Fishery Resources

The no action alternative would not impose any additional measures to pound net fishing practices that have been conducted in previous years. As such, there will be no impacts to fishery resources beyond those impacts that have occurred in years past.

5.2.1.2 Endangered and Threatened Species

The no action alternative has the potential to impact threatened and endangered sea turtles, and to a minimal extent, endangered shortnose sturgeon. With this alternative, the pound net fishery will continue to fish as in years past and sea turtles will continue to be subject to potential entanglement in pound net leaders.

As mentioned in section 5.1.1.2, high turtle mortalities in late May and early June in Virginia have previously been attributed to entanglement in large mesh and stringer pound net leaders in the Chesapeake Bay (Lutcavage 1981; Bellmund et al. 1987). The data on pound net leader and sea turtle entanglement presented in the proposed action section apply to this alternative as well. This information demonstrates that sea turtles are subject to entanglement in pound net leaders with large mesh (generally greater than 12 inches stretched) and stringers. NMFS believes that while other natural or

anthropogenic factors may play a role in the annual high spring strandings in Virginia, it is likely that pound nets are a major factor in these high sea turtle strandings. If pound net leaders continue to be fished in Virginia waters during May and June, sea turtle entanglement and subsequent strandings would be probable results of this alternative. This alternative offers no protection to sea turtles, but allows the fishery to continue as in years past.

If pound net leaders are not modified to reduce sea turtle mortality, resultant lethal interactions may reduce the ability of the northern nesting subpopulation of loggerheads to recover. Most loggerheads in U.S. waters come from one of two genetically distinct nesting subpopulations. The subpopulation that nests in south Florida is much larger and has shown recent increases in numbers of nesting females. The increase in documented sea turtle mortalities in Virginia could be a function of the increase in the southern subpopulation of loggerheads, which make up approximately 50 percent of the loggerheads found in the Chesapeake Bay, but the fact remains that pound nets entangle turtles, some of which are likely from the northern subpopulation. The northern subpopulation that nests from northeast Florida through North Carolina is much smaller and nesting numbers are stable or declining. Genetic studies indicate that approximately one-half of the juvenile loggerheads inhabiting Chesapeake Bay during the spring and summer are from the smaller, northern subpopulation (TEWG 2000; Norrgard 1995). There are only an estimated approximately 3,800 nesting females in the northern subpopulation of loggerhead sea turtles (TEWG 2000). The northern subpopulation produces 65 percent males, while the southern subpopulation is estimated to produce 80 percent females (NMFS SEFSC 2001). As males do not appear to show the same degree of site fidelity as females, it is possible that the high proportion of males produced in the northern subpopulation are an important sources of males for all loggerheads inhabiting the Atlantic. The loss of the male contribution from the northern subpopulation may restrict gene flow and result in a loss of genetic diversity to the loggerhead population as a whole. The continued loss of females from the northern subpopulation at the magnitude exhibited in Virginia may preclude future reproduction, reducing the likelihood of both future survival and recovery of the northern subpopulation of loggerheads. While the abundance of the southern subpopulation of loggerheads appears to be increasing, the high level of spring sea turtle mortality in Virginia must be reduced to ensure the southern subpopulation of loggerheads continues towards recovery. All loggerhead sea turtles are still listed as threatened under the ESA as populations have not yet recovered. To avoid further impacts to the

northern and southern subpopulations of loggerheads, the high stranding levels documented in previous years must be reduced. The no action alternative will not help accomplish this goal.

The potential of turtle mortality as a result of the implementation of the no action alternative is of further concern because most of the stranded turtles have been of the juvenile/immature life stage, a life stage found to be critical to the long term survival of the species. Studies have concluded that sea turtles must have high annual survival as juveniles through adults to ensure that sufficient numbers of animals survive to reproductive maturity to maintain stable populations (Crouse et al. 1987, Crowder et al. 1994, Crouse 1999). Relatively small decreases in annual survival rates of both juvenile and adult loggerhead sea turtles may be likely to jeopardize the continued existence of the total loggerhead sea turtle population. As such, the historical high level of mortality in Virginia plus the increase in loggerhead mortality documented during the last several years may reduce the recovery of the loggerhead population.

During 2001 workgroup meetings with NMFS, VMRC, VIMS, and pound net industry representatives, it was recognized that pound net leaders may result in sea turtle entanglement. Stakeholders may not agree on the magnitude of the interaction, but acknowledge that some level of gear modification may be necessary to reduce interactions with sea turtles. The lack of action with regards to this fishery would not fulfill NMFS responsibilityunder the ESA and will likely result in future spring sea turtle strandings on Virginia beaches.

It is unlikely that endangered shortnose sturgeon will be significantly impacted by the no action alternative. Section 5.1.1.2 describes the potential interactions between pound net leaders and shortnose sturgeon, and that information also applies to this alternative. If shortnose sturgeon are subject to entrapment by pound nets or entanglement in leaders, the no action alternative would not change the potential for this to occur.

Endangered right, humpback, and fin whales are unlikely to be in the project area. If they do enter the Chesapeake Bay, they will probably not interact with the fixed pound net gear. As such, the no action alternative should not affect endangered whales.

5.2.1.3 Marine Mammals

The data presented in the PA section (5.1.1.3) indicate that the

marine mammal species most likely found in association with Virginia pound nets, the coastal bottlenose dolphin, may become entangled in pound net leaders. The no action alternative would not change past fishing practices and as such, bottlenose dolphin would continue to be subject to entanglement in all pound net leaders. Entanglement of bottlenose dolphin typically results in injury and mortality of the species. This alternative may have an adverse effect on bottlenose dolphin by creating a situation for entanglement, injury, and ultimately, death. Harbor porpoise and harbor seals could also be subject to entanglement and injury by the no action alternative, but the potential impacts would likely be small given the infrequent spring distribution of these species in the Virginia Chesapeake Bay and the lack of documented entanglements in pound net leaders.

5.2.1.4 Birds

The data presented in the PA section (5.1.1.4) indicates that birds inhabiting the Chesapeake Bay area, in particular brown pelicans and cormorants, may become entangled in pound net leaders. The no action alternative would not change past fishing practices and as such, avian species would continue to be subject to entanglement in all pound net leaders. Entanglement of birds typically results in injury and mortality of the species. This alternative may have an adverse effect on birds, most likely the brown pelican and cormorant, by creating a situation for entanglement, and ultimately, death.

5.2.1.5 Habitat

The no action alternative should not adversely impact EFH or SAV in Virginia waters, as the continued operation of the pound net fishery would not likely have any direct or indirect effect to bottom habitat.

5.2.2 Economic Impacts

Under the no action alternative, fishing practices would not be restricted and therefore, there will be no economic impacts to the pound net industry.

5.2.3 Social Impacts

Under the no action alternative, fishing practices would not be further restricted and therefore, at least in the short term, there will be no negative social impacts to pound net fishermen employment, family and community. If, however, the failure to take action now to

minimize impacts on sea turtles results in the need to take more aggressive action at a later date, the consequences to employment, family and community would be greatly increased from that described under the proposed action alternative.

If the failure to take action results in an increased risk of extinction of endangered and threatened sea turtles, then there are social impacts associated with the failure to take action. The extinction of sea turtles would be a loss to society which has placed a value on the protection of all species for its intrinsic value as well as for its contribution to biodiversity. By failing to take action the Secretary of Commerce would not be carrying out responsibilities imposed on him by society via the ESA which require him to ensure that all actions must not result in unauthorized incidental take of threatened and endangered species or that the take is not likely to jeopardize the continued existence of a species listed under the ESA.

5.3 PROHIBITION OF LEADERS GREATER THAN OR EQUAL TO 8 INCHES (NPA 1)

This non-preferred alternative (NPA 1) would include the Preferred Alternative requirement for the prohibition of leaders with stringers, but instead of prohibiting leaders with stretched mesh greater than or equal to 12 inches as in the Preferred Alternative, NPA 1 would prohibit the use of pound net leaders with stretched mesh greater than or equal to 8 inches. The anticipated biological consequences of this alternative are described in the following Biological Impacts Section, and the economic and social impacts are also discussed in the associated sections.

5.3.1 Biological Impacts

5.3.1.1 Fishery Resources

The NPA 1 involves prohibiting pound net leaders with stretched mesh 8 inches or greater and leaders with stringers in the Virginia Chesapeake Bay. Section 5.1.1.1 presents information on the potential impacts of restricting pound net leader mesh size on fishery resources, and that information will apply to this alternative as well. The difference is that a smaller mesh size would be restricted and more fishermen would be affected. Should the fishermen choose to remove their leaders, fewer fish may be caught in pound nets and fewer fish may be entangled in pound net leaders. However, as fishing effort will continue in the affected area, either by the affected

pound net fishermen or by the other commercial or recreational fishermen, and fish may continue to become entangled in small mesh leaders and caught in pound nets, the NPA 1 is unlikely to result in a large benefit to fish resources in Virginia waters.

5.3.1.2 Endangered and Threatened Species

The information presented in Section 5.1.1.2 identifies that sea turtles become entangled in pound net leaders. Data presented in that section applies to this alternative as well. However, the difference between the two alternatives is that NPA 1 restricts fishing with 8 inches stretched mesh leaders to provide additional protection to sea turtles.

As mentioned, anecdotal pound net observations in North Carolina during the early 1980s described sea turtle entanglements in pound net leaders with approximately 8 inch stretched mesh and greater. While NMFS recognizes that the specific conditions between waterbodies may vary, information from North Carolina indicates that turtle entanglement with approximately 8 inch mesh leaders can and has occurred. North Carolina pound netters switched to mesh smaller than 8 inches and a different gear configuration partly as a result of interactions with sea turtles, and found that entanglements were reduced.

In the fall of 2000, Mansfield et al. (2001) documented a juvenile loggerhead entangled in a large mesh leader along the Chesapeake Bay side of the Eastern shore. Constriction wounds indicated that the probable cause of death was entanglement. The mesh size of the leader was reported as 11 inches stretched mesh.

Further, it appears that while the level of entanglement was "insignificant", some level of entanglement did occur in small mesh leaders in the VIMS study conducted in the early 1980s (Bellmund et al. 1987). While potential turtle entanglement in small mesh leaders may be lower than in large mesh or stringer leaders, it may occur nonetheless. Lutcavage (1981) also discussed potential turtle entanglement in small mesh leaders: "I believe that any runner [leader] mesh size large enough to accommodate a turtle's fin or head may entangle turtles that swim into it. I observed that smaller mesh size in hedging may snag a turtle carapace but should not immobilize the turtle...It is likely that as sea turtles encounter poundnet mesh, they struggle to escape and further entangle their heads or fins. This study conducted in 1979 and 1980 found that most turtles were

captured in 12 to 16 mesh but no turtleswere reported entangled in mesh sizes of 8 or less, suggesting that some turtles were entangled in mesh between 8 and 12 . However, NMFSdoes not have access to those data and this interpretation is speculative. While smaller mesh nets may pose some entanglement risk to sea turtles, the degree of entanglement has not been as adequately documented as entanglement in larger mesh.

While the best available, scientifically defensible data supports that turtles are more prone to entanglement in leaders with 12 inches and greater stretched mesh, restricting the use of 8 inches and greater stretched mesh will provide additional protection to sea turtles by minimizing any potential interactions with those leaders found to have some interaction with turtles. However, this alternative may have some negative consequences to effective management solutions in the future. If the NPA 1 is implemented, the potential for turtles to be entangled in pound net leaders will likely decrease. If strandings also decrease, as expected, it will be unknown what percentage of the strandings in previous years were caused by interactions with leaders greater than or equal to 12 inches stretched mesh or leaders greater than or equal to 8 inches stretched mesh. While this alternative is generally more protective of sea turtles, it may result in more restrictive management solutions being applied unnecessarily in the future.

Additionally, this alternative does not have an option as in the PA that if high strandings start to occur or monitoring reveals new information, NMFS may determine that additional restrictions are necessary. While NMFS intends to monitor sea turtle stranding levels and other potential anthropogenic causes of sea turtle mortality as in previous years, NMFS would not conduct additional independent monitoring of smaller mesh pound net leaders under this alternative. As such, there would be limited information on the manner in which sea turtles and pound net leaders interact to stimulate additional management measures or future management strategies.

It is unlikely that endangered shortnose sturgeon will be significantly impacted by NPA 1. Section 5.1.1.2 describes the potential interactions between pound net leaders and shortnose sturgeon, and that information also applies to this alternative. If shortnose sturgeon are subject to entrapment by pound nets or entanglement in leaders, this alternative would minimize this potential because prohibiting leaders greater than or equal to 8 inches and leaders with stringers will likely reduce fish catch in

pound nets in the Virginia Chesapeake Bay. The NPA 1 would have a greater potential benefit to shortnose sturgeon than the PA because a larger number of pound net leaders would be impacted and potential interactions would be further minimized. Should the affected fishermen choose to switch to leaders smaller than 8 inches stretched mesh instead of electing to remove their leaders, the potential benefits to shortnose sturgeon would be negated to an unknown degree.

Endangered right, humpback, and fin whales are unlikely to be in the project area. If they do enter the Chesapeake Bay, they will probably not interact with the fixed pound net gear. As such, this non-preferred alternative should not affect endangered whales.

5.3.1.3 Marine Mammals

Prohibiting the use of pound net leaders greater than or equal to 8 inches stretched mesh and leaders with stringers may have a beneficial effect on the marine mammal species most likely found in association with Virginia pound nets, the coastal bottlenose dolphin. The data presented in Section 5.1.1.3 indicate that bottlenose dolphin may become entangled in pound net leaders. The information on bottlenose entanglements in pound net leaders is presented in this PA section and further applies to this alternative.

There is limited information on bottlenose dolphin entanglements in leaders with varying mesh sizes and it is possible that the level of entanglement may be greater with larger mesh size. Bottlenose dolphin appear more likely to become entangled in leaders with stretched mesh greater than 8 inches rather than smaller than 8 inches. Regardless of mesh size, as bottlenose have been found entangled in pound net leaders in Virginia waters, any measure that limits the amount of gear in the water should serve to limit the interactions with pound net gear and bottlenose dolphin and any subsequent entanglements and benefit these marine mammals. NMFS assumes that fishermen are using the smallest mesh size that is operational, but under this alternative, fishermen have the option to switch to leaders smaller than 8 inches stretched mesh. As the leader mesh size resulting in the most bottlenose dolphin entanglements has not been conclusively determined, if fishermen switch to smaller mesh sizes, bottlenose dolphin entanglement could still occur. This alternative will most likely provide a greater beneficial impact to bottlenose dolphin than the PA as the NPA 1 affects a larger number of pound net leaders, further reducing the potential for interactions.

As described in Section 5.1.1.3, harbor porpoise and harbor seals may infrequently occur in the Virginia Chesapeake Bay waters during May and June and interact with pound net leaders. While there is no documentation of these species entanglements in pound net leaders, there remains the potential for harbor porpoise and harbor seals to interact, and potentially become entangled, in pound net leaders with greater than 8 inches stretched mesh and stringers. As such, it is likely that this alternative will provide some benefit to these species.

5.3.1.4 Birds

Prohibiting leader mesh greater than or equal to 8 inches and leaders with stringers should benefit birds that inhabit the Chesapeake Bay area, in particular brown pelicans and cormorants. The data presented in Section 5.1.1.4 indicate that birds inhabiting the Chesapeake Bay area, in particular brown pelicans and cormorants, may become entangled in pound net leaders. The information on bird entanglements in pound net leaders is presented in the PA section and further applies to this alternative.

While avian entanglements may still occur in other parts of the pound net, restricting leader mesh size and leaders with stringers may reduce some of the brown pelican and cormorant entanglement. This alternative will most likely provide a greater beneficial impact to birds than the PA as the NPA 1 affects a larger number of pound net leaders, further reducing the potential for interactions.

5.3.1.5 Habitat

NMFS believes that the NPA 1 would have only minor impacts on bottom vegetation and habitat. The information presented in Section 5.1.1.5 describes the potential impacts to habitat resulting from the removal of pound net leaders. The anticipated impacts would be slightly greater with this alternative because more leaders would need to be removed. As such, the restriction of leaders with 8 inches and greater stretched mesh and leaders with stringers may result in some disruption of bottom habitat, but it is unlikely to adversely impact EFH or SAV.

5.3.2 Economic Impacts

Under the NPA 1, all pound net leaders measuring 8 inches or greater stretched mesh and all pound nets with stringers in the Virginia waters of the Chesapeake Bay are prohibited from May 8 to June 30.

Similar to the PA plan, we assume that in the worst case scenario harvesters will remove their leaders and therefore incur revenue losses due to not fishing and labor costs associated with removing and replacing leaders. (See Section 5.1.2 for further explanation).

Revenue and Landings

Revenue and landings for harvesters fishing pound nets are the same as those reported under the PA. See Section 5.1.2 for details of methods and results.

Results of NPA 1

Under the NPA 1, a harvester fishing pound nets will incur revenue losses of $16,700 (CV=100) on average (Table 5.1.2.2). Over all water areas, harvesters fish 2.4 pound nets on average. The cost of removing and replacing one pound net leader is approximately $1,600 ($1,618 = 2.4 pound net leaders * 3 persons*8 hours* 14.05 per hour * 2). A harvester s annual revenue will be reduced by 22% on average, given annual revenues are $84,300 (CV=101) (Table 5.1.2.3).

There are approximately 12.7 harvesters fishing 30.7 pound nets that would be affected from May 8th to June 30th, 2001 under the NPA 1. Total industry revenue losses are $237.4K and the cost of removing pound net leaders is $20.3K ($20,343 =12.7*$1,600), for a total of $258K if the NPA 1 is imposed (Table 5.3.2.1).

Table 5.3.2.1. Number of harvesters fishing from May 8th to June 30th (seasonal), number harvesters and pound nets affected by the NPA 1, average revenues per harvester with coefficient of variation (CV), and total industry revenue losses by water area.

Water Areas	Harvesters May 8 to June 30	Affected Harvesters	Affected Pound nets	Seasonal Revenues Harvesters		Industry
				Revenue	CV	Revenue
306	6	3.5	13.0	23,900	37	83,650
307	4	4.0	7.8	21,900	63	87,600
308	0	0.0	0.0			0
309	12	4.5	8.2	12,799	38	57,596
346,353,358	5	0.7	1.7	12,000	67	8,571
Total	27	12.7	30.7			237,417
Average				16,700	100	

5.3.3 Social Impacts

The economic analysis demonstrates the pound net fishing community will be impacted by this alternative. Section 5.1.3 describes the potential social impacts associated with restricting leader mesh size and stringers. That information also pertains to this alternative, with the only difference being the restricted mesh size of the leader. Under NPA 1, those fishing pound nets with leaders measuring 8 inches or greater stretched mesh and leaders with stringers will be affected. The social impacts would be the same as those in the PA, but the magnitude of the impacts would be greater. There are more fishermen who fish with leaders greater than or equal to 8 inches stretched mesh, than those who fish with leaders greater than or equal to 12 inches stretched mesh. As such, more fishermen, more families, and a larger portion of the community will be impacted by a restriction of 8 inches and greater stretched mesh leaders.

The social benefits described in Section 5.1.3 also apply to this alternative. For instance, if these gear modifications are effective at reducing the entanglement risk to sea turtles and increase the potential for sea turtle recovery, then society will benefit by preventing a loss of a species and preserving biodiversity.

5.4 PROHIBITION OF ALL POUND NET LEADERS (NPA 2)

The complete prohibition of all pound net leaders, regardless of mesh size, from May 8 to June 30 is recognized as the most risk averse technique for minimizing sea turtle entanglements in pound net gear. The anticipated biological consequences and risk reduction benefits of this alternative are described in the Biological Impacts Section, and the economic and social impacts are also discussed in the associated sections.

5.4.1 Biological Impacts

The biological benefits to sea turtles and other species at risk of entanglement brought about by the prohibition of all pound net leaders is thought to be the most risk averse option and therefore of the greatest biological benefit.

5.4.1.1 Fishery Resources

The NPA 2 involves prohibiting all pound net leaders in the Virginia Chesapeake Bay. Section 5.1.1.1 presents information on the potential impacts of restricting pound net leader mesh size on fishery resources, and that information will apply to this alternative as well. The difference is that all leaders would be prohibited and more

fishermen would be affected. As fishermen must curtail all fishing activity with leaders, few fish would likely be caught in the pounds. If fewer fish are caught in pound nets, there may be more fish in the Virginia waters. However, these fish may continue to be caught by other commercial and recreational fishing gear. As fishing effort will continue in the affected area, likely by other commercial or recreational fishermen, the NPA 2 may only slightly benefit fishery resources. Eliminating leaders in the Virginia Chesapeake Bay may also have a beneficial effect on fishery resources by reducing the threat of entanglement in the leaders. This alternative would have the highest potential benefit to fishery resources, in comparison to the other alternatives.

5.4.1.2 Endangered and Threatened Species

The information presented in the PA and NPA 1 sections (5.1.1.2 and 5.3.1.2) identifies that sea turtles may become entangled in pound net leaders. All data presented in those sections apply to this alterative as well. However, the difference from the PA and NPA 1 is that NPA 2 prohibits fishing with all leaders, regardless of mesh size or structure (buoy, stringer, mesh), to provide additional protection to sea turtles.

Sea turtles have been found to become entangled in pound net leaders with greater than or equal to 12 inches stretched mesh and leaders with stringers. Leaders with this construction may account for the largest number of sea turtle entanglements, but sea turtles likely interact with pound net leaders with smaller mesh, and as a result, entanglements could occur. Pound net observations in North Carolina during the early 1980s documented sea turtle entanglements in pound net leaders with approximately 8 inch stretched mesh and greater. Sea turtles may theoretically become entangled in any type of net that has an opening in which the turtles head or flipper may fit. Sufficient data are not available to adequately document the potential for sea turtles to become entangled in leaders with varying mesh sizes (primarily below 8 inches stretched mesh). Future studies should address this potential occurrence, but until that information is received, NMFS recognizes that while relatively unlikely, turtles may potentially become entangled in leaders of almost all mesh sizes. As such, this alternative would be the most protective of sea turtles by eliminating all potential sea turtle interactions with pound net leaders.

While the best available scientifically defensible data supports that turtles are more prone to entanglement in leaders with stretched mesh

12 inches and greater, and industry reports have documented sea turtle entanglements with 8 inches and greater stretched mesh leaders, prohibiting all leaders in Virginia Chesapeake Bay waters will provide the most protection to sea turtles by eliminating all pound net gear that may result in interactions with sea turtles. However, this alternative may have some negative consequences to effective management solutions in the future. If the NPA 2 is implemented, the potential for turtles to be entangled in pound net leaders will be eliminated. If strandings also decrease, as expected, it will be unknown what percentage of the strandings in previous years were caused by interactions with leaders greater than or equal to 12 inches stretched mesh, leaders greater than or equal to 8 inches stretched mesh, or leaders below 8 inches stretched mesh. While this alternative is generally more protective of sea turtles, it may result in more restrictive management solutions being applied unnecessarily in the future.

Information on shortnose sturgeon and pound net interactions is presented in section 5.1.1.2. As with the preferred alternative and NPA 1, it is unlikely that endangered shortnose sturgeon will be significantly impacted by NPA 2. Should shortnose sturgeon be subject to entrapment by pound nets or entangled in pound net leaders, this alternative would minimize this potential and benefit the species because prohibiting all leaders will likely reduce fish catch in pounds in the Virginia Chesapeake Bay and all potential interactions with leaders.

Endangered right, humpback, and fin whales are unlikely to be in the project area. If they do enter the Chesapeake Bay, they will probably not interact with the fixed pound net gear. As such, this non-preferred alternative should not affect endangered whales.

5.4.1.3 Marine Mammals

Prohibiting the use of pound net leaders regardless of mesh size may have a beneficial effect on the marine mammal species most likely found in association with Virginia pound nets, the coastal bottlenose dolphin. The data presented in Section 5.1.1.3 indicate that bottlenose dolphin may become entangled in pound net leaders. The information on bottlenose entanglements in pound net leaders is presented in the PA section and further applies to this alternative.

There is limited information on bottlenose dolphin entanglements in varying leader mesh sizes and it is possible that the level of entanglement may be greater with larger mesh sizes. Regardless of

mesh size, as bottlenose dolphin have been found entangled in pound net leaders in Virginia waters, any measure that limits the amount of gear in the water should benefit these marine mammals. Prohibiting all leaders regardless of mesh size should serve to eliminate all interactions between pound net leaders and bottlenose dolphin, and any subsequent entanglements. This alternative provides the greatest benefit to bottlenose dolphin as the NPA 2 affects the largest number of pound net leaders.

As described in Section 5.1.1.3, harbor porpoise and harbor seals may infrequently occur in the Virginia Chesapeake Bay waters during May and June and interact with pound net leaders. While there is no documentation of these species entanglements in pound net leaders, there remains the potential for harbor porpoise and harbor seals to interact, and potentially become entangled, in pound net leaders. As such, it is likely that this alternative will benefit these species.

5.4.1.4 Birds

Prohibiting the use of all pound net leaders regardless of mesh size or composition should benefit birds that inhabit the Chesapeake Bay area, in particular brown pelicans and cormorants. Section 5.1.1.4 indicates that birds inhabiting the Chesapeake Bay area may become entangled in pound net leaders. The information on bird entanglements in pound net leaders is presented in the PA section and further applies to this alternative.

While avian entanglements may still occur in other parts of the pound net, prohibiting all leaders will likely reduce some of the brown pelican and cormorant entanglement in pound net gear. NMFS is unaware of data comparing potential bird entanglement between the leader and the pound, but with an elimination of all pound net leaders in the Virginia Chesapeake Bay, avian species coming in contact with pound nets should benefit greatly. This alternative provides the greatest benefit to birds, as the NPA 2 affects the largest number of pound net leaders.

5.4.1.5 Habitat

NMFS believes that the NPA 2 would have only minor impacts on bottom vegetation and habitat. The information presented in Section 5.1.1.5 describes the potential impacts to habitat resulting from the removal of pound net leaders. The anticipated impacts would be greater with this alternative because more pound net leaders would need to be removed. Nevertheless, the prohibition of all leaders may result in

some temporary disruption of bottom habitat, but it is unlikely to adversely impact EFH or SAV.

5.4.2 Economic Impacts

Under the NPA 2, all pound net leaders are prohibited. Similar to the PA plan, we assume harvesters will remove their leaders and therefore incur revenue losses due to not fishing and labor costs associated with removing and replacing leaders (See Section 5.1.2 for further explanation).

Revenue and Landings

Revenue and landings for harvesters fishing pound nets are the same as those reported under the PA. See Section 5.1.2 for details of methods and results.

Results of NPA 2

Under the NPA 2, a harvester fishing pound nets will incur revenue losses of $16,700 (CV=100) on average (Table 5.1.2.2). Over all water areas, harvesters fish 2.4 pound nets on average. The cost of removing and replacing one pound net leader is approximately $1,600 ($1,618 = 2.4 pound net leaders * 3 persons*8 hours* 14.05 per hour * 2). A harvester s annual revenue will be reduced by 22 percent on average, given annual revenues are $84,300 (CV=101) (Table 5.1.2.3).

There are approximately 27 harvesters fishing 63.9 pound nets that would be affected from May 8th to June 30th under the NPA 2. Total industry revenue losses are $444.6K and the cost of removing pound net leaders is $43.2K ($43,200 =27*$1,600), for a total of $488K if the NPA 2 is imposed (Table 5.4.2.1).

Table 5.4.2.1. Number of harvesters and pound nets fishing from May 8th to June 30th (seasonal) under the NPA 2, average revenues per harvester with coefficient of variation (CV), and total industry revenue losses by water area.

Water Areas	May 8 to June 30 Harvesters	Pound nets	Seasonal Revenues ($1) Harvesters	CV	Industry
306	6	22.3	23,900	37	143,400
307	4	7.8	21,900	63	87,600
308	0	0.0			0
309	12	21.8	12,799	38	153,588
346,353,358	5	11.9	12,000	67	60,000
Total	27	63.9			444,588

Average		16,700 100	

5.4.3 Social Impacts

The economic analysis demonstrates the pound net fishing community will be impacted by this alternative. The NPA 2 results in the greatest negative impact to the social structure of the pound net fishing community, as this alternative prohibits the use of all pound net leaders. As such, the entire pound net fishery will be affected from May 8 to June 30. If fishermen cannot fish with their leaders, this would result in a net negative impact on fishing communities in all areas of the Virginia Chesapeake Bay. Target species catch rates will likely decrease due to the inability to use the leaders on the pound nets, but the heart(s) and pound may still be set, which may result in some level of catch. This may negate the negative impacts to the fishing community somewhat, but fishing without leaders will virtually render the pound nets ineffective at catching fish. Fish dealers and processors may also be impacted with a prohibition of all pound net leaders, as reduced landings would result in a much lower level of fish catch passing through their facilities and available for purchase.

The impacts on the pound net fishing community will likely be greater with this non-preferred alternative than with the proposed alternative. This alternative impacts all pound net fishermen in the Virginia Chesapeake Bay, while the preferred alternative and NPA 1 impact a smaller subset of these fishermen. As such, more fishermen, more families, and a larger portion of the community will be negatively impacted by NPA 2.

The social benefits described in Section 5.1.3 also apply to this alternative. For instance, if these gear modifications are effective at reducing the entanglement risk to sea turtles and increase the potential for sea turtle recovery, then society will benefit by preventing a loss of a species and preserving biodiversity.

5.5 IMPLEMENTATION OF VMRC/INDUSTRY PLAN (NPA 3)

This non-preferred alternative includes measures to prohibit the use of pound net leaders with greater than 16 inches stretched mesh, drop the mesh of all leaders using stringers 9 feet below mean low water so that the stringers will attach from the mesh to a lead line at the surface, and space stringer lines at least 3 feet apart. This alternative will therefore only impact those pound net leaders with

stretched mesh greater than 16 inches and those leaders that use stringers. According to VMRC data, there does not appear to be any fishermen using pound net leaders greater than 16 inches stretched mesh. However, verbal reports from VMRC indicate that there a few nets with this leader mesh size in the Virginia Chesapeake Bay. As this information remains inconclusive, for the purposes of the biological impacts section, NMFS will assume that a few nets are using 16 inches stretched mesh. The anticipated biological consequences and risk reduction benefits of this alternative are described in the Biological Impacts Section, and the economic and social impacts are also discussed in the associated sections.

5.5.1 Biological Impacts

5.5.1.1 Fishery Resources

The NPA 3 involves prohibiting pound net leaders with stretched mesh greater than 16 inches, dropping the mesh of leaders using stringers, and widening the spaces between the stringers. Those fishermen that use leaders affected by this alternative have the option to switch to a stretched mesh leader size smaller than or equal to 16 inches, modify their stringer leader fishing gear, or remove their leaders during the proposed time period of the regulation. This alternative should not have any notable impacts to fishery resource catch, because it is likely that the leaders will continue to fish in the same manner as in previous years. However, fishermen that use leaders greater than 16 inches stretched mesh may decide to remove their leaders rather than switching to a smaller mesh leader. Information presented in Section 5.1.1.1 describes the potential impacts of reducing mesh size in a limited number of leaders.

As described in Section 5.1.1.1, some fish species have been found entangled in the pound net leaders themselves. If the affected fishermen elect to remove their leaders rather than switching to smaller mesh leaders or changing their gear configuration, reducing the number of leaders in the water may have a beneficial effect on fishery resources by reducing the threat of entanglement in the leaders. However, most of the affected fishermen will likely modify their leaders to retain fish catch, resulting in the continued potential for fish entanglement in the leaders. Therefore, NPA 3 may not have a large beneficial impact on fish resources as they may still become entangled in smaller mesh leaders and those leaders dropped 9 feet below the surface.

If any fishery resource may benefit from this alternative, it would be

fish species that school close to the surface (e.g., menhaden). Dropping the mesh in those leaders that use stringers may reduce the catch of fish species that occur at the surface, as the pound net leader mesh would not guide those fish into the pound. As such, fewer menhaden or other fish that occur at the surface may be caught in pound nets, and subsequently there may be more of these species in Virginia waters. However, as fishing effort will continue in the affected area, either by the affected pound net fishermen or by the other commercial or recreational fishermen and stringers may continue to guide some of the surface schooling fish into the pound, the NPA 3 should not greatly impact fishery resources in either a positive or negative manner.

5.5.1.2 Endangered and Threatened Species

The information presented in the proposed alternative and NPA 1 sections identifies that sea turtles may become entangled in pound net leaders. All data presented in those sections apply to this alternative as well. However, the difference between the alternatives is that NPA 3 restricts fishing with greater than 16 inches stretched mesh leaders and modifies the gear configuration of stringer leaders rather than prohibiting the use of stringers.

This alternative was developed by VMRC, VIMS, and industry representatives to reduce the potential for sea turtles to become entangled in pound net leaders. While NMFS was not at the September 12, 2001, meeting in which this alternative was developed, electronic mail and telephone correspondence between VMRC and NMFS outlined the proposed strategy. The two components of the NPA 3, modifications to stringer leaders and restrictions on leader mesh size, will be addressed in this section separately.

A letter from VIMS to VMRC dated November 14, 2001, provided further justification for the proposed management measures involving stringers:

> The The justification fo dropping The justification fo dropping leaders to water s surface is baed on observations of poundnet leaders byby VIMS over the course of 22 years. This research was conductedconducted by vessel and by scuba divers, and suggests that the vastvast majority of tvast majority of turvast majority of turtle entangle metersmeters of net (Musick et al., 1984). The behavior of sea turtlesturtles in the Chesapeake Bay in late May and early June probablyprobably explains this pattern. The thermocline at thisprobably expl ofof year is still steep with surface temperatures rof year is still s

between 18 to 24 C and bottom temperatures between 10 and 14 C. These conditions limit the turtles preferred habitat to the upper part of the thermocline. As the Bay heats in June and bottom temperatures warm up, loggerheads move onto their preferredpreferred foragingpreferred foraging arepreferred foraging areas (Byles,(Byles, 1988). (Byles, 1988). This wou(Byles, 1988). This entanglements in late June and beyond. VIMS side scan sonar surveyssurveys of poundnet leaders during the sumsurveys of poundnet leade supportsupport the contentionsupport the contention thsupport the content rarrare.rare. No potential sea turtle acoustic signatures were observedobserved during surveys conducted afterobserved during surveys conducte peak.

Lowering the mesh on those leaders using stringers may allow the sea turtles near the surface to swim over the larger mesh leaders and through the stringers. This will likely reduce the potential of sea turtle entanglement in these leaders. However, NMFS is concerned that dropping the leader mesh on those leaders that use stringers may not necessarily preclude turtle entanglement and may in fact create a situation where turtles are more at risk as described in the following comments.

Cold blooded sea turtles prefer warmer waters, but species occur in waters as cold as 10 C. In fact, in March 1999, an incidental take of a loggerhead sea turtle in the monkfish gillnet fishery off North Carolina occurred in 8.6 C water. NMFS does not believe that turtles will only be in the upper third of the water column during the spring when the bottom temperatures are cold. While they may prefer these warmer waters, it is unlikely that all of their prey resources are located in these surface waters. Lutcavage and Musick (1985) and Mansfield et al. (2001) state that entanglements occur when turtles first enter the Bay after the spring migration in areas where currents are strong, and many of the turtles are emaciated and weak. Strandings data from May and June 2000 and 2001 do not indicate that most of the stranded turtles are emaciated. According to STSSN reports, most stranded turtles have had relatively good fat stores, indicating that they have been foraging. Further, NMFS is unaware of data supporting the conclusion that there is a seasonal difference in the number of emaciated turtles found stranded in the Virginia Chesapeake Bay. The Mansfield et al. (2001) report further states that turtles are able to forage around the nets with little threat by the end of June. If turtles are emaciated and weak early in the season, and are able to circumnavigate the leaders later in the season (indicating that the turtles are no longer in a weakened state), turtles are likely foraging in the Chesapeake Bay. Loggerheads and

Kemp s ridleys in Virginia waters are primarily benthic foragers. Musick et al. (1984) found that crustaceans aggregate on large epibiotic loads that grow on the pound net stakes and horseshoe crabs become concentrated at the bottom of the net. Turtles may be more common in the upper water column, but if they are foraging for their preferred prey, which appears to be present around pound nets, they must be periodically near the bottom, thus subject to entanglement in leaders more than 9 feet below the surface.

In early June 1983, VIMS conducted subsurface monitoring on 10 pound nets in the York River and York Spit area. During this monitoring survey, one net had four loggerheads caught near the surface and two more below the surface. The turtles below the surface were entangled approximately three meters deep, at the pound where the stringer top portion of the leader junctured with the mesh lower portion (Musick et al. 1984). The stringers in this pound net leader appear to extend approximately 3 meters, or 9.8 feet, below the surface. The NPA 3 would lower the mesh of all leaders using stringers 9 feet below mean low water, but the Musick et al. (1984) report states that sea turtles were documented entangled approximately 9 feet below the surface in early June. As such, it appears that sea turtles may still be vulnerable to entanglement in leaders 9 feet below the surface if this alternative is implemented.

The VIMS justification for the proposed plan states that no sea turtle acoustic signatures were observed during surveys conducted after the stranding peak. It is NMFS understandingthat VIMS did not observe any acoustic signatures from turtles at any depth, other than those ground truthed by VIMS in a controlled situation. Sonar surveys conducted after the mass stranding period may not be reflective of what was occurring in May. As such, the lack of sea turtle acoustic signatures in pound net leaders at depth during the VIMS June/July 2001 survey may not indicate that turtles will not be periodically sub-surface during the spring. Further research on the effectiveness and practicality of side scan sonar techniques in observing sea turtle entanglements should be conducted during May and June and include real time verification of sonar surveys by divers or other means.

Adequate monitoring of NPA 3 is imperative, not only to document sea turtle bycatch but to determine the effectiveness in fish catches and how the leader mesh dropped below the surface operates. There is no component of this alternative that establishes a monitoring study. It remains unclear how one can ensure that the leaders will not billow in the strong currents or that the leaders are operating effectively at such a depth given the poor water clarity in the Chesapeake Bay. Tie-

downs used in other fisheries (e.g., monkfish) have been found to increase the potential of sea turtle entanglement by creating a bag or pocket in the net. While tie-downs are used with gillnets and therefore cannot be compared directly to pound net gear, NMFS is concerned that in areas with strong current, dropping the leaders below the surface may increase the potential for the net to gap, or billow between the leader poles, creating an effect like a tie down pocket. This may magnify the potential of sea turtle entanglement. Without adequate monitoring and evaluation, this alternative may create a situation in which sea turtles become entangled in leader mesh 9 feet below mean low water. Note that leaders set at the surface may billow with the current and create a similar situation for increased turtle entanglement, but this occurrence would be easier to document and remedy if necessary.

Stringers set in the Chesapeake Bay are approximately 6 to 8 inches apart (VMRC personal communication). Bellmund et al. (1987) found that leaders with stringers set 16 to 18 inches apart entangled turtles. This alternative would widen the spacing between stringers to 36 inches (3 feet), approximately twice the distance found to entangle sea turtles in 1983 and 1984. Widening the gap between stringers to 3 feet may allow some turtles to pass through the stringers unobstructed. This would benefit sea turtles by minimizing potential interactions with those nets that use stringers. There are no data available that ensure sea turtles will not become entangled in these stringer leaders. While these interactions are likely limited due to the spacing of the stringers and the average size of sea turtle found in the Chesapeake Bay, additional information should be gathered on the potential for this management strategy to reduce sea turtle strandings caused by stringer pound net gear.

VIMS also stated in their November 14, 2001, letter that the proposed measure of widening the gap between the stringers would create an opening larger than the Turtle Excluder Devices (TEDs) utilized by trawl-based fisheries. NMFS is uncertain how the three feet stringer spacing was decided upon, but has some concerns with using the TED opening as justification. In this particular scenario, it is inappropriate to compare a stationary gear type, like pound nets, to mobile trawl gear. TEDs have been extensively tested in the Southeast United States and have been found to be effective at excluding sea turtles during trawl operations (when moving). In some areas of the Chesapeake Bay, the currents are strong, but these water flow conditions are not nearly the same as those resulting from moving trawl operations. The dimensions of the spaces in each gear type may be similar, but the characteristics of the different fishing gear make

the comparison impractical. A thorough analysis of the potential reduction in sea turtle entanglement due to widening the stringers in a stationary net should be considered, rather than comparing these openings to TEDs. Without this analysis, NMFS is unable to conclusively determine if this measure would protect sea turtles in the Virginia waters of the Chesapeake Bay.

The implementation of NPA 3 would likely benefit sea turtles by reducing interactions with leaders using stringers. However, without adequate documentation that these measures will reduce sea turtle entanglement in the stringers themselves and in the mesh dropped 9 feet below mean low water, the specific benefits to sea turtles remain somewhat unclear.

This alternative also restricts the use of leaders greater than 16 inches stretched mesh. Sea turtle entanglements have been documented in large mesh leaders and may occur in the leader mesh size restricted by this alternative, so sea turtles should benefit from the implementation of NPA 3. However, it appears that very few (if any) leaders utilize large mesh leaders greater than 16 inches stretched mesh in Virginia waters. As such, this portion of the NPA 3 is likely to have only a very small beneficial effect to sea turtles (if any) by eliminating potential sea turtle entanglement in a small number of leaders with greater than 16 inches stretched mesh. If fishermen switch to leaders less than 16 inches stretched mesh, this beneficial effect will be eliminated.

As stated in Sections 5.1.1.2 and 5.3.1.2, sea turtle entanglements in pound net leaders have been adequately documented in smaller leader mesh sizes as well (Bellmund et al. 1987, Mansfield et al. 2001). Most of the previously documented entanglements involved pound net leaders with 12 to 16 inches stretched mesh. As such, fishing with leaders using stretched mesh documented to result in sea turtle entanglement would be allowed to continue under this alternative. NMFS does not anticipate that the portion of the pound net fishery using leaders with smaller than or equal to 16 inches stretched mesh would operate differently than in the past. Therefore, sea turtles may become entangled in leaders smaller than or equal to 16 inches stretched mesh. As sea turtle entanglements may continue to occur with this alternative, there is the potential for large numbers of sea turtles to drown in pound net leaders and subsequently strand on Virginia beaches. Again, NMFS has no data to indicate that high sea turtle strandings will not occur in the spring in Virginia if appropriate management measures are not implemented.

The information presented in the no action alternative (section 5.2.1.2) describes the potential impacts of high strandings on sea turtles. Those impacts also pertain to this alternative; high sea turtle mortality in Virginia in May and June may affect the recovery of loggerheads, and the high mortality of juveniles in Virginia needs to be reduced to ensure future reproduction of the species.

Additionally, this alternative does not have an option as in the PA that if high strandings start to occur or monitoring reveals new information, additional restrictions can be implemented. While NMFS intends to monitor sea turtle stranding levels and other potential anthropogenic causes of sea turtle mortality as in previous years, NMFS would not conduct additional independent monitoring of smaller mesh pound net leaders under this alternative and have the option of imposing additional measures as appropriate. As such, there would be limited information on the manner in which sea turtles and pound net leaders interact to stimulate additional management measures or future management strategies.

This alternative recommended enacting management measures for a 3 to 4 week period beginning in approximately the third week of May, or approximately May 15. The commencement of sea turtle strandings is variable from year to year, but from 1994 to 2001, the average date of the first reported stranding in Virginia was May 15. Enacting management measures based upon the date of the average first turtle stranding (May 15) may not necessarily be appropriate, as sea turtles would have been subject to the mortality source well before the animals stranded on Virginia beaches. The amount of time it takes for a sea turtle to be killed and then strand on Virginia beaches has not been adequately determined, but obviously the mortality would have occurred before the stranding was documented. As such, implementing regulations on the date of first average stranding may result in sea turtle mortality occurring before the gear modifications are in effect.

Based upon STSSN strandings data, strandings in Virginia typically remain elevated until June 30, indicating that turtles may be vulnerable to entanglement in pound net leaders until this time. VIMS data from 1999 to 2001 show that the level of decomposition for the majority of stranded turtles progresses with the season, suggesting that most of those turtles stranding in later June may have been subject to mortality sources earlier in the season. Whether the differences in decomposition levels by week are statistically significant remains to be determined. It is possible that turtles stranding in June are subject to mortality sources approximately a few

days to two weeks prior. Only implementing management measures for a three to four week period (ending in approximately early to mid-June) may result in sea turtles being vulnerable to pound net entanglement after the restrictions are lifted.

As with the preferred alternative (Section 5.1.1.2), it is unlikely that endangered shortnose sturgeon will be significantly impacted by NPA 3. Should shortnose sturgeon be subject to entrapment by pound nets or entanglement in leaders, this alternative should not change this potential because there will be approximately the same number of fishermen using pound net leaders as in the past. It is possible that those fishermen using pound net leaders greater than 16 inches stretched mesh will switch to a smaller mesh size. Therefore, only the mesh size of the leaders and the configuration of the stringers would change. While unlikely, shortnose sturgeon may continue to be subject to take.

Endangered right, humpback, and fin whales are unlikely to be in the project area. If they do enter the Chesapeake Bay, they will probably not interact with the fixed pound net gear. As such, this non-preferred alternative should not affect endangered whales.

5.5.1.3 Marine Mammals

Prohibiting pound net leaders with stretched mesh greater than 16 inches, dropping the mesh of leaders using stringers, and widening the spaces between the stringers may have a beneficial effect on the marine mammal species most likely found in association with Virginia pound nets, the coastal bottlenose dolphin. The data presented in Section 5.1.1.3 indicate that bottlenose dolphin may become entangled in pound net leaders, but the mesh size of the leaders resulting in this entanglement was not determined. The information on bottlenose entanglements in pound net leaders is presented in the PA section and further applies to this alternative.

There is limited information on bottlenose dolphin entanglements in leaders with varying mesh sizes and it is possible that the level of entanglement may be greater with larger mesh. Restricting the use of leader mesh greater than 16 inches may reduce potential bottlenose dolphin entanglement in these leaders and benefit this species. Dolphins may continue to be entangled in stretched mesh leaders smaller than 16 inches however, so the implementation of NPA 3 would not reduce all potential bottlenose dolphin entanglement. While NMFS assumes fishermen are using the minimum mesh size that is operational, under this alternative, fishermen have the option to switch to leaders

smaller than or equal to 16 inches stretched mesh. As the leader mesh size resulting in the most bottlenose dolphin entanglements has not been conclusively determined, if fishermen switch to smaller mesh sizes, bottlenose dolphin entanglement could still occur at the same magnitude as in previous years. As such, restricting leaders with stretched mesh greater than 16 inches should serve to limit some of the interactions with pound net gear and bottlenose dolphin, but it is likely that entanglements will continue in the leaders not affected by this alternative. Bottlenose dolphin entanglements often result in injury, and ultimately, death, thus creating an adverse situation for the species.

The impacts of lowering the mesh on those leaders that use stringers and widening the stringer spacing on bottlenose dolphins are more difficult to predict. As bottlenose dolphin may occur throughout the water column, it is likely that they would continue to be subject to entanglement in leader mesh dropped 9 feet below mean low water. Depending on the size class of the species, bottlenose dolphin may be able to swim through a 3 feet opening in the stringers, which may reduce entanglements in these leaders. However, this potential benefit to the species is speculative as there are a number of factors that contribute to marine mammal entanglements in fishing gear and the potential for bottlenose dolphins to swim through the widened stringers remains undetermined.

As described in Section 5.1.1.3, harbor porpoise and harbor seals may infrequently occur in the Virginia Chesapeake Bay waters during May and June and interact with pound net leaders. While there is no documentation of these species entanglements in pound net leaders, there remains the potential for harbor porpoise and harbor seals to interact, and potentially become entangled, in pound net leaders. This alternative will not likely minimize the potential entanglement threat as these species may interact with gear below 9 feet mean low water and with leaders less than 16 inches stretched mesh. If widening the stringers allows harbor porpoise and harbor seals to pass through the stringer leaders (should they be in contact with the leader), there may be benefits of this alternative to these species but the magnitude is uncertain.

5.5.1.4 Birds

Prohibiting pound net leaders with stretched mesh greater than 16 inches, dropping the mesh of leaders using stringers, and widening the spaces between the stringers may have a beneficial effect on the birds that inhabit the Chesapeake Bay area, in particular brown pelicans and

cormorants. The data presented in Section 5.1.1.4 indicates that birds inhabiting the Chesapeake Bay area have been documented entangled in pound net leaders. The information on bird entanglements in pound net leaders is presented in the PA section and further applies to this alternative.

While avian entanglements may still occur in other parts of the pound net, the NPA 3 may reduce some of the brown pelican and cormorant entanglement. Birds would not be as likely to become entangled in stringers spaced three feet apart. Additionally, dropping the leader mesh in stringer leaders would further preclude the potential for avian entanglement because the leader mesh would likely be at a sufficient depth to reduce bird interactions with the leaders. These measures may benefit birds by reducing potential entanglements in those pound net leaders using stringers.

Restricting leaders greater than 16 inches stretched mesh is not likely to have a large beneficial impact to birds. While entanglement risks in leaders greater than 16 inches stretched mesh would be minimized, birds would continue to become entangled in those leaders with smaller mesh.

5.5.1.5 Habitat

NMFS believes that the NPA 3 would have only minor impacts on bottom vegetation and habitat. The information presented in Section 5.1.1.5 describes the potential impacts to habitat resulting from the removal of pound net leaders. The anticipated impacts would be smaller with this alternative because fewer pound net leaders would need to be removed, and the modification of stringer leaders should not disrupt bottom habitat. Nevertheless, the NPA 3 may result in some temporary disruption of bottom habitat, but it is unlikely to adversely impact EFH or SAV.

5.5.2 Economic Impacts

Under the non-preferred alternative 3 (NPA 3) plan, all pound net leaders with a mesh size of greater than 16 inches are prohibited, and harvesters using stringers must drop the mesh to 9 feet below mean low water so that the stringers will attach from the mesh to a lead line at the surface, and space stringer lines at least 3 feet apart. Similar to the PA plan, we assume harvesters will remove their leaders and therefore incur revenue losses due to not fishing and labor costs associated with removing and replacing leaders (See Section 5.1.2 for further explanation). However, as mentioned previously, this

assumption may not hold true for all harvesters and some may be able to switch to smaller mesh leaders and continue to fish.

Revenue and Landings

Revenue and landings for harvesters fishing pound nets are the same as those reported under the PA. See Section 5.1.2 for details of methods and results.

Results of NPA 3

According to the VMRC data, there are no harvesters fishing pound net leaders with mesh sizes 16 inches or greater. Therefore, this requirement has no impact. For harvesters fishing with stringers, there is no data available on the distance between the water surface and the top of the mesh. It is therefore not possible to estimate the impact of this part of the regulation either. However we can assume the worst case scenario as assumed under the PA. That is, harvesters using stringers will have to remove the leader and therefore incur revenue losses.

Therefore, under the NPA 3, a harvester fishing pound nets will incur revenue losses of $16,700 (CV=100) on average (Table 5.1.2.2). Over all water areas, harvester fish 2.4 pound nets on average. The cost of removing and replacing one pound net leader is approximately $1,600 ($1,618 = 2.4 pound net leaders * 3 persons*8 hours* 14.05 per hour * 2). A harvester s annual revenue will be reduced by 22% on average, given annual revenues are $84,300 (CV=101) (Table 5.1.2.3).

There are approximately 7 harvesters fishing 13.6 pound nets that would be affected with stringers from May 8th to June 30th, 2001 under the NPA 3. Total industry revenue losses are $125.0K and the cost of removing pound net leaders is $11.2K ($11,200 =7*$1,600), for a total of $136.2K if the NPA 3 is imposed (Table 5.4.2.1).

Table 5.5.2.1. Number of harvesters and pound nets fishing from May 8th to June 30th under the NPA 3, average revenues per harvester with coefficient of variation (CV), and total industry revenue losses by water area.

	Harvesters	No. Effected by PA		Revenues ($1)		
Water	May 8 to	Harvesters	Pound	Harvesters		Industry
Areas	June 30		nets	Revenue	CV	Revenue
306	6	0.0	0.0	23,900	37	0
307	4	4.0	7.8	21,900	63	87,600
308	0	0.0	0.0			0
309	12	2.3	4.1	12,799	38	28,798

346,353,358	346,353,358	85	0.7	1.7	12,000 67	8,571
Total	27		7.0	13.6		124,969

5.5.3 Social Impacts

The economic analysis indicates that the pound net industry will be impacted by this alternative. Under the NPA 3, fishing practices are affected, but not to the same extent as with the proposed alternative, NPA 1 or NPA 2. The pound net industry was involved in developing this alternative, so the projected impacts to the fishing industry are anticipated to be relatively small. These impacts would be concentrated in areas where stringers are used (e.g., Western Chesapeake Bay), and only affect those leaders fishing from approximately May 15 to June 15.

The affected fishermen must remove their leaders, modify their stringer leaders, or decrease their leader mesh size. Complying with these actions may create additional expenses and effort by the fishermen, resulting in negative social impacts to the industry. However, the workgroup convened by VMRC determined that stringers could be placed at least 3 feet apart with little extra expense or effort (VMRC personal communication), which would minimize the impacts of this alternative on those pound net fishermen that use stringers. If fishermen choose to remove their leaders rather than modifying their leader configuration, a net negative impact on fishing communities would result. Target species catch rates will likely decrease due to the inability to use the leaders on the pound nets, but the heart(s) and pound may still be set, which may result in some level of catch. This may somewhat negate the negative impacts to the fishing community, but fishing without leaders will virtually render the pound nets ineffective at catching fish. Fish dealers and processors may also be impacted if fishermen decide not to fish, as reduced landings would result in a much lower level of fish catch passing through their facilities and available for purchase. As mentioned, if fishermen change their fishing gear configuration as anticipated, the negative social impacts to the fishery should be small as fish catch would be retained.

If, however, the NPA 3 does not minimize impacts on sea turtles and results in the need to take more aggressive action at a later date, the consequences to employment, family and community would be increased from that described under the PA.

The social benefits described in Section 5.1.3 also apply to this

alternative. For instance, if these gear modifications are effective at reducing the entanglement risk to sea turtles and increase the potential for sea turtle recovery, then society will benefit by preventing a loss of a species and preserving biodiversity. However, if sea turtles continue to be entangled in those leaders unaffected by this alternative or in the modified pound net leaders, and sea turtles are at an increased risk of extinction, there are different social impacts associated with this alternative. The extinction of sea turtles would be a loss to society which has placed a value on the protection of all species for its intrinsic value as well as for its contribution to biodiversity. The Secretary of Commerce must carry out responsibilities imposed by society via the ESA which require him to ensure that all actions must not result in unauthorized incidental take of threatened and endangered species or that the take is not likely to jeopardize the continued existence of a species listed under the ESA.

6.0 POTENTIAL CUMULATIVE EFFECTS

This section identifies the cumulative effects of this PA with other existing federal and/or state regulations. The PA prohibits a mesh size on pound net leaders at 12 inches or greater and prohibits the use of stringers on leaders from May 8 to June 30. The pound net fishery lands several different species through out the year. In existence, are regulations that are species specific. There are currently no regulations in place to protect sea turtles in the pound net fishery.

Major species landed by weight are: bait, Atlantic croaker, menhaden, sea trout (weakfish), catfish, spot, striped bass, Spanish mackerel, blue crab, bluefish, shad-gizzard, and summer flounder. Size and/or limit regulations are in place for striped bass, Spanish mackerel, black drum, and red drum. Total allowable catch (TAC) limits are in place for bluefish and summer flounder. Pound nets are prohibited from catching gray trout (weakfish) from May 1 to May 22 and from September 13 through March 31. However, if a harvester fishes 2 or 3 pound nets, a harvester can forfeit one pound net and be exempt from the gray trout fishing restriction (i.e., closure).

7.0 FINDING OF NO SIGNIFICANT IMPACT

The preferred alternative involves NMFS issuance of a proposed rule that would restrict the use of all pound net leaders measuring 12

inches or greater stretched mesh and all pound net leaders with stringers in the Virginia waters of the mainstem Chesapeake Bay and portions of the Virginia tributaries from May 8 to June 30. The area where this gear restriction would apply includes the Virginia waters of the mainstem Chesapeake Bay from the Maryland-Virginia State line (approximately 38 N. lat.) to the COLREGS line at the mouth of the Chesapeake Bay; the James River downstream of the Hampton Roads Bridge Tunnel (I-64); the York River downstream of the Coleman Memorial Bridge (Route 17); and the Rappahannock River downstream of the Robert Opie Norris Jr. Bridge (Route 3). This proposed rule is necessary to protect sea turtles listed as threatened or endangered under the Endangered Species Act of 1973 from incidental takes in Virginia state water fisheries.

Impacts to the human environment, both beneficial and adverse, were evaluated in this document and are not significant.

Implementation of gear restrictions, as described in this document, are expected to have a short-term negative economic impact on the pound net fishing industry. Gear restrictions are expected to have positive effects on threatened and endangered sea turtles, as well as bottlenose dolphin and certain bird species, by reducing serious injury and mortality in the event of an entanglement.

Public health and safety is not expect to be significantly affected by implementation of these gear restrictions. The modifications involve removing pound net leaders or switching to a smaller mesh size during the spring. As the fishing industry removes their leaders during certain months for maintenance and replacement, without creating a significant public health and safety concern, this alternative would not impose any additional public health and safety issues.

The unique characteristics of the geographic area impacted by the rule are the presence of submerged aquatic vegetation, essential fish habitat, and the abundance of life forms of commercial and non-commercial value. The value of this area was considered in the essential fish habitat consultation process and described in this document, and the unique characteristics will be not be impacted by this proposed action.

The effects on the human environment of gear restrictions are not likely to be highly controversial. The impact of gear restrictions may be controversial to a small segment of the fishing community using certain pound net leaders, but the overall effects on the human environment are not expected to be highly controversial. These gear

restrictions are limited in geographic area and time period, and are implemented in an effort to facilitate the coexistence of fishing activity and sea turtles. These factors restrict the scope of the effects on the human environment.

The degree to which the effects of the proposed alternative are highly uncertain or involve unique or unknown risks is small.

The implementation of gear restrictions to reduce the risk of entanglement to sea turtles is a commonly used management tool and as such, does not establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. The use of gear modifications as a management tool has been determined to be important in order for the agency to meet objectives under the ESA. It is an independent action being implemented to achieve a specific objective given local conditions and issues, and is therefore not expected to establish a precedent for future actions. In the future, NMFS intends to evaluate the potential for sea turtles to be taken in pound nets in other states. However, this proposed rule does not establish a precedent for the forthcoming analysis, as sea turtle interactions with pound nets in each state will be evaluated separately based upon its own unique factual situation.

This action would restrict pound net leader mesh size and prohibit the use of stringers, as well as establish a framework for future action designed to further protect sea turtles based upon new information. The cumulative impacts of the initial restriction and any possible additional restrictions have been analyzed. Given the short duration and limited scope of possible cumulative impacts, such impacts are not expected to be significant.

There is no evidence that the implementation of gear restrictions will adversely affect entities listed in or eligible for listing in the National Register of Historic Places or will cause loss or destruction of significant scientific, cultural, or historic resources. Compliance with these restrictions is, by definition, not likely to result in the permanent loss or destruction of resources.

The basis for this proposed action is to offer additional protection to endangered and threatened sea turtles. It is expected that protected marine mammals found in the Virginia Chesapeake Bay will also benefit from the imposition of gear restrictions. While there is no evidence that threatened or endangered species will be adversely affected by these gear restrictions, a formal section 7 consultation

on the proposed action is underway on the fishery as a whole and addresses the potential for adverse effects to occur as a result of incidental take (typically live take) in the pounds of the state pound net fishery. No critical habitat for endangered or threatened species under NMFS jurisdiction has been designated in Virginia waters, so none will be affected by the proposed gear restrictions.

There is no evidence that implementation of gear restrictions is likely to result in a violation of a Federal, state or local law for environmental protection. In fact, gear modifications would be expected to support Federal, state and local laws for environmental protection. The implementation of gear restrictions would not result in any actions that would be expected to result in the introduction or spread of a nonindigenous species.

In view of the analysis presented in this document, it is hereby determined that the implementation of gear restrictions, as described in section 3.1 of this document, will not significantly affect the quality of the human environment with specific reference to the criteria contained in NAO 216-6 regarding compliance with the National Environmental Policy Act. Accordingly, the preparation of an Environmental Impact Statement for this proposed action is unnecessary.

William T. Hogarth Date
Assistant Administrator for Fisheries,
National Marine Fisheries Service

8.0 REGULATORY IMPACT REVIEW (RIR)

A Regulatory Impact Review (RIR) for all regulatory actions that are of public interest is required by NMFS. The RIR does three things: 1) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem, 2) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action, and 3) it ensures that the regulatory agency systematically and comprehensively considers all

available alternatives so that the public welfare can be enhanced in the most efficient and cost effective way.

The RIR also serves as the basis for determining whether any proposed regulations are a significant regulatory action under certain criteria provided in Executive Order 12866 and whether the proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act of 1980 (RFA). The primary purpose of the RFA is to inform the agency, as well as the pubic, of the expected economic impacts of the various alternatives considered and to ensure that the agency considers alternatives that minimize the expected impacts while meeting goals and objectives of applicable statutes.

8.1 Executive Order (E.O.) 12866

The RIR is intended to assist NMFS decision making by selecting the regulatory action that maximizes net benefits to the Nation.

Framework for Analysis
Net National benefit is measured through economic surpluses, consumer and producer surplus. Within this setting, consumer surplus is associated with the value of sea turtles and the consumer surplus associated with seafood products supplied by pound nets. The value of sea turtle protection is comprised of non-consumptive use and non-use values. Non-consumptive use value is associated with activities such as seeing turtles within whale watching trips or at an aquarium, while non-use value is associated with the satisfaction that people derive from knowing sea turtles exist. Producer surplus is associated with the economic profit earned by businesses engaged in pound net fisheries as well as that earned by businesses supplying aquariums to individuals that want to view sea turtles.

When comparing a regulatory action to the status quo or no action alternative, it is the change in net National benefit that becomes the focal point of analysis. Given the finding that the status quo alternative does not afford adequate protection to sea turtles, the consumer surplus (non-consumptive use and non-use value) associated with improved sea turtle protection will be superior to that of the status quo. Further, regulatory alternatives that afford higher protection will yield higher benefits at the margin.

Aside from the no action alternative, all four of the remaining alternatives involve restricting pound nets with leaders and stringers. Under all four alternatives harvesters can continue to

fish in the area if they convert their gear. The four alternatives have different leader mesh size restrictions. Stringers are completely prohibited in 3 out of 4 alternatives. Specifically, the preferred alternative (PA) prohibits pound net leaders with 12 inches and greater stretched mesh, as well as those using stringers, from May 8 to June 30. The non-preferred alternative 1 prohibits pound net leaders with 8 inches and greater stretched mesh, as well as those using stringers, from May 8 to June 30. The non-preferred alternative 2 prohibits all pound net leaders from May 8 to June 30. Finally, the non-preferred alternative 3 prohibits pound net leaders with greater than 16 inches stretched mesh, and requires pound net leaders with stringers to drop the mesh to 9 feet below mean low water and to space stringer lines at least 3 feet apart, from May 15 to approximately June 15.

The absolute magnitude of sea turtle protection provided by these regulatory alternatives can not be quantified, but they can be ranked. The non-preferred alternative 2 provides the greatest protection to sea turtles, followed by the non-preferred alternative 1 and PA. The non-preferred alternative 3 provides the least protection to sea turtles. The reasoning is as follows. For the purposes of this analysis, we assume that, within the range of mesh sizes used in the pound net fishery, larger mesh in pound net leaders is equivalent to a increased rate of entanglement. That is, the rate of entanglement is reduced as the mesh size is reduced. The non-preferred alternative 2 provides the most protection because all pound net leaders are prohibited and therefore the rate of entanglement in these leaders is zero, since they are completely removed. Since the non-preferred alternative 1 prohibits leader mesh sizes at 8 inches or greater, and the PA plan prohibits the same mesh to 12 inches or greater, the non-preferred alternative 1 provides more protection to sea turtles compared to the PA given the previous assumption. Finally, the non-preferred alternative 3 provides the least protection due to prohibiting the leader mesh to 16 inches or greater.

Both consumer surplus and producer surplus for seafood products supplied by the pound net fisheries will be affected by these sea turtle protection measures. If harvesters are currently operating with the minimum mesh size possible, these sea turtle protection measures will result in revenue losses due to not fishing, plus labor costs for removing and replacing leaders from May 8 to June 30. However, if harvesters are able to operate with a smaller mesh size and without stringers, those measures will result in labor costs for removing and replacing leaders from May 8 to June 30, plus the cost of a compliant leader. A decrease in earned revenues from not fishing

will result in a reduction in quantities of seafood supplied to seafood markets which may result in higher prices to consumers. The magnitude of these changes and how the surpluses will be redistributed between consumers and producers will depend on the slopes of the respective supply and demand functions. In any case, as long as demand functions are downward sloping and supply functions are upward sloping, there is always a loss in economic surplus when regulatory costs are imposed. However, this loss in economic surplus will be minimized by selecting the least costly regulatory alternative which provides the maximum protection. Further, since the PA would only affect a portion of the pound net fishery s average annual landings (approximately 350,000 pounds), the effect on regional seafood markets would probably be negligible, as would the impact on seafood prices and consumer s surplus.

8.2 Regulatory Cost to Pound Net Industry

Under 4 alternatives, excluding status quo, harvesters must convert their pound net leaders to continue fishing in the Virginia portion of the Chesapeake Bay. The following five alternative are evaluated: 1) pound nets with stringers and mesh of leaders greater than 12 inches are prohibited, 2) status quo or no action, 3) pound nets with stringers and mesh of leaders greater than 8 inches are prohibited, 4) all pound net leaders are prohibited, and 5) stringers must be spaced 3 feet apart and drop the mesh to 9 feet below mean low water, and mesh of leaders greater than 16 inches are prohibited. These alternatives are to be effective from May 8 to June 30.

One scenario was evaluated. For the purposes of this analysis, we assume harvesters are fishing with the minimum mesh size that is operational. That is, if a harvester chose a smaller mesh size in the pound net leader to comply with regulations, the leader would be washed away due to strong currents and debris becoming entangled. This is also assumed for harvesters fishing with stringers. This assumption was required since the data provided by VMRC does not give the exact position of where pound nets were located within large water areas. Currents may be stronger in a position below a river versus above a river out flow. This scenario is assumed to be the worst case. Since the leader guides fish into the heart of the pound net, its removal will result in a loss of catch. Harvesters will then incur revenue losses and labor costs associated with the removal and replacement of the leader. However, this assumption that harvesters use the minimum mesh size that is operational may not necessarily hold true for all harvesters. It is possible that fishermen choose mesh size based upon a variety of factors, such as cost, selectivity for certain finfish

species, and local environmental conditions. Under this scenario, some fishermen may be able to use smaller mesh sizes, but they may also incur an additional expense they might not otherwise and may not be able to select for specific species of fish as well. There may be unknown revenue differences (either positive or negative) between fishing with larger mesh and smaller mesh leaders.

Average revenues earned from May 8 to June 30 were based on data from 1999 to 2001. A three year average is reported. Annual revenues were calculated the same and include revenues earned from landing catch within several gear types. Data was not available on the cost of removing leaders from a pound net and therefore not reported. It is noted that removal of leaders is difficult task since the bottom of the mesh is typically buried into the bottom. Anecdotal evidence suggests the time to remove a leader depending on location would require 3 to 6 persons for 1 to 2 days.

In section 8.2.1, the economic impacts on an individual harvester are discusses, and in section 8.2.2, industry impacts are presented.

8.2.1 Small Entity Impacts

Economic impacts on an individual harvester are evaluated here. Revenue impacts per individual harvester are the same across all alternatives. On an annual time frame, harvesters earned $84,300 (CV=101) in revenues and landed 353,300 (CV=110) pounds of fish on average. Under the 4 alternatives, excluding status quo, a harvester on average would incur revenue losses of $16,700 (CV=100) from not fishing and a cost of $1,600 to remove and replace leaders on pound nets between May 8 and June 30. Under the worst case scenario, a harvester s annual revenue would be reduced by 22 percent on average under the 4 alternatives, excluding status quo. This revenue reduction is considered significant. However, if a harvester is able to use a smaller mesh size, then he/she would just incur the $1,600 cost of removing and replacing the leader plus approximately $8,300 for the compliant leader.

8.2.2 Industry Impacts

Under the PA plan, 10.5 harvesters fishing 23.7 pound nets are affected (Table 8.2.2.1). Forgone industry revenues are $192.0K and the cost to remove and replace pound net leaders is $16.7K for a total of $208.7K. Under the NPA 1 plan, 12.7 harvesters fishing 30.7 pound nets are affected. Forgone industry revenues are $237.4K and the cost to remove and replace pound net leaders is $20.3K for a total of

$257.7K. Under the NPA 2 plan, 27 harvesters fishing 63.9 pound nets are affected. Forgone industry revenues are $444.6K and the cost to remove and replace pound net leaders is $43.2K for a total of $487.8K. Under the NPA 3 plan, 7 harvesters fishing 13.6 pound nets are affected. Forgone industry revenues are $125.0K and the cost to remove and replace pound net leaders is $11.2K for a total of $136.2K. For details of how these numbers were derived, see Sections 5.1.2, 5.3.2, 5.4.2, and 5.5.2.

Table 8.2.2.1 Number of harvesters and pound nets affected, total forgone industry revenues, the cost of removing and replacing pound net leaders and the grand total cost to the industry by alternative, in the worst case scenario.

	PA	NPA 1	NPA 2	NPA 3
Number of Harvesters Affected	10.5	12.7	27	7
Number of Pound Nets Affected	23.7	30.7	63.9	13.6
Total Forgone Industry Revenues	192.0	237.4	444.6	125.0
Cost of Remove & Replace Leader	16.7	20.3	43.2	11.2
Grand Total ($1,000)	208.7	257.7	487.8	136.2

Given the inability to provide a quantitative analysis of these regulatory alternatives, the regulatory choice was considered with respect to the known costs and the relative differences in sea turtle protection benefits. Of the alternatives, given the assumption that harvesters will not switch to smaller mesh leaders, NPA 3 would be the least burdensome to industry, but offer the lowest expected protection to sea turtles, with the exception of the no action alternative. The implementation of the PA would result in a greater level of expected protection to sea turtles at a relatively modest incremental cost compared to the NPA 3 ($72.5 thousand). Of the alternatives, the PA is based upon the best available scientific data showing that sea turtles are susceptible to entanglement in leaders greater than or equal to 12 inches stretched mesh and leaders with stringers. The NPA 1 and NPA 2 would provide higher expected sea turtle protection by restricting more leaders that may result in sea turtle entanglement, but turtle interactions with leaders smaller than 12 inches stretched

mesh have not been scientifically documented in the Virginia Chesapeake Bay and interactions with large mesh leaders likely account for most of the turtle interactions with pound net gear in Virginia waters. As such, compared to the PA, sea turtle protection benefits are higher with NPA 1 and highest with NPA 2, but the industry costs associated with NPA 1 and NPA 2 are also higher ($49 thousand and $279.1 thousand, respectively) and the degree of sea turtle and pound net interactions with the respective leader mesh sizes has not been scientifically documented in Virginia waters.

8.3 Initial Regulatory Flexibility Act Analysis

The regulatory flexibility analysis is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. This analysis is conducted to primarily determine whether the proposed action would have a significanteconomic impact on a substantial number of small entities . Inaddition to analyses conducted for the Regulatory Impact Review (RIR), the regulatory flexibility analysis provides: 1) a description of the reasons why action by the agency is being considered; 2) a succinct statement of the objectives of, and legal basis for the proposed rule; 3) a description and where feasible, an estimate of the number of small entities to which the proposed rule applies; 4) a description of impacts of the proposed rule and alternatives; 5) a description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and 6) an identification, to the extent practical, of all relevant Federal rules which many duplicate, overlap, or conflict with the proposed rule.

Description of the reasons why action by the agency is being considered: The need and purpose of the action are set forth in Section 2.0 of this document and are included herein by reference.

Statement of the objectives of, and legal basis for the proposed rule: The specific objective of the action is to: reduce injuries or mortalities of sea turtles attributable to entanglements with pound net leaders. The Endangered Species Act provides the legal basis for this rule.

Description and estimate of the number of small entities to which the proposed rule will apply:
Of the 160 pound net licenses, where one license is assigned to each

pound net, 72 licenses are fishing in the water area of this proposed rule, according to the 2001 VMRC survey data. According to VMRC landings data, there were 27 harvesters fishing 63.9 pound nets from May 8 to June 30 in 2001. This proposed rule will potentially affect 10.5 harvesters fishing 23.7 pound nets.

Description of impacts of the proposed rule and alternatives:
The impact of the proposed rule and alternatives is analyzed and described in sections 5.1.2, 5.2.2, 5.3.2, 5.4.2, 5.5.2, and 8.2. These sections are incorporated by reference herein.

Description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records: The proposed rule would not impose any additional reporting, record-keeping, or compliance requirements. Thus, no new skills would be required for compliance.

Identification of all relevant Federal rules which many duplicate, overlap, or conflict with the proposed rule: No duplicative, overlapping, or conflicting Federal rules have been identified.

Substantial Number of Small Entities Criterion:
All commercial fishing operations that fish in the manner and location of the proposed rule would be effected. All such operations, where they exist are assumed to be small business entities, given the information provided above and the standard that a fish harvesting business is considered a small business if it is independently owned and operated and not dominant in its field of operation, and if it has annual receipts not in excess of $3.5 million. The number of entities that engage in fishing in the manner that would be prohibited is considered few.

Significant Economic Impact Criterion:
The outcome of signficant economic impact can be ascertainedby examining two issues: disproportionality and profitability.

Disproportionality: Do the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities? All small business entities participating in the pound net fisheries are considered small business entities, so the issue of disproportionality does not arise.

Profitability: Do the regulations significantly reduce profit for a

substantial number of small entities? The proposed regulation affects 10.5 harvesters fishing 23.7 pound nets. This is considered a substantial number of entities within the May 8 to June 30 time frame. However, a harvester s annual revenues may be reduced by 22 percent in the worst case scenario under this proposed rule, and this is considered a significant reduction.

Description of significant alternatives to the proposed rule and discussion of how the alternatives attempt to minimize economic impacts on small entities: Four alternatives to the proposed rule have been considered. Given the inability to provide a quantitative analysis of these regulatory alternatives, the regulatory choice was considered with respect to mitigating the known costs on small entities while providing sea turtle protection. One alternative being status quo would not provide any protection to sea turtles, the species being protected, but would not have any economic consequences at least in the short term. No action now may lead to more severe and costly action to protect sea turtles in the future. The alternative that prohibits leaders from May 8 to June 30, provides the most protection to sea turtles and is the most costly to the industry. The alternative which provides the least protection to sea turtles (which prohibits pound net leader meshes of 16 inches or greater and modifies stringer leaders) costs the least to the industry. Of the two remaining alternatives, the PA and NPA 1, the proposed alternative provides less protection to turtles at a lower industry cost. However, of these two alternatives, the best available scientific data documenting turtle entanglement in pound net leaders support the implementation of the PA. Further, compared to the NPA 3, the PA provides higher expected protection to turtles at a relatively modest incremental cost to the industry.

9.0 APPLICABLE LAW

9.1 National Environmental Policy Act

NMFS prepared this Environmental Assessment in accordance with the National Environmental Policy Act.

9.2 Endangered Species Act

A section 7 consultation is being completed on the Preferred Alternative, the prohibition of leader mesh size greater than 12 inches and leaders with stringers in the Virginia waters of the Chesapeake Bay from May 8 to June 30, in the context of the fishery as

a whole. The Biological Opinion will be issued before the regulations go into effect.

9.3 Marine Mammal Protection Act

The proposed action to restrict certain pound net leaders will not adversely affect marine mammals because the proposed action will provide additional risk reduction in the effort to reduce serious injury and mortality due to entanglement in pound net leaders.

9.4 Paperwork Reduction Act

This final rule does not contain a collection of information requirement for the purposes of the Paperwork Reduction Act.

9.5 Essential Fish Habitat

The area affected by the proposed action has been identified as Essential Fish Habitat (EFH) for the following species: Atlantic butterfish, Atlantic sea herring, Atlantic sharpnose shark, black sea bass, bluefish, cobia, dusky shark, king mackerel, red drum, red hake, sand tiger shark, sandbar shark, scup, Spanish mackerel, summer flounder, whiting, windowpane flounder, and winter flounder. On March 7, 2002, NMFS conducted an analysis of the impacts on EFH pursuant to 50 CFR 600.920(h), and determined that this proposed action will not have any adverse impact to EFH.

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Appendix A.

COMMERCIAL FISHERIES STATISTICS
2ND QUARTER (APRIL-JUNE) 2001
(Preliminary Report)

SPECIES	APRIL		MAY		JUNE	
FINFISH	POUNDS	VALUE($)	POUNDS	VALUE($)	POUNDS	VALUE($)
ALEWIFE	27729	2937	6770	685	1760	192
AMBERJACK	106	45	0	0	269	202
ANGLER	79212	101352	247503	300153	47389	61892
BASS, BLACK SEA	55512	165995	69545	171407	14245	32491
BASS, STRIPED	48835	74225	30236	45964	31596	47804
BLUEFISH	90500	22954	82200	21471	29063	7292
BONITO	0	0	0	0	19	15
BULLHEADS	4215	801	8010	1523	1300	247
BUTTERFISH	6380	3076	5454	3174	2543	1482
CARP	1433	144	1340	268	106	13
CATFISH	115297	27876	202969	48902	228480	54917
COBIA	0	0	147	312	2344	5395
COD	0	0	5	8	0	0
CREVALLE	0	0	0	0	26	25
CROAKER, ATLANTIC	2117644	994815	1482798	681263	1549946	699573
DOGFISH, SMOOTH	97803	46658	4836	1113	5145	1650
DOGFISH, SPINY	0	0	2251	394	0	0
DOGFISH, UNCLASSIFIED	36281	12701	83933	28783	203	71
DOLPHIN FISH	0	0	0	0	286	388
DRUM, BLACK	7650	1609	50013	10503	2603	548
DRUM, RED	382	487	1355	1725	733	941
DRUM, UNCLASSIFIED	0	0	1756	804	0	0
EEL, AMERICAN	34921	29168	26521	31168	8722	9912
EEL, CONGER	1033	552	1880	938	342	175
FLOUNDER, SUMMER	151079	313873	42048	79752	22319	39884
FLOUNDER, WINTER	60	45	12	9	20	15
FLOUNDER, WITCH	23	8	0	0	0	0
GARFISH	0	0	0	0	5	1
GROUPERS	2	4	0	0	0	0
HAKE, RED	6	2	152	28	98	18
HAKE, SILVER	1548	725	29	7	0	0
HAKE, WHITE	33	17	11	2	0	0
HARVESTFISH	0	0	3698	4880	15242	20119
HERRING, ATLANTIC	5441	1380	2153	544	0	0
HERRING, UNCLASSIFIED	66245	4637	0	0	0	0
JOHN DORY	0	0	2	1	0	0
MACKEREL, ATLANTIC	32788	13172	229	133	911	540
MACKEREL, KING	0	0	0	0	201	353
MACKEREL, SPANISH	467	368	1172	899	70422	52476
MENHADEN	524525	28683	1191193	65442	558798	29478
MULLET	162	108	28	10	15	5
PERCH, WHITE	15714	10645	3754	2705	932	647
PERCH, YELLOW	294	389	184	112	207	287
POLLOCK	14	7	0	0	0	0

POMPANO, COMMON	0	0	0	0	4	6
PUFFER, NORTHERN	1315	1126	5982	5600	3076	3796
RIBBON FISH	0	0	0	0	3	3
SEA ROBINS	15302	2045	0	0	0	0
SEATROUT, GREY	160665	94993	86417	44939	75089	27219
SEATROUT, SPOTTED	71	71	65	65	32	32
SHAD, AMERICAN	76024	35044	1294	1498	43	59
SHAD, GIZZARD	117161	8651	35874	2447	46881	3579
SHAD, HICKORY	1279	185	39	7	48	6
SHARK, BLACKTIP	0	0	46	10	982	222
SHARK, DUSKY	0	0	209	106	588	1090
SHARK, LEMON	30	0	171	0	0	0
SHARK, MAKO	0	0	0	0	268	393
SHARK, PORBEAGLE	60	85	139	49	0	0
SHARK, SAND TIGER	0	0	411	145	294	88
SHARK, SANDBAR	0	0	758	546	10386	6915
SHARK, THRESHER	548	409	5450	2865	383	195
SHARK, UNCLASSIFIED	6249	5352	227935	121870	31822	11086
SHARK, WHITE	0	0	26	18	0	0
SHEEPSHEAD	0	0	50	22	141	57
SKATE, WINGS	19124	3666	20641	2745	0	0
SPADEFISH	0	0	3462	2043	11512	6794
SPOT	37927	16747	87508	38590	90913	40153
TAUTOG	2275	3101	667	1009	63	107
TILEFISH, BLUELINE	5	6	0	0	0	0
TUNA, ALBACORE	70	7	0	0	0	0
TUNA, BIGEYE	0	0	0	0	181	578
TUNA, FALSE ALBACORE	0	0	4681	1375	258	77
TUNA, YELLOWFIN	0	0	0	0	739	1393
WHITING, KING	768	572	400	317	152	121
OTHER FISH(FOOD)	114	45	1067	955	178	90
FISH,OTHER(INDUSTRIAL)	516601	41843	827218	63843	246255	19675
TOTAL FINFISH	**4478922**	**2073406**	**4864697**	**1796146**	**3116581**	**1192782**

SPECIES	**APRIL**		**MAY**		**JUNE**	
SHELLFISH	**POUNDS**	**VALUE($)**	**POUNDS**	**VALUE($)**	**POUNDS**	**VALUE($)**
BLOOD ARK, CLAM	6	48	51	457	148	1206
CONCHS	41911	58364	107734	69193	21683	16279
CRAB, BLUE	1126728	937639	2494218	3723671	2604621	2658826
CRAB, HORSESHOE	6910	1759	14927	4351	4254	1830
CRAB, RED	270510	378687	262227	367774	126329	139070
QUAHOG, PUBLIC	22306	103425	44028	273496	47327	262005
SCALLOPS, SEA	1157998	4281932	1822730	6966802	1483524	5209637
SQUID (LOLIGO)	26564	15780	19	19	0	0
WHELK, CHANNEL	18829	55268	12280	36456	1675	4890
TOTAL SHELLFISH	**2671762**	**5832902**	**4758214**	**11442219**	**4289561**	**8293743**
FINFISH & SHELLFISH	**7150684**	**7906308**	**9622911**	**13238365**	**7406142**	**9486525**

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Appendix B. Landings data provided by the Virginia Marine Resources Commission show that the following species have been landed in pound nets:

Alewife (*Alosa pseudoharengus*)

Bluefish (*Pomatomus saltatrix*)

Bonito (*Sarda sarda*)

Butterfish (*Peprilus tricanthus*)

Cobia (*Rachycentron canadum*)

Catfish (*Arius* or *Bagre spp.*)

Cod (*Gadus morhua*)

Atlantic Croaker (*Micropogonias undulatus*)

Black Drum (*Pogonius cromis*)

Red Drum (*Sciaenops ocellatus*)

American Eel (*Anguilla rostrata*)

Winter Flounder (*Pseudopleuronectes americanus*)

Summer Flounder (*Paralichthys dentatus*)

Harvest Fish (*Peprilus alepidotus*)

Atlantic Herring (*Clupia harengus*)

Spotted Seatrout (*Cynoscion nebulosus*)

Sheepshead (*Archosargus probatocephalus*)

Spanish Mackerel (*Scomberomorus maculates*)

White Perch (*Morone Americana*)

Red hake (*Urophycis chuss*)

Silver Hake (*Merluccius bilinearis*)

Amberjack (*Seriola spp.*)

Spadefish (*Chaetodipterus faber*)

Sturgeon (*Acipenser spp.*)

Scup (*Stenotomus chrysops*)

Tautog (*Tautoga onitis*)

Spot (*Leiostomus xanthurus*)

Dogfish (*Squalus acanthias*)

Mullet (*Mugil spp.*)

Menhaden (*Brevoortia spp.*)

Hickory Shad (*Alosa mediocris*)

Striped Bass (*Morone saxatilis*)

Skipjack Tuna (*Euthynnus pelamis*)

Gizzard Shad (*Dorosoma cepedianum*)

Northern Puffer (*Sphoeroides maculates*)

Little Tunny (*Euthynnus alletterathus*)