

Application for an Individual Incidental Take Permit under the Endangered Species Act of 1973

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Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

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## **Introduction**

The North Carolina Division of Marine Fisheries (NCDMF) requests an Individual Incidental Take Permit (ITP) under Section 10(a)(1)(B) of the Endangered Species Act (ESA) of 1973 (Public Law 93-205, ESA) for a 10 year period covering gill net fisheries in internal coastal waters of North Carolina. This request was prompted by notification from the National Marine Fisheries Service (NMFS) Southeast Regional office (SERO) in February indicating the intent to list the Carolina Distinct Population Segment (DPS) of Atlantic sturgeon as endangered under the ESA. The NCDMF is requesting an ITP that implements a proposed conservation plan that will ensure that only a reasonable level of authorized Atlantic sturgeon incidental takes will occur, while allowing North Carolina estuarine gill net fisheries to operate. NCDMF requests NMFS to authorize such takes as are incidental to normal fishing activity, described below, with increased public outreach by NCDMF to help fishermen avoid, minimize, and mitigate incidental takes of Atlantic sturgeon. NCDMF proposes increased monitoring of its fisheries to further develop information about Atlantic sturgeon bycatch and proposes to use data gathered through that monitoring effort to identify further practicable measures to protect Atlantic sturgeon.

NMFS rules (§ 222.307) stipulate the need to submit an application 120 days prior to the requested effective date. Because of the extremely short time frame (60 days) from listing determination to the ESA rule effective date of April 6, 2012, the NCDMF acknowledged this application would require several iterations prior to being published in the Federal Register for public comment.

## **Species of Concern**

### **Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)**

For a detailed description of Atlantic sturgeon please refer to Greene et al. 2009.

## **Estuarine Gill Net Fisheries**

North Carolina has a unique estuarine system that is created by a chain of barrier islands along nearly the entire coast. Inlets within these barrier islands allow saline ocean water to mix with freshwater which is provided by a network of river systems to the west (Figure 1). This brackish

water coastal sound ecosystem is the third largest estuary in the world. This estuary provides prime habitat for numerous finfish species which are harvested by residents and visitors to North Carolina in both the recreational and commercial fishing industries.

Analyses of NCDMF commercial harvest trip ticket data, observer data, fish house sampling programs, and input from the fishing industry enables North Carolina fisheries to be characterized by gear type, both spatially and temporally (NCDMF 2008). Commercial landings are monitored through the North Carolina Trip Ticket Program (NCTTP), which began in 1994. Under this program, only licensed commercial fishermen may sell catches to fish dealers who must be licensed by the NCDMF. Dealers are required to complete a trip ticket every time a commercial fisherman lands fish. Trip tickets record information on gear type, area fished, species harvested, and total weight by species.

The NCDMF initiated a statewide sampling program covering the dominant commercial finfish fisheries in 1982. The objective was to obtain biological and fisheries data on economically important fishes for use in reaching management decisions. The NCDMF field biologists and technicians collect data dockside as fish are landed. Commercial fishers are also interviewed dockside whenever possible. Data collected include information on location, effort, and gear characteristics, as well as information used to determine the size and age distribution of species landed (NCDMF 2008).

The following descriptions of ongoing North Carolina estuarine gill net fisheries characterize the types of gear used, areas and seasonality of the fisheries, target species for each fishery, dockside value, and participation levels. The diversity and scale of the North Carolina fishing industry is illustrated, and the descriptions provide a basis for understanding how Atlantic sturgeon interactions may occur in the various estuarine gill net fisheries.

Along the Atlantic Coast, gill nets are a legal gear and used for commercial and recreational purposes in all states, to some degree, with the exception of Pennsylvania and Florida. Commercial and recreational fishermen deploy gill nets in much of North Carolina's coastal estuarine and ocean waters (Figure 1). Gill nets are highly regulated through the fisheries rules adopted by the North Carolina Marine Fisheries Commission (NCMFC) and proclamations issued by the NCDMF director. Regulations include mandatory attendance, yardage limits, soak-time restrictions, net shot limits, net height tie down requirements, closed areas (primary

nursery areas, Pamlico Sound Gill Net Restricted Area (PSGNRA), western Albemarle Sound), mesh size restrictions, minimum distance between fishing operations, marking requirements, permit mandates (PSGNRA), and observer requirements (PSGNRA, Core Sound 2009, Beasley Settlement Agreement).

Gill net fisheries and related restrictions differ throughout the state depending on season, target species, location, and physical characteristics of the water body being fished (Appendices A-G; Tables 1 and 2). In general, there are three primary set techniques: anchored set nets, floating drift nets, and strike or runaround nets. Anchored gill nets are passive sets deployed with an anchor or stake at one or both ends of the net shots or operation. Sink nets fish from the bottom upward into the water column, while float nets fish from the surface downward. Drift nets are floated with the tides, are not anchored, and are typically used in deeper water areas such as near ocean inlets. With strike or runaround gill net fisheries, the gear is set and quickly retrieved after surrounding a school of fish. For the purpose of this ITP, the term “gill net” refers to the anchored gill net, as limited amounts of drift nets are allowed and interactions are believed to be minimal in run around nets.

Gill nets may be used to target specific size ranges of fish due to the selectivity of different mesh sizes. Consequently, fishermen use gill nets of different mesh sizes to target different species. Commonly used mesh sizes in North Carolina estuarine waters range from 2.5 inch stretch mesh (ISM) to 6.5 ISM and covers the range of allowable mesh sizes in North Carolina’s estuarine waters. Mesh size limitations are established by fisheries rules or NCDMF proclamation.

Gill nets have been subject to increased monitoring over the past decade. In addition to the observer monitoring efforts throughout the fall PSGNRA from 2000 through 2012, commercial estuarine gill net observer coverage has expanded throughout the state since 2004. Information gathered during observer trips includes data on effort and mesh sizes used, as well as data on the size and disposition of captured species (Boyd 2012; NCDMF 2008; Price 2007a, 2008, 2009a, 2010b).

The NCDMF uses data from its NCTTP and fish house samples, in addition to observations of commercial trips, to characterize North Carolina’s estuarine gill net fishery. Many commercially valuable species are targeted by gill nets throughout the year with no single mesh size being

ideal for all species. Resulting information confirms that gill net fishermen utilize specific mesh size nets depending on the target species. While multiple species are most often landed for a single trip, a target species often comprises the majority of the catch.

By conducting these analyses and combining this information with direct commercial observations, distinct target species for small (<5.0 ISM) and large (≥5.0 ISM) mesh gill net fisheries may be identified spatially and temporally for North Carolina estuarine waters. Large mesh gill net fisheries consist primarily of five target species including southern flounder (*Paralichthys lethostigma*), striped bass (*Morone saxatilis*), American shad (*Alosa sapidissima*), hickory shad (*A. mediocris*), and catfishes (*Ictalurus spp.*). Large mesh gill net fisheries for southern flounder traditionally operated throughout the majority of the sounds and lower estuarine river systems with a peak in effort in the fall months (September to November). However, due to the Sea Turtle Settlement Agreement management measures there are now area and seasonal closures impacting the southern flounder gill net fishery and gill net restrictions including: a stretch mesh size range of 4 ISM to, and including, 6.5 ISM for large mesh gill nets; soak times limited to overnight soaks an hour before sunset to an hour after sunrise, Monday evenings through Friday mornings; large mesh gill nets were restricted to a height of no more than 15 meshes, constructed with a lead core or leaded bottom line and without corks or floats other than needed for identification; a maximum of 2,000 yards of large mesh gill nets allowed to be used per vessel; and maximum individual net (shot) length of 100 yards with a 25-yard break between shots. Fishermen in the southern portion of the state were allowed to use floats on nets but were restricted to the use of a maximum of 1,000 yards of large mesh gill-net per fishing operation.

Fisheries for striped bass, which are managed in most areas as bycatch fisheries by the NCDMF, are more limited in time and space due to the anadromous migration of this species. Striped bass gill net fisheries are prosecuted from October to late April. The majority of estuarine striped bass harvest occurs in the Albemarle Sound with additional early spring effort occurring in the Pamlico Sound and the Pamlico and Neuse river systems. American and hickory shad fishing operations had occurred exclusively from January 1 through April 14 due to their anadromous migration and distribution (season established by Fisheries Rule – 15A NCAC O3M .0519). However, during 2012, the NCDMF has developed a Shad Sustainability Plan that has been approved by the Atlantic States Marine Fisheries Commission (ASMFC) and reduced the seasons for American shad. Catfish are harvested with large mesh gill nets in the major

rivers and western Albemarle Sound and the majority of catches occur during the winter to spring months. The most common mesh size for all large mesh gill net fisheries is 5.5 ISM.

Small mesh gill net operations target a more diverse array of species relative to large mesh gill net fisheries. Small mesh gill net fisheries primarily target spot (*Leiostomus xanthurus*), striped mullet (*Mugil cephalus*), bluefish (*Pomatomus saltatrix*), spotted seatrout (*Cynoscion nebulosus*), weakfish (*Cynoscion regalis*), Atlantic menhaden (*Brevoortia tyrannus*), Spanish mackerel (*Scomberomorus maculatus*), white perch (*Morone americana*), and kingfishes (*Menticirrhus spp.*). Spot are landed throughout the estuarine waters and river systems with peak landings in the spring/summer (April to June) and fall (October to November) months. Striped mullet are landed year round, but peaks occur in the fall/winter months (October to January). Bluefish are also landed year round throughout the estuarine and river systems, and most landings occur in the spring during April and May. Spotted seatrout and weakfish are targeted by small mesh gill net operations primarily in the fall/winter (September to January) months. Weakfish landings may also peak in the spring during April and May. Atlantic menhaden are mostly targeted during the spring (February to May) and another peak in landings occurs in October. Spanish mackerel are targeted during the spring, summer, and fall months. White perch are almost exclusively targeted during the winter/spring months (December to April). Kingfishes are targeted primarily in the spring and the fall mainly in the more northern estuarine system. Mesh sizes used in small mesh gill net operations vary more than those used in large mesh fisheries. However, the most commonly used small mesh sizes generally fall between 3.0 and 3.75 ISM.

The 1994 North Carolina Estuarine Striped Bass Fishery Management Plan (FMP) limited unattended small mesh gill nets in the Albemarle Sound Management Area (ASMA—Albemarle, Currituck, Croatan, Roanoke sounds and its tributaries) to 800 yards per operation to reduce the bycatch of striped bass, and the allowable mesh sizes < 4.0 ISM are limited. Amendment 1 to the Red Drum FMP analyzed small mesh gill net yardage used in the commercial fishery for a variety of target species (NCDMF 2008). From 2001 to 2006, average gill net yardage fished ranged from approximately 700 yards per trip in the white perch fishery to over 1,300 yards per trip for the weakfish fishery. Small mesh gill net yardage fished per trips ranged from 100 yards per trip to 4,000 yards per trip. From 2009 to 2011, there has been a reduction (12%) of small mesh gill net yardage used and trips in estuarine waters averaged 9,648 per year (Tables 3 and

4). Although the estuarine gill net fishery is extensively managed, there is no maximum yardage limit for gill nets < 4.0 ISM for most of North Carolina's estuarine waters.

Required attendance of small mesh gill nets in North Carolina's estuarine waters is a management measure designed to minimize bycatch of undersized finfish (Figure 2). Small mesh gill net attendance is required from mid-May through mid-November in the ASMA, and small mesh gill nets in the upper reaches of Pamlico, Pungo, Neuse, and Trent rivers are required to have year-round attendance to minimize bycatch of undersized striped bass (NCDMF 2004). The North Carolina Red Drum FMP implemented attendance requirements for small mesh gill nets from May 1 through October 31 in areas known to be critical for juvenile red drum. These critical areas were defined as all primary and secondary nursery areas, areas within 200 yards of any shoreline, and the extensive shallow grass flats located on the inshore side of the Outer Banks. An exemption to this rule lifts the attendance requirement for the region from Core Sound to the South Carolina state line in October to allow for the fall spot fishery (NCDMF 2008). Detailed maps of attendance rules for each waterbody can be found at <http://portal.ncdenr.org/web/mf/attended-gill-net-areas>.

Amendment 1 to the North Carolina Red Drum FMP expanded on the small mesh gill net attendance requirements. Specifically, it extended the year-round attendance within 200 yards of shore to include the area of the lower Neuse out to the mouth of the river and extended the seasonal attendance requirements to include the period of May 1 through November 30 in the following areas: all primary and permanent secondary nursery areas and all modified no-trawl areas (shallow grass beds in eastern Pamlico and Core sounds); within 200 yards of any shoreline for the areas of Pamlico, Pungo, Neuse, and Bay rivers; and within 50 yards of any shoreline in areas of Pamlico and Core sounds and in all coastal waters south to the South Carolina state line (NCDMF 2008). However, the area from Core Sound to South Carolina state line was excluded from the shoreline attendance requirement during October and November.

Small mesh gill net attendance requirements designed to minimize undersized red drum and striped bass bycatch also occur in areas and times where sea turtles are most commonly found and where Atlantic sturgeon interactions have been documented. The attendance requirements may be the reason for the low number of interactions or it could be the result of reduced effort stemming from the attendance requirements.

## Landings and Values

The socioeconomic characteristic of commercial fishing varies by county and region along the coast of North Carolina. Comparing the data gathered from the NCTTP and those from the North Carolina Employment Security Commission showed that the commercial fishing industry was a significant economic factor for some of the more prominent coastal fishing counties including Dare, Carteret, Pamlico, Hyde, and Tyrrell counties (Bianchi 2003). In these counties, 4% (greater than 8% in Hyde County) of the workforce participated in commercial fishing. Also in these counties, the average income of commercial fishermen was greater than the average annual wage per employee. Therefore, in considering the economic impacts of restrictions in one fishery, it is important to understand that North Carolina fishermen rely upon having diverse fishing opportunities to make their living.

The NCDMF License and Statistics Socioeconomic Program surveys commercial fishermen by region on a cyclical basis. The Albemarle and Pamlico sounds were last surveyed in 2007 (Crosson 2007a), Core Sound in 2007 (Crosson 2007b), Atlantic Ocean in 2009 (Crosson 2009), and the southern part of the state from Bogue Sound to the South Carolina line in 2010 (Crosson 2010). Analysis of the surveys showed that 40% of commercial fishermen surveyed in the Albemarle and Pamlico sounds made more than \$15,000 per year and 59% had annual household incomes greater than \$30,000 (Crosson 2007a). In the Core Sound region, commercial fishing accounted for 70% of the income on average of surveyed fishermen; however, only 53% made more than \$5,000 from commercial fishing (Crosson 2007b). The median household income for those surveyed was approximately \$40,000 (Crosson 2007b). In the southern part of the state, 5% of the commercial fishermen surveyed made \$30,000 or more from commercial fishing; however, less than 20% of these fishermen reported annual household incomes of more than \$50,000 (Crosson 2010). Commercial fishermen operating in the ocean fisheries exhibit different trends as opposed to those who operate in the estuarine fisheries with a higher percentage of surveyed commercial fishermen making more than \$30,000 a year from commercial fishing (Crosson 2009). Commercial fishermen who operate in ocean fisheries also tended to have higher household incomes with more than 50% of the respondents reporting more than \$50,000 a year (Crosson 2009).

Ex-vessel value is a measure of payment a fishermen receives from a fish dealer for landed product and provides an indicator of the value of a fishery. Total landings (all finfish and

shellfish) throughout North Carolina were valued (ex-vessel) at approximately \$70 million in 2011. Estuarine landings accounted for 64% of the total and were valued at \$44 million in 2011. From 1994 to 2011, the mean value of commercial fishing operations in North Carolina estuarine waters was \$58 million per year. Estuarine gill nets were responsible for landings valued at \$5.1 million in 2011 and averaged \$6.1 million per year from 1994 to 2011 (Table 5).

From 1994 to 2011, the total number of commercial fishing trips for all gears averaged 210,000 per year. The average number of annual commercial fishing trips for all gears in estuarine waters was 191,000 between 1994 and 2011. Beginning in 2002, a decreasing trend in the total number of estuarine trips for all gears was noted with 125,000 trips in 2011. By comparison, the average number of trips for all gears from 2002 to 2010 was 153,000 per year.

The number of annual estuarine gill net trips averaged 35,716 from 2001 through 2011. A declining trend in total estuarine commercial fishing trips is also reflected in the number of estuarine gill net trips. Estuarine gill net trips declined from a high of 51,000 in 1997 to 25,431 trips in 2011 (Table 5; Figure 3).

The top ten valued species in 2011 from North Carolina estuarine gill nets were southern flounder, striped mullet, Spanish mackerel, striped bass, spot, bluefish, white perch, American shad, red drum, and sea mullet (Table 5). These species made up 92% of the total ex-vessel value for estuarine gill nets in North Carolina for 2011. Gill net landings are responsible for greater than 50% of the total 2011 North Carolina estuarine landings for all of the top ten species except spot. In addition, for six of the top ten species landed from gill nets in estuarine waters in 2011, gill nets were responsible for more than 80% of the total North Carolina estuarine landings for each species. Gill net fisheries with  $\geq 5$  ISM (e.g., southern flounder, red drum, striped bass, American shad) accounted for almost 48% of the total estuarine gill net value and 55% of the total estuarine gill net number of trips for 2011.

As fishermen spend their earnings in community stores, shipyards, offices, and other businesses, additional economic impacts are generated. An analysis using the IMPLAN software package estimates that each \$1 spent generates approximately \$1.50 in economic impact before leaving the state's borders (IMPLAN version 3.0.5.2 2010). Estuarine gill net landed species contribute to the businesses of primary dealers and processors and are estimated to have an economic impact of \$255 million per year to the state economy (Hadley



and Crosson 2010). These estimates do not include further “downstream” impacts of locally caught seafood that support owners and workers of most secondary dealers and processors, restaurants, shipping companies, refrigeration companies, and a multitude of other businesses.

#### Atlantic Sturgeon Interaction Trends from the Estuarine Gill Net Fishery

A detailed description of Atlantic sturgeon trends in the North Carolina estuarine gill net fishery can be found in Appendices H–L. These appendices include descriptions of the North Carolina Observer Program Interactions (Appendix H), the Albemarle Sound Independent Gill Net Survey (IGNS; Appendix I), the Pamlico Sound IGNS (Appendix J), the Pamlico, Pungo, Neuse rivers IGNS (Appendix K), and the Cape Fear IGNS (Appendix L). These data were also used in the calculations to estimate the number of takes for the estuarine gill net fishery.

#### **Management History**

Initial reviews of the Atlantic sturgeon status began in 1977, when the Research Management Division of NMFS sponsored the preparation of a report on the biology and status of Atlantic sturgeon (Murawski and Pacheco 1977). In 1980 at the request of NMFS, another document was prepared by Hoff (1980) to assist in making future Atlantic sturgeon fisheries decisions and to determine what action was required, if any, to conserve the species under the ESA. In 1988, NMFS requested information regarding the status of Atlantic sturgeon. NMFS added Atlantic sturgeon to its candidate species list published in the Federal Register (FR) in 1997 (62 FR 37560, 14 July 1997, NMFS 1997a). In April 2004, NMFS published a subsequent notice announcing that the NMFS “candidate species list” was being changed to the “Species of Concern (SOC) list” to better reflect the ESA definition of candidate species while maintaining a separate list of species potentially at risk (69 FR 19975 -15 April 2004, NMFS 2004a; ASSRT 2007).

On June 2, 1997, a petition dated May 29, 1997 was received by NMFS from the Biodiversity Legal Foundation. The petitioner requested that NMFS list Atlantic sturgeon, where it continues to exist in the United States, as threatened or endangered and designate critical habitat. The NMFS reviewed the request and determined that the petition presented substantial information indicating that the petitioned action may be warranted and announced the initiation of a status review (62 FR 54018, 12 October 1997, NMFS 1997b; ASSRT 2007).

NMFS and United States Fish and Wildlife Service (USFWS) completed their status review in 1998 and concluded at that time Atlantic sturgeon were not threatened or endangered based on any of the five factors (NMFS and USFWS 1998). Concurrently, the Atlantic States Marine Fisheries Commission (ASMFC) completed Amendment 1 to the 1990 Atlantic Sturgeon FMP that imposed a 20–40 year moratorium on all Atlantic sturgeon fisheries until the Atlantic Coast spawning stocks could be restored to a level where 20 subsequent year-classes of adult females were protected (ASMFC 1998). NMFS followed this action by closing the Exclusive Economic Zone (EEZ) to Atlantic sturgeon harvest in 1999. In 2003, a workshop on the “Status and Management of Atlantic Sturgeon” was held to discuss the current status of Atlantic sturgeon along the Atlantic Coast and determine what obstacles, if any, were impeding the recovery of Atlantic sturgeon (Kahnle et al. 2005; ASSRT 2007).

Based on the information gathered from the 2003 workshop on Atlantic sturgeon, NMFS decided that a second review of Atlantic sturgeon status was needed to determine if listing as threatened or endangered under the ESA was warranted. The 2007 analysis from the Atlantic Sturgeon Status Review Team (ASSRT) determined that at least three (New York Bight, Chesapeake Bay, and Carolina) of the five DPSs should be considered threatened under the ESA, as it was determined that they had a moderately high risk of becoming threatened in the foreseeable future (next 20 years). The ASSRT determined that the remaining two DPSs (Gulf of Maine, South Atlantic) had a moderate risk of becoming extinct, though there were insufficient data to allow for a full assessment of these subpopulations; thus, a listing recommendation was not provided (ASSRT 2007).

On October 6, 2009, NMFS received a petition from the Natural Resources Defense Council to list Atlantic sturgeon throughout its range as endangered under the ESA. As an alternative, the petitioner requested that the species be listed as the five DPSs described in the 2007 Atlantic sturgeon status review (ASSRT 2007), with the GOM and South Atlantic DPSs listed as threatened and the remaining three DPSs listed as endangered. The petitioner also requested that critical habitat be designated for Atlantic sturgeon under the ESA. NMFS published a Notice of 90-Day Finding on January 6, 2010 (75 FR 838, 6 January 2010) stating that the petition presented substantial scientific or commercial information indicating that the petitioned actions may be warranted. NMFS considered the information provided in the status review report, the petition, other new information available since completion of the status review report,

and information submitted in response to the Federal Register announcement of the 90-day finding (75 FR 838, 6 January 2010). On October 6, 2010, NMFS published a proposed rule to list the Carolina DPS of Atlantic sturgeon as endangered under the ESA (75 FR 838, 6 January 2010). On February 6, 2012 NMFS issued a final determination to list the Carolina DPS of Atlantic sturgeon as an endangered species under the ESA (77 FR 5914, 6 February 2012).

Prior to the federal listing, North Carolina had taken steps to protect Atlantic sturgeon. The NCDMF implemented a statewide moratorium on Atlantic sturgeon in 1991 (15A NCAC 03M.0508).

The NCDMF is the branch of the North Carolina Department of Environment and Natural Resources (NCDENR) that carries out fishery management responsibilities. The North Carolina Marine Fisheries Commission (NCMFC), a nine member citizen commission that determines fishery management actions for North Carolina coastal waters is charged to “manage, restore, develop, cultivate, conserve, protect, and regulate the marine and estuarine resources of the State of North Carolina” (G.S. 143B-289.51). The NCMFC can regulate fishing times, areas, fishing gear, seasons, size limits, and quantities of fish harvested and possessed (G.S. 113-182; 143B-289.52). North Carolina General Statute (G.S.) 143B-289.52 allows the NCMFC to delegate the authority to implement its regulations for fisheries “which may be affected by variable conditions” to the director of the NCDMF who may then issue public notices called proclamations. Thus, North Carolina has a very powerful and flexible legal basis governing coastal fisheries management. Adopting effective management strategies for the recovery of Atlantic sturgeon is a priority for the state and necessary actions will be taken to protect these important protected resources.

Implementation of management actions such as gear restrictions, fishing seasons, soak times, area closures, mesh size restrictions, and FMPs for other species have likely had a positive effect on reducing takes and minimizing the mortality associated with the incidental bycatch of Atlantic sturgeon. The North Carolina management system has shown the ability to effectively manage fisheries throughout the state and reduce incidental bycatch of finfish and protected species.

The NCDMF has applied for and received ITPs for the ocean shrimp trawl fishery and the estuarine gill net fishery in the past.

**ITP 1008**, incidental takes of sea turtles in the shrimp trawl fishery in the area off the North Carolina coastal ocean waters from Brown's Inlet to Rich's Inlet, 1996–2000.

**ITP 1325**, incidental takes of sea turtles in the shrimp trawl fishery in the area off the North Carolina coastal ocean waters from Brown's Inlet to Rich's Inlet, 2001–2006.

**Application (file number 1603)**, renewal of permit 1325 was not issued.

**ITP 1259**, implementation of gill net management measures to protect threatened and endangered sea turtles in the southeastern Pamlico Sound (PSGNRA), 2000.

**ITP 1348**, implementation of gill net management measures to protect threatened and endangered sea turtles in the southeastern Pamlico Sound (PSGNRA), 2001.

**ITP 1398**, implementation of gill net management measures to protect threatened and endangered sea turtles in the southeastern Pamlico Sound (PSGNRA), 2002–2004.

**ITP 1528**, incidental takes of sea turtles along the Outer Banks fall flounder fishery, September 1, 2005–December 31, 2010.

**ITP 1528** (extension), incidental takes of sea turtles during the Outer Banks fall flounder fishery 2011.

**Application (file number 16230)**, incidental takes of sea turtles in the North Carolina estuarine gill net fishery, August 11, 2011.

## **Current Events**

The NCDMF is continuously seeking funding to expand the state's existing Observer Program (Appendix H) to cover areas and gears where incidental catches of Atlantic sturgeon occur. Newly identified funds have allowed the NCDMF to provide additional observer coverage for large mesh, small mesh, and floating shad nets in the Albemarle, Croatan, Roanoke, and Currituck sounds and their tributaries. These funds are supporting 11-month, 40-hour per week observer positions in the Albemarle Sound area. Estimates of bycatch and at-net mortality will be calculated from the data collected during observer trips as well as characterization of Atlantic sturgeon if observed. If possible, passive integrated transponders (PIT) and T-Bar tagging of collected individuals can occur as well as collection of fin clips for genetic testing to identify from which DPS the collected fish originated. Tags may be provided by the USFWS to expand their

tagging data set and all fin clips will be mailed to the repository in South Carolina and made available for researchers to assist with the validation of developed DPS and to identify from which DPS collected Atlantic sturgeon originated. *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

North Carolina is collecting these observer data to characterize the bycatch in fisheries that previously had spatially and temporally minimal observer coverage. By expanding observer coverage throughout the state, the NCDMF will provide valuable data to the NMFS about bycatch while allowing the fisheries to operate.

## **Outreach**

Communicating management concerns and actions, including protected species bycatch issues, has always been an integral part of effective and adaptive fisheries management in North Carolina. The implementation of the PSGNRA has necessitated industry involvement, participation, and compliance since 2000. Informing and educating the industry about the ESA, the protection of species listed as either threatened or endangered, and how this applies to the commercial fishing industry has been a major focus of the NCDMF outreach. Outreach efforts include public meetings, workshops, presentations, mail outs of summary information, public involvement (through advisory committees), and direct communications.

As a result of the NCDMF outreach efforts, the North Carolina commercial and recreational fishing industries have become increasingly aware of the requirements of the ESA and the need for protected species conservation measures. The NCDMF will continue its efforts to conduct outreach to the industry concerning protected species bycatch. The NCDMF will benefit from the incorporation of the knowledge of fishermen concerning seasonal, annual, spatial, and temporal variations in activities and distribution and abundance of protected species. Input from individuals who depend upon estuarine resources for a living and who observe the environment on a daily basis is a critical component of the NCDMF efforts to achieving sustainable fisheries resources. Outreach provisions included in this permit application will involve the relay of information between state and federal managers and fishing communities in addition to increasing public awareness of ESA mandates for protection of threatened or endangered species.

In the course of its management and conservation actions taken to address sea turtle bycatch in commercial fishing operations in North Carolina, the NCDMF has continuous outreach to the commercial and recreational fishing industries and is expanding the information to include Atlantic sturgeon. This outreach occurs in print form at least annually as part of the NCDMF management strategy and continuously through various forms including web-based announcements, press releases, public meetings, mail-out flyers, and direct communications.

Over the last ten years, NCDMF has circulated over 30 news releases pertaining to protected species. The news releases are distributed to 1,691 media outlets and individuals including tackle shops and other prominent places that commercial and recreational fishermen have full access. NCDMF informs the public on changes to management measures that affect protected species through proclamations. Proclamations are automatically sent to anyone holding a standard commercial fishing license or a recreational use of commercial gear fishing license via mail and email. Tackle shops, fish dealers, and other individuals are also on the distribution list. In 2008, NCDMF began distributing educational materials to fishermen who obtained a PSGNRA Permit which has averaged approximately 160 fishermen since its inception. The materials include a NMFS guide for sea turtle handling and resuscitation to decrease the chance of mortalities in the fishery. Fishermen are provided with a guide titled “Best Fishing Practices” which goes into detail on how to avoid sea turtle interactions when fishing. Public comment was sought on all materials. For commercial fishermen, NCDMF created a pamphlet describing the proper procedures on what to do if you capture a sea turtle and ways to avoid interactions with sea turtles. These pamphlets are distributed to every individual who obtains any license or permit where commercial gear is used, totaling 11,426 people. With NMFS’s input, NCDMF plans to develop more detailed information for fishermen related to Atlantic sturgeon interactions. NCDMF will use the already established modes of communication to make certain that the commercial and recreational fishing communities have up-to-date information on how to avoid, minimize, and mitigate Atlantic sturgeon interactions. NCDMF also created a webpage for the Observer Program which explains the program and provides information on all protected species that occur in North Carolina Waters.

Outreach continues to be conducted to educate the fishing community and the public on the parameters of the ESA and Marine Mammal Protection Act (MMPA). Additionally, the NCDMF will rely on outreach to solicit ideas and suggestions concerning reducing Atlantic sturgeon bycatch in commercial fishing gear. Communication with the fishing industry is a critical

component in successful management of fisheries and achieving sustainable resources while minimizing bycatch of finfish and protected species (Zollett et al. 2011).

The NCDMF has been proactive and has developed materials that were mailed to fishermen, issued proclamations, and has used other public conduits about the decision by the NMFS to list Atlantic sturgeon as an endangered species. These materials include the effective date of the listing as well as information on what constitutes a take. NCDMF has prepared the 2012 North Carolina Coastal Recreational Fishing Digest and included a section dedicated to providing insight on protected species and how to avoid them in recreational fishing gear. The species include sea turtles, sturgeon, and marine mammals. The article also explains the proper procedures for an unintentional interaction with a protected species. The digest was distributed throughout North Carolina with 164,000 copies in circulation. The NCDMF has stressed the importance to the fishermen on the need to avoid all protected species and the potential impact this listing could have.

## **Conservation Plan**

The objective of the ITP is to provide a multifaceted management framework in the Conservation Plan (CP) with coverage of interconnected fisheries and a flexible, adaptive management approach that accounts for improvements in understanding the causes and level of possible interactions. The ESA mandates that CPs be based on the best scientific and commercial data available and detail the anticipated impact (i.e., amount, extent, type of anticipated taking) of the proposed activity; outline steps that will be taken to monitor, mitigate, and minimize the impacts; describe the funding available to implement such measures; and describe alternative measures considered, including why those alternatives are not being used. Agency rules or policies describe how each of these elements is to be determined. The most difficult aspect is the consideration of cumulative and aggregate effects of multiple fisheries on five multiple DPS of Atlantic sturgeon.

The proposed statewide coverage for estuarine gill net fisheries will allow for better evaluation and control of the impacts of this fishery. Additionally, by including an adaptive management scheme, the CP will allow NCDMF to respond to new information about populations of Atlantic sturgeon, changes in knowledge about Atlantic sturgeon life history characteristics, and enhancements to targeted fishery gear types in a way that protects Atlantic sturgeon, sea

turtles, other candidate species, and a fishing industry that relies on access to North Carolina's coastal waters. Under the CP, valuable information relative to Atlantic sturgeon will be collected and analyzed allowing managers to react to the listing of Atlantic sturgeon under the ESA through sound science. This statewide approach offers the potential to capture the benefits of regional planning, which includes increased flexibility, reduced regulatory burden on the state, allowance for long-term planning, and more coordinated decision making. Most importantly, a statewide approach enables NMFS and NCDMF to consider cumulative impacts on a wide scale, as required by the ESA.

The detailed CP for this ITP application provides mitigation measures that will provide protection for Atlantic sturgeon and other protected species such as sea turtles. NCDMF submitted a Section 10 ITP application for sea turtles on September 6, 2012. For most of the state, the provisions adopted from the Settlement Agreement and various FMPs will concurrently protect Atlantic sturgeon and sea turtles in the same fisheries.

The NCDMF has monitored gill net fisheries in Pamlico Sound since 2000 and has conducted numerous observations outside of this area since 2004. The information gathered from these direct observations allows the NCDMF to generate requested estimated take numbers for observed fisheries and build a functional CP. It is important to recognize that this CP maintains flexibility in design and management adaptations necessary to address potential changing finfish and Atlantic sturgeon populations and distributions, as well as varying fishing practices and data collections while providing for a better understanding of fishery bycatch issues and to more efficiently direct human resources. Currently, NCDMF and NMFS are working on an Implementing Agreement (IA) to help implement and execute the CP in this ITP application (Appendix N)

## **Estimation of Incidental Takes**

### **Data**

#### Commercial Fishery Observer Data

The NCDMF Observer Program is comprised of onboard observations (Program 466) and Alternative Platform (AP) observations (Program 467) and is the primary program by which the NCDMF collects information on bycatch from the state's commercial fisheries (Appendix H). No



Atlantic sturgeon have been observed via AP observations to date, so these data are not included in the analyses here, but will be considered in future analyses.

Data collected from the NCDMF Observer Program were used to develop models for estimating Atlantic sturgeon interactions. This program collects a number of gear and environmental variables, but only variables that were also available from the NCTTP database were considered because the same data from the commercial fishery are required to estimate the total number of interactions. Only trips in which passive gears (i.e., anchored sink gill nets and anchored floating gill nets) which were observed were included in the analyses.

The number of commercial fishery trips observed by the NCDMF Observer Program in management unit A has been limited (Table 6), although the majority of observed Atlantic sturgeon interactions occur in this area (Table 7). In order to supplement information on interactions of Atlantic sturgeon in management unit A for the purposes of model development, data from NCDMF's Striped Bass IGNS (Program 135) were used. While this program uses a variety of mesh sizes, only data collected from those mesh sizes similar to those permitted in the commercial fishery were used in the analysis (small: 3.0 and 3.5 ISM; large: 5.0, 5.5, and 6.0 ISM). Additionally, data collected during times and in areas when and where commercial fisheries are restricted were excluded from the analyses.

#### Commercial Fishery Effort

An estimate of total effort for North Carolina's estuarine gill net fishery was needed to predict the number of interactions for the entire fishery. Total effort was estimated by combining information from three NCDMF monitoring programs: Observer Program (Appendix H), NCTTP, and Commercial Fish House Sampling Program (Program 461).

Data on individual fishing trips are recorded on trip ticket forms used by state-licensed fish dealers to document all transfers of fish sold from the fishermen to the dealer. Information reported on these forms includes transaction date, area fished, gear used, landed species, and total weights of each individual species, as well as fisherman and dealer information. The NCTTP is considered a census of all North Carolina landings and fishing trips.

Commercial catches and effort are directly characterized through the fishery-dependent Commercial Fish House Sampling Program. Commercial fishermen are interviewed and the catch is sampled. Data collected include information on location, effort, and gear characteristics, as well as information used to determine the size and age distribution of species landed.

Information gathered from these three programs was used to characterize North Carolina's estuarine gill net fishery and to determine total effort of gill net (passive gears only) used by year, mesh size, management unit, and season. Data from Program 461 and Program 466 were used to determine the average gill net effort (yards fished and soak time) for both the small ( $< 5.0$  ISM) and large ( $\geq 5.0$  ISM) gill net fisheries. Effort was measured as soak time (days) multiplied by net length (yards). These data were then applied to the census data from the NCTTP to determine trip-level effort for all trips taken.

## **Analyses**

### **Model Development**

A generalized linear model (GLM) framework was used to predict Atlantic sturgeon interactions in North Carolina's estuarine gill net fishery based on data collected during 2004 through 2011. Only those variables available in all data sources could be considered as potential covariates in the model. Available variables included year, mesh size, season, and management unit. Mesh sizes were categorized as large ( $\geq 5.0$  ISM) or small ( $< 5.0$  ISM). Seasons were designated as: winter (December–February); spring (March–May); summer (June–August); and fall (September–November). Throughout this section (estimation of incidental takes), the term “year” is based on the season designation such that a year includes the month of December from the previous calendar year and the months January through November from the current calendar year. Management units are defined elsewhere in the ITP application (A1, A2, A3, B, C, D, and E; Figure 4). Management subunits A1, A2, and A3 were combined into a single management unit, unit A, for modeling purposes. Interactions were modeled independent of Atlantic sturgeon disposition (i.e., live or dead).

The Poisson distribution is commonly used to model species abundance; however, if there are more zeros in the data than expected for a Poisson distribution, models that can account for these excess zeros should be considered. There are two types of models that are commonly

used for count data that contain excess zeros (more than expected for a Poisson or negative binomial distribution). Those models are zero-altered (two-part or hurdle models) and zero-inflated (mixture) models (see Minami et al. 2007 and Zuur et al. 2009 for detailed information regarding the differences of these models). Minami et al. (2007) suggests that zero-inflated models may be more appropriate for catches of rarely encountered species; therefore, zero-inflated models were considered here. A score test was applied to test for the presence of zero-inflation in the data (van den Broek 1995). If the results of the test suggested that the number of zeros in the data was too large for the Poisson to fit the data well, then a zero-inflated Poisson (ZIP) GLM was applied; otherwise, a standard Poisson GLM would be used. Vuong's (1989) test was applied to assess whether the zero-inflated GLM provided a better fit than the standard Poisson GLM. The model chi-square statistic was calculated for the best-fitting model to determine if the overall model is statistically significant. The predictive ability of the best-fitting model was also assessed by counting the number of residuals within  $[-1, 1]$ ; a large number of residuals falling within this range is indicative of a good predictive model for the data (Ngatchou-Wandji and Paris 2011).

The numbers of interactions were modeled by a set of explanatory variables and an offset term for effort. The variables investigated (and available) included year, mesh size, season, and management unit, all of which were treated as categorical variables. All available covariates were included in both parts of the initial model (count part and zero-inflation part). The significance of each covariate was assessed by applying likelihood ratio tests to sub-models in which individual terms were dropped from either the count part or zero-inflation part of the model. Non-significant covariates were removed to find the best-fitting predictive model. The offset term was included in the model (count part only) to account for differences in fishing effort among observations (Crawley 2007; Zuur et al. 2009, 2012). Using effort as an offset term in the model assumes that the number of Atlantic sturgeon interactions is proportional to fishing effort (A. Zuur, Highland Statistics Ltd., pers. comm.). Due to the small sample size and in order to maintain parsimony, no interactions between covariates were considered in the model. Code to compute many of the analyses were adapted from Zuur et al. (2009, 2012).

### **Estimation of Interactions**

Predicted numbers of annual interactions were computed using the best-fitting GLM and assuming effort levels equivalent to those observed in 2004 through 2011. The GLM

coefficients were applied to the corresponding predictor variables in the trip-level effort data to predict annual interaction numbers for each management unit (A subunits pooled) by season and mesh size. If the net size for an individual trip was greater than 2,000 yards, then the net size was fixed at 2,000 yards.

## Results

All trips that occurred in management unit D were removed from all datasets for the analyses because no Atlantic sturgeon were observed in management unit D during 2004 through 2011 (Table 7). A total of 113 Atlantic sturgeon were observed in the NCDMF Observer Program over the time period (Table 7). The NCDMF Striped Bass IGNS observed 193 Atlantic sturgeon during the same period (Table 8).

From 2004 through 2011, there was a combined total of 12,742 trips between the NCDMF Observer Program ( $n = 2,667$ ) and the Striped Bass IGNS ( $n = 10,075$ ; excluding those in management unit D). The number of Atlantic sturgeon observed on any one trip ranged from zero to eight individuals (Figure 5). The majority (98%) of these trips had no interactions with Atlantic sturgeon. The apparent zero-inflation in the data was tested with the score test, which confirmed that the number of zeros in the data is too large for the Poisson distribution to fit the data well ( $S = 836.9$ ,  $p < 0.0001$ ), lending support to the application of a zero-inflated model.

A ZIP GLM that included year, mesh size, season, and management unit as categorical covariates and an offset term for effort was applied to the data (Table 9). Year, mesh size, season, and management unit were found to be significant in the count part of the model while season was found to be significant in the zero-inflation part of the model (Table 10). A total of 12,513 out of 12,742 (98%) residuals were within  $[-1, 1]$ , lending support that the model is a good predictable model for the data (Figure 6). There were no major problems detected in the residuals (Figures 7-11). The overall fit of the final ZIP GLM was statistically significant ( $\chi^2 = 534.6$ ,  $df = 17$ ,  $p < 0.0001$ ). Vuong's (1989) test was applied to compare the ZIP GLM to a standard Poisson GLM fit to the same data. The results indicated that the ZIP GLM provided a better fit to the data (test statistic:  $-3.417$ ,  $p = 0.0003170$ ).

The best-fitting ZIP GLM (Tables 11, 12) for the Atlantic sturgeon data was applied to the effort data from 2004 to 2011 to estimate the total number of annual interactions for North Carolina's

estuarine gill net fishery over time. Predictions could not be made for management unit D because this management unit was excluded from the GLM due to lack of observed interactions during the time period used in the model.

### **Summary of Estimated Takes**

Effort is a key component for estimating interactions in the North Carolina estuarine gill net fishery. To compare how effort levels and other mitigation measures enacted in 2010 affected the level of interactions, annual takes were estimated for 2004 through 2011 based on effort levels from each year. Estimated Atlantic sturgeon interactions from the large mesh gill net fishery ranged from a high of 15,812 in 2008 to a low of 1,066 during 2011 (Table 11).

Interactions in the small mesh gill net fishery ranged from a high of 3,071 during 2008 to a low of 559 during 2004 (Table 12). Interactions decreased 70% for the large mesh and 45% for the small mesh fisheries from 2009 to 2010. This decrease in interactions was in large part due to the reduction in effort coupled with other mitigation measures implemented by the Sea Turtle Settlement Agreement (i.e., soak time, yardage limits).

Take levels were based on 2010 effort given that regulations implemented during 2010 to protect sea turtles will not allow effort to increase above the 2010 levels. Additional yardage limits have also been implemented in the Albemarle Sound area (management subunits A1, A2, and A3) and the rivers entering Pamlico Sound (management unit C), further curtailing the possibility of increased effort in the future. There are three years of data available that have impacts relative to reductions in gill net fisheries due to protected species interactions. Initial regulations were enacted during 2009, but have since become more restrictive. Hurricane Irene impacted the gill net fisheries during 2011 reducing the total number of trips made. The NCDMF believes that 2010 is the most representative year for effort under the current regulation scheme. *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

Requested annual interactions for Atlantic sturgeon were estimated for large mesh (n = 2,186) and small mesh (n = 707) fisheries by management unit, season, and disposition (Tables 11, 12). For management units where interactions could not be estimated (D and E) or management units with seasons where zero interactions were estimated, 34 (n = 17 large mesh and n = 17 small mesh) annual observed takes were requested in addition to the estimated

interactions to allow for incidental catches of this species due to environmental or population effects, even though the likelihood of an interaction is very low. The total requested estimated annual takes for management unit A ( $n = 2,822$ ) and observed takes for management units B-E ( $n = 105$ ) are presented in Table 13 and the total requested estimated and observed takes ( $n = 29,270$ ) for the ten year span of this application are presented in Table 14. The mortality rate of observed Atlantic sturgeon was not significantly correlated with soak time (Pearson  $r = 0.3858$ ,  $p = 0.2155$ ). Therefore, it was deemed appropriate to pool data across management units to compute an overall mortality rate for each mesh size category (large and small). *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

### **Requested Takes Outside the Carolina DPS**

It is the understanding of the NCDMF that when calculating takes NCDMF must not only account for takes from the Carolina DPS but for Atlantic sturgeon that may migrate to and from NC waters from other DPSs. The NCDMF will need further discussion with NMFS to determine the best way to allocate takes by DPS. Lacking that guidance, the NCDMF has estimated the number of interactions that will likely occur throughout the North Carolina estuarine gill net fishery and has also estimated the number of anticipated mortalities. Atlantic sturgeon of migratory size ( $\geq 760$  mm TL: ASSRT 2007) are not as commonly caught in the estuarine fisheries in North Carolina as juveniles. A breakdown of fish collected through NCDMF gill net surveys and the Observer Program identifies what proportion could have originated from outside the Carolina DPS based on the 700 mm TL cutoff described in ASSRT 2007 (Tables 15, 16).

### **Anticipated Impact**

The provisions proposed in this ITP application and the expanded NCDMF Observer Program will provide data that can be used to characterize interaction trends by gear, season, and management unit and allow for implementation of management measures to reduce takes. The resulting data may lead to management measures, changes in fishing practices, and gear modifications that will ultimately conserve more Atlantic sturgeon than the preliminary analysis used for estimating a range of takes in this application. The NCDMF believes, with the concurrence of the Duke Environmental Law and Policy Clinic and the Beasley Center, the gill net restrictions implemented May 15, 2010 and subsequently modified and the implementation of Proclamation M-38-2012 (Appendix D) will be effective in reducing Atlantic sturgeon

interactions with gill net gear. Reports from onboard and AP observations will allow Atlantic sturgeon gill net interactions to be closely monitored and provide for the timely implementation of mitigation measures should estimated observed take levels approach the allowed levels.

*Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

Due to the uncertainty of population estimates for Atlantic sturgeon, it is not possible to know with precision the full impact the gill-net fisheries have on the different distinct population segments. Boreman (1997) found that Atlantic sturgeon can only sustain low levels of bycatch and other anthropogenic mortality. Substantial removals from any DPS could negatively impact Atlantic sturgeon; however, the decrease in fishing effort suggests bycatch of Atlantic sturgeon in the gill-net fisheries is minimally affecting the populations. Effort has decreased over the last three years (40%) and will never achieve levels that have been seen in the past due to fishery regulations which prohibit the amount of gear and soak times allowed in North Carolina's estuarine waters. In addition, management measures in place for the Sea Turtle ITP for North Carolina's estuarine waters will likely reduce fishing effort further.

Capturing Atlantic sturgeon in gill nets can result in injury and mortality (Moser and Ross 1995). Moser and Ross 1995 found mortality to be 24% in the Cape Fear River, NC with them all occurring from June through September. Historically, the majority of sturgeon mortality during capture in gillnets, whether intentional or accidental, has been related to water temperature, low dissolved oxygen concentration, soak time, and mesh size.

Capturing Atlantic sturgeon in gill nets can also be beneficial enabling researchers to tag fish and obtain genetic samples for DPS analysis. It also provides a way to collect recapture data, abundance information and ultimately data that is needed for the ASMFC coast wide stock assessment. The tagging can in turn provide information on growth migration, and habitat use.

This proposed activity will have no impact on the habitat of Atlantic sturgeon.

NCDMF actively works to protect and enhance coastal fish habitat through review of coastal development projects, and habitat conservation planning efforts. NCDMF and the NCMFC are key partners in North Carolina's Coastal Habitat Protection Plan (CHPP). That plan identifies goals and priorities including protections for and improvements of habitats for anadromous fish such as Atlantic sturgeon. North Carolina's CHPP was written and developed to:

1. Document the ecological role and function of aquatic habitats for coastal fisheries.
2. Provide status and trends information on the quality and quantity of coastal fish habitat.
3. Describe and document threats to coastal fish habitat, including threats from both human activities and natural events.
4. Describe the current rules concerning each habitat.
5. Identify management needs.
6. Develop options for management action using the above information.

As part of the Coastal Habitat Protection Plan, NCDMF has participated in identifying goals which are consistent with improvement of Atlantic sturgeon habitat such as:

### Goal 3. Enhance Habitat and Protect it From Physical Impacts

- \* Greatly expand habitat restoration, including:
  - Creation of subtidal oyster reef no-take sanctuaries.
  - Re-establishment of riparian wetlands and stream hydrology.
  - Prepare and implement a comprehensive beach and inlet management plan that addresses ecologically-based guidelines, socio-economic concerns, and fish habitat.
- \* Protect submerged aquatic vegetation, shell bottom, and hard bottom areas from fishing gear effects through improved enforcement, establishment of protective buffers around habitats, and further restriction of mechanical shellfish harvesting.
- \* Protect fish habitat by revising estuarine and public trust shoreline stabilization rules using best available information, considering estuarine erosion rates, and the development and promotion of incentives for use of alternatives to vertical shoreline stabilization measures.
- \* Protect and enhance habitat for anadromous fishes by:
  - Incorporating the water quality and quantity needs of fish in surface water use planning and rule making.
  - Eliminating obstructions to fish movements, such as dams, locks, and road fills.



#### Goal 4. Enhance and Protect Water Quality

- \* Reduce point source pollution discharges by:
  - Increasing inspections of wastewater treatment facilities, collection infrastructure, and disposal sites.
  - Providing incentives for upgrading all types of discharge treatment systems.
  - Developing standards and treatment methods that minimize the threat of endocrine disrupting chemicals on aquatic life.
  
- \* Improve strategies throughout the river basins to reduce non-point pollution and minimize cumulative losses of fish habitat through rule making and/or voluntary actions, assistance, and incentives.

NCDMF will continue to work towards these goals with its Coastal Habitat Protection Plan Partners. Actions that remove obstructions to historical fish passage, improve water quality, and restore riparian wetland habitat will benefit Atlantic sturgeon. In addition, when NOAA identifies critical habitat for Atlantic sturgeon, NCDMF will consider what further measures may be appropriate.

#### **Monitor, Minimize, and Mitigate Impacts**

##### **Monitoring Impacts**

##### NCDMF Observer Program

The first facet of the CP is a comprehensive bycatch monitoring program that will provide information to evaluate, mitigate, and minimize the impacts of the requested takes under the ITP. *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

The NCDMF has collected data from commercial gill net fisheries through an onboard observer program since 2000 (Program 466; Price 2007b, 2009b, 2010a; Appendix H). This program has allowed for the collection of data that are used for fishery management and monitoring protected species bycatch issues, the latter initially focused primarily on the PSGNRA. The Observer

Program was expanded statewide in 2010. The traditional Observer Program (Program 466; onboard fishing vessels) is complemented by an AP program (Program 467; alternative platform observations) where gill netting operations are monitored at close proximity from state-owned vessels. NCDMF has not used volunteer observers to date for several reasons. There has been a lack of expressed interest on the part of the public and logistics are difficult when observers must contact fishermen in the evening to arrange trips for the next day and predawn rendezvous for trips with fishermen at docks or boat ramps. Additionally, NCDMF is concerned about possible liability issues, limited availability of NCDMF required safety equipment (US Coast Guard approved cold weather survival gear, personal emergency position-indicating radio beacon), and limited staff to train and supervise volunteers.

The infrastructure (i.e., database, personnel, equipment) necessary to implement the AP program has been achieved and NCDMF observations incorporate AP trips. The NCDMF AP program utilizes vessels that may vary in model and range in size from approximately 19' to 25'. Vessels suitable for use in the AP program are located at each field office for use by observer program personnel. All boats are equipped and maintained in accordance with US Coast Guard safety regulations and NCDMF safety policies.

Program 467 was added to the NCDMF Biological Database to house AP data and the program is structured with flexibility to incorporate multiple fishery operations (e.g., gill net, haul seine, pound net, trawl, and channel net fisheries). The AP program requires two observers in a separate state-owned vessel to monitor commercial fishermen hauling their gill nets. The AP observer's document protected species interactions and also provide catch and discard estimates for information for other species that are observed. The data collected through the AP program is modeled after data collected in the NMFS AP study conducted in the Core Sound gill net fishery during 2009. The NCDMF received copies of the NMFS AP field forms and data sheets and staff incorporated elements of the forms in the NCDMF program to ensure transferability from state to state and state to federal programs. The data logs for the AP program differ slightly from the traditional observer program due to a reduction of the quantity of catch and bycatch species data collected in the AP program.

Marine Patrol officers are stationed within three coastal districts or in the vicinity of the NCDMF offices in Elizabeth City, Manteo, Washington, Morehead City, and Wilmington. Weekly responsibilities for Marine Patrol officers include fish house inspections, aerial surveys, on-the-

water fishing gear and license checks, fishermen interviews, enforcement of regulations, and monitoring fishing activities. The tasking of Marine Patrol officers with gill net observer responsibilities is now an integral part of both the NCDMF observer and enforcement programs. However, as more observers are trained and onboard and AP trips obtained, the NCDMF would like to reduce the amount of Marine Patrol observations to allow them to focus on their enforcement responsibilities while still maintaining required coverage.

The Marine Patrol observer data are similar to that of the AP program. The primary goal of the Marine Patrol observer program is to provide additional fisheries coverage and to collect protected species interaction data. Marine Patrol officers are debriefed only if they witness a protected species interaction. The Atlantic Sturgeon Incidental Capture Report, which will be utilized by all observer and fishery-independent programs, is the form used to debrief Marine Patrol officers (Appendix M).

The NCDMF staff created field data forms for Marine Patrol officers to use for observed trips; these forms are in the AP data format. The forms are specific to gill net observations and include location, effort, activity, violations, and protected species information. The Marine Patrol observer trip data is identical to other NCDMF observer staff data collections, uploaded into the NCDMF biological database, and used to improve fisheries observations by management unit and season and to provide prompt responses to protected species interactions.

Observers have been trained by NCDMF staff on all data collection protocols. Observers are trained to handle, transport, identify, resuscitate, tag, take genetic samples, and release Atlantic sturgeon by NCDMF staff. Marine Patrol officers are trained by staff on all data collection protocols and were provided field and final data sheets for weekly observations. As other biological staff and Marine Patrol officers are hired, similar training will take place.

Data collections from observer trips include date, location, unit, time, season, gill net configuration (net length, number of net shots, mesh size, presence/absence of tie downs, vertical mesh height, hang ratio), soak time, and water depth. Additionally, environmental data (wind, tide stage and water quality) are collected when feasible. Total catches of target species are estimated and final disposition (kept or discarded) is recorded. Atlantic sturgeon interaction information includes species, condition, tag numbers, and final disposition and are photo documented when possible. Gill net interactions involving other protected species are also

documented. All observers are required to adhere to these data collection parameters. The observer coordinator debriefs the observers by phone daily and they submit weekly reports. The weekly reports include the following information: the fisherman's name, area fished, all protected species interactions, quantity and species of fish caught, fishing effort in the area, and other vessels in the area, as well as any other information which will assist in the determination of ongoing observer effort required at that location.

Observer data are coded into the NCDMF Biological Database Program 466 and Program 467 and observers are debriefed by supervisory staff via telephone, email, and/or in person daily. Summary reports are provided monthly to the NMFS-Office of Protected Resources (NMFS-OPR) and the NMFS –SERO with estimates of total Atlantic sturgeon takes by management unit, season, and disposition (alive or dead). Atlantic sturgeon take estimates will be cumulative in each management unit and season by species and disposition. Should Atlantic sturgeon interactions approach permitted levels during the period covered by this permit, NCDMF will issue a proclamation closing any remaining portion of the season for the responsible gear in the management unit(s) where the interactions are observed.

Both programs (onboard and AP) are critical for NCDMF monitoring and management of gill net fisheries, conservation of protected species, and for providing outreach opportunity to the fishing industry.

In order to accomplish the CP objectives, the NCDMF will divide the waters of North Carolina into five primary management units (Figure 4) based on the types and levels of fishing, Atlantic sturgeon activity, and NCDMF's ability to monitor fishing effort in primary fisheries within each management unit. Equally important, each management unit, coupled with a season, represents the framework upon which the permitted allowable takes will be allocated and managed. Each of the units will be monitored seasonally and by fishery with weighted coverage derived from estimated Atlantic sturgeon takes. Due to the availability of data for management units developed by NCDMF for use in an ITP application for sea turtles, similar management unit designation will be used for Atlantic sturgeon. As more data become available, these management units and subunits are likely to change in scope to better address variable distribution of Atlantic sturgeon interactions while allowing fisheries to continue. Management unit A is able to be subdivided into three subunits at this time because of the quantifiable evidence of differences in Atlantic sturgeon distribution and fishing effort within management

unit A. Early acknowledgment of these areas allows for better public understanding that proactive management actions may be taken at a finer scale in this unit. Similar subunits may arise in other management units, but additional data is needed to clearly define. *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

**Management Unit A** is divided into three subunits—A-1, A-2, and A-3—to allow NCDMF to effectively address subunits where proactive management actions may be taken at a finer scale.

**Management Subunit A-1** will encompass Albemarle Sound as well as contributing river systems in the unit not crossing a line  $36^{\circ} 4.30'N$  -  $75^{\circ} 47.64'W$  east to a point  $36^{\circ} 2.50'N$  -  $75^{\circ} 44.27'W$  in Currituck Sound or  $35^{\circ} 57.22'N$  -  $75^{\circ} 48.26'W$  east to a point  $35^{\circ} 56.11'N$  -  $75^{\circ} 43.60'W$  in Croatan Sound and  $36^{\circ} 58.36'N$  -  $75^{\circ} 40.07'W$  west to a point  $35^{\circ} 56.11'N$  -  $75^{\circ} 43.60'W$  in Roanoke Sound.

**Management Subunit A-2** will encompass Currituck Sound north of a line beginning at  $36^{\circ} 4.30'N$  -  $75^{\circ} 47.64'$  east to a point at  $36^{\circ} 2.50'N$  -  $75^{\circ} 44.27'W$  as well as the contributing river systems in this unit.

**Management Subunit A-3** will encompass Croatan Sound waters south from a point at  $35^{\circ} 57.22'N$  -  $75^{\circ} 48.26'W$  east to a point  $35^{\circ} 56.11'N$  -  $75^{\circ} 43.60'W$  and Roanoke Sound waters south from a point  $36^{\circ} 58.36'N$  -  $75^{\circ} 40.07'W$  west to a point  $35^{\circ} 56.11'N$  -  $75^{\circ} 43.60'W$  south to  $35^{\circ} 46.30'N$ .

**Management Unit B** will encompass all estuarine waters South of  $35^{\circ} 46.30'N$ , east of  $76^{\circ} 30.00'W$  and north of  $34^{\circ} 48.27'N$ . This management unit will include all of Pamlico Sound and the northern portion of Core Sound.

**Management Unit C** will include the Pamlico, Pungo, Bay, and Neuse river drainages west of  $76^{\circ} 30.00'W$ .

**Management Unit D** will encompass all estuarine waters south of  $34^{\circ} 48.27'N$  and west of a line running from  $34^{\circ} 40.70'N$  –  $76^{\circ} 22.50'W$  to  $34^{\circ} 42.48'N$  –  $76^{\circ} 36.70'W$  to the Hwy 58 bridge. Management unit D includes southern Core Sound, Back and Bogue sounds, and North, and Newport rivers.

**Management Unit E** will encompass all estuarine waters south and west of the Hwy 58 Bridge to the North Carolina/South Carolina state line. This includes the Atlantic Intracoastal Waterway (ICW) and adjacent sounds, and the White Oak, New, Cape Fear, Lockwood Folly, and Shallotte rivers.

The Observer Program will maintain weekly gill net fishery coverage (7–10%  $\geq 5.0$  ISM; 1–2%  $< 5.0$  ISM) statewide while gill net-fishing efforts are occurring. Weekly observer coverage will be determined based upon fisheries effort data (i.e., trips), Atlantic sturgeon abundance, open management units, and in management units where protected species have been reported. With coverage based upon fisheries efforts, observer coverage will be relative to the fisheries efforts for that management unit, unless protected species reports indicate that an increase in coverage is needed within a management unit. Reports of increased numbers of protected species in an area will allow the NCDMF to increase observer coverage in areas where high concentrations of protected species populations may potentially interact with fishing gear during specific seasons or other times during the year. The observer program does not have allocated sea days associated with management units. *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

The following is the methodology used to place observers for alternative platform, Marine Patrol, and traditional on-board:

Traditional, on-board trips are the preferred method of obtaining observer data and are used most frequently. Each observer attempts three to four trips per working week. Observers are assigned a management unit to work weekly and the amount of observers assigned to a management unit depends upon the season and fishing effort. On-board observer trips are random and stratified by management unit and season. Fishermen holding a Standard Commercial Fishing License (SCFL) and landing fish in North Carolina using gill nets in the previous years are pooled by management unit. The contact information is then given to the observer assigned to that area and the observer contacts the fishermen randomly from the list of names given and sets up trips. Real time trip ticket information and contacting fisherman selling catch at fish houses help keep the list of fisherman as current as possible. Alternative platform trips are utilized for areas that may be hard to get on-board trips (i.e., fishermen in remote locations that leave from their residence by boat). Alternative platform trips are also utilized in areas where fishing effort may increase quickly or Atlantic sturgeon abundance is high. Alternative platform trips are random and stratified by management unit and season.

Marine Patrol also conducts alternative platform trips weekly in all management units. Coordination of on-board, alternative platform, and Marine Patrol trips is done daily, monthly, and yearly to avoid sampling bias.

Since May 17, 2010 NCDMF staff conducted observations in large mesh gill net fisheries in five units. Management units have been observed on a seasonal basis. “Seasons” are defined as: (1) Winter (Dec–Feb); (2) Spring (Mar–May); (3) Summer (June–Aug); and (4) Fall (Sep–Nov). Observations in the past have been concentrated in areas and during times of known or suspected sea turtle concentrations and anticipated trips have been based on prior year’s gill net effort by unit and season. NCTTP data are used to estimate the number of large mesh gill net trips by unit and season when weighting coverage. In addition, NCDMF observations from onboard gill net observations will be used to direct coverage to known areas of increased Atlantic sturgeon interactions. This will not only allow for Atlantic sturgeon distributions and interaction concerns to be more comprehensively characterized, but will also assist in shaping future conservation efforts.

### Management Measures

Under the requested ITP, the NCDMF will proactively implement management measures for responsible fisheries in accordance with the CP within season and management unit or subunit. The bycatch monitoring program will evaluate the functionality of management measures and allow timely adaptations of management restrictions to address Atlantic sturgeon and other protected species conservation issues. If estimated takes approach allowable thresholds in a management unit, the NCDMF will respond by issuing a proclamation closing the season for the responsible fishery gear within the applicable management unit. Proclamations involving restrictions must be issued a minimum of 48 hours prior to the effective date and time. The bycatch estimates for each disposition represents the maximum threshold of allowable takes for the given disposition. If the maximum allowed threshold is approached for any disposition the management unit will close for the remainder of the season; therefore, the maximum allowable threshold will not be approached for every disposition in every management unit for every season each year. It would be impossible to foresee which management unit and disposition would approach their maximum allowed threshold first from year-to-year. *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

Data from observed trips will serve as the primary source of information that will be used to identify the responsible gear should authorized take levels be approached. However, information from other NCDMF biological sampling programs and Marine Patrol observations of gear will be used when available. Management flexibility through the CP will allow necessary mitigation measures to be implemented and monitored in each management unit or subunit. Implementation of effective proactive management measures will ensure the continued protection of threatened and endangered species and allow vital North Carolina gill net fisheries to be executed at controlled levels.

## **Monitoring**

### Adaptive Observations

Outreach, extensive monitoring, and identification of areas of concern will allow the NCDMF Observer Program to efficiently direct resources on a seasonal and area basis. Variations in finfish distribution and abundance, changes in commercial fishing behavior, and variable protected species distribution and migration will direct monitoring efforts in gill net fisheries. Since these factors do not remain static, it will be paramount for the NCDMF Observer Program to be adaptable and flexible to respond to changing conditions in fisheries and distributions of protected species. Adaptive responses and flexibility in this program are necessary for increased understanding of protected species behavior patterns and to have the ability to respond to the changes associated with protected species conservation. The NCDMF Marine Patrol is responsible for enforcing fisheries rules and NCDMF proclamations. Enforcement of management measures will be a key component of the CP. *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

## **Minimize Impacts**

### Fishery Reduction

North Carolina estuarine gill net fisheries have been altered by the recent Sea Turtle Settlement Agreement entered into between the Beasley Center and the NCDMF (Appendices F–G). Restrictions on gill nets with mesh sizes  $\geq 4.0$  ISM were implemented in internal coastal waters by NCDMF Proclamation M-8-2010 effective May 15, 2010 (Appendix G; Tables 1, 2). These restrictions limit soak times for unattended gill nets  $\geq 4.0$  ISM from one hour before sunset to



one hour after sunrise to remove unattended gill nets from the water when sea turtles are thought to be more active. Large mesh gill nets are not allowed at any other time except for areas exempt from the Settlement Agreement. At a minimum, this regulation reduces the chance for Atlantic sturgeon and sea turtles to interact with an unattended gill net. *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

The Sea Turtle Lawsuit Settlement Agreement reduced the maximum yardage limit for gill nets  $\geq 4.0$  ISM to 2,000 yards per fishing operation from Croatan and Roanoke sounds at the Highway 64/264 bridges to Bogue Sound at the Highway 58 Bridge (management units A, B and D1); the maximum yardage limit from the line dividing management units D1 and D2 to the South Carolina state line (management units D2 and E) is 1,000 yards per fishing operation (Figure 12). Net shot lengths are restricted to a maximum of 100 yards with a 25-yard separation required between each net shot. This management measure could reduce interactions with Atlantic sturgeon by reducing the amount of gill net set in any given area. Large mesh gill nets cannot exceed 15 meshes in depth and tie-downs are prohibited. Floats or corks are not allowed along the floatline of nets north of the North Carolina Highway 58 Bridge.

With an additional year of observer documentations, the Pamlico, Pungo, Bay, and Neuse rivers (management unit C) were exempted from provisions of the Sea Turtle Lawsuit Settlement Agreement by Proclamation M-27-2011 on September 12, 2011 due to very few documented sea turtle interactions (Appendix B; Figure 12). Albemarle Sound and its tributaries as well as Croatan and Roanoke sounds north of the Highway 64/264 bridges (management unit A) were also exempt from the provisions of the Sea Turtle Lawsuit Settlement Agreement due to no documented sea turtle interactions (Figure 12). Additionally, the NCDMF Observer Program was expanded to achieve a minimum of seven percent observer coverage with a goal of ten percent of large mesh gill net trips as required by the Settlement Agreement, with the exception of exempted areas. In May 2012, the NCMFC voted to decrease the maximum yardage limit from 2,000 to 1,000 yards per fishing operation in management unit D2 (Appendix B). By responding to increased observed turtle interactions in management units A and B, the NCDMF demonstrated its commitment and ability to abide by the terms and conditions of its current ITP application and Settlement Agreement by implementing a closure of the PSGNRA effective September 26, 2012 (proclamation M-42-2012) and re-implementation of the restrictions of the Settlement Agreement in management unit A (proclamation M 47- 2012) effective October 1,

2012. These closures and restrictions, at the height of the flounder season, created considerable public outcry and undoubtedly created a hardship for North Carolina's fishing families. The PSGNRA was reopened October 15, 2012 (proclamation M 51-2012) and the restrictions for daytime fishing in management unit A were reduced on November 7, 2012 (proclamation m 53-2012).

After the implementation of Proclamation M-8-2010 large mesh gill net effort decreased considerably based on gill net effort comparisons from 2009 (pre-settlement agreement) through 2011 (post-settlement agreement). Data from the NCDMF Trip Ticket Program, fish house sampling, and Observer Program were used to estimate commercial gill net fleet effort. The large mesh gill net restrictions led to a large reduction in large mesh trips from 2009 to 2010 ( $n = 5,155$ ) and continued to decrease from 2010 to 2011 ( $n = 4,325$ ) for an overall effort reduction of 41% (Tables 3, 4). Similar trends occurred in the amount of gill net (yd) being fished with a 38% reduction of large mesh gill nets from 2009 to 2010 and 30% from 2010 to 2011 creating a total reduction of 57% over the three-year period (Table 4).

Additional restrictions on yardage were implemented effective September 3, 2012 in the Albemarle Sound area (management unit A) and the Pamlico, Bay, and Neuse rivers (management unit C) by Proclamation M-37-2012, which restricted yardage to 2,000 yards maximum and make it unlawful to fail to be present at the nets at least once during a 24-hour period no later than noon each day (Appendix C). NCDMF has other restrictions that also reduce the likelihood of interactions with protected species (Appendix E).

For the ten-year life of the requested Atlantic sturgeon ITP, the NCDMF will issue proclamations implementing additional restrictions if necessary to provide increased protection of Atlantic sturgeon and other ESA listed species or liberalizing gill net or area restrictions if supported by NCDMF or NMFS biological data. Restrictions may include additional measures to reduce fishing effort, reduced yardage, seasonal/area closures, attendance requirements, or other gear limitations or modifications.

## **Mitigate Impacts**

### Mitigation Measures

Mitigation measures in the CP and continued monitoring of the fishery will provide managers with the tools necessary to modify fisheries practices in a timely fashion. North Carolina Marine Fisheries Commission Rule 15A NCAC 03I .0107(b) Endangered or Threatened Species states, in part, “The Fisheries Director may close or restrict by proclamation any coastal waters with respect to taking or attempting to take any or all kinds of marine resources when the method (equipment) used is a serious threat to an endangered or threatened species listed pursuant to 16 USC 1533(c)”. Such actions may include time/area closures, attendance requirements, gear restrictions, and increased monitoring efforts. However, if information collected by the NCDMF Observer Program indicates that no interactions have been observed or estimated takes are well below authorized levels, relaxation of restrictions during some seasons or in some areas may be in order. The CP and subsequent monitoring will provide management flexibility and protection of ESA listed species and the most efficient use of management resources.

***Information was requested by NMFS after the last revision of the application and is provided in Appendix N.***

Mitigation measures will be implemented by the NCDMF to minimize and reduce Atlantic sturgeon and other protected species interactions in gill-net fisheries. These measures may include extensive outreach, timely response to hotspots, an adaptive observer program, and implementation of further restrictions through Fisheries Rules or NCDMF proclamations. These measures will potentially minimize Atlantic sturgeon interactions, reduce Atlantic sturgeon mortality, and offer protection to other threatened and/or endangered species.

For the ten year life of the requested ITP, the NCDMF will issue proclamations implementing additional restrictions if necessary to provide increased protection of Atlantic sturgeon and other ESA listed species or liberalizing gill net or area restrictions if supported by NCDMF or NMFS biological data. Restrictions may include additional measures to reduce fishing effort, reduced yardage, attendance requirements, or other gear limitations. ***Information was requested by NMFS after the last revision of the application and is provided in Appendix N.***

Outreach, extensive monitoring, and identification of areas of concern will allow the NCDMF Observer Program to efficiently direct resources on a seasonal and area basis. Variations in finfish distribution and abundance, changes in commercial fishing behavior, and variable protected species distribution and migration will direct monitoring efforts in gill net fisheries. Since these factors do not remain static, it will be paramount for the NCDMF Observer Program to be adaptable and flexible to respond to changing conditions in fisheries and distributions of

protected species. Adaptive responses and flexibility in this program are necessary for increased understanding of protected species behavior patterns and to have the ability to respond to the changes associated with protected species conservation. Live Atlantic sturgeon encountered during fishing observations may be tagged by a trained observer. If possible, PIT and T-bar tagging of collected individuals will occur, as well as collection of fin clips for genetic testing. This will help to distinguish DPS of the collected specimen. Tags will be provided by USFWS to expand their tagging dataset and all the fin clips will be sent to the repository in South Carolina and could be made available for researchers to assist with the validation of DPS units. *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

## **Management Measures**

### Hotspots

A key component of an adaptive management program is the identification of areas of high potential for bycatch of protected species in fisheries through observed interactions of Atlantic sturgeon by the NCDMF observers, biological staff, Marine Patrol in addition to reports from commercial and recreational fishermen and the general public. These areas will be referred to as hotspots and will provide managers the opportunity to address bycatch concerns through timely implementation of conservation measures such as increased observer and Marine Patrol coverage, additional gear restrictions, and temporary and/or seasonal closures. For this permit's duration, a hotspot will be defined as any area, determined by geographically enforceable boundaries, where Atlantic sturgeon observations are unusually high within a management unit or subunit, such that the director determines that closure and evaluation is necessary to (1) avoid violation of a take limit, or (2) provide adequate protection or the Atlantic sturgeon, or (3) to allow Atlantic sturgeon to complete a seasonal migration and minimize interactions. Temporary hotspot closures may be implemented while confirmatory data is gathered, or to allow real time data to be analyzed. Hotspot areas will be identified and handled proactively and reactively. For any given management unit or subunit during a season that shows high Atlantic sturgeon abundance, NCDMF may close the management unit or subunit for the duration of the defined season. If an area is closed as a hotspot multiple times throughout the year or over a two-year period, NCDMF will take proactive measures to close the area for longer than a defined season. If a particular area within a management unit or subunit can be defined within the unit as the hotspot that area can be defined geographically and closed

within the unit temporarily or permanently. *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

Currently for sea turtles proactive measures have been implemented for areas where NCDMF has data showing increased abundance over long periods of time such as management unit D1. From 2010 through 2011, 44% of all observed sea turtle interactions (n = 85) occurred in management unit D1 and was therefore designated a hotspot by NCDMF. The management unit was closed several times due to increases in observed sea turtles. This determination was presented to the NCMFC which then closed management unit D1 to large mesh gill nets from May 8 through October 14 annually to reduce the number of sea turtle interactions occurring in North Carolina waters. In the PSGNRA, identification of hotspots helped characterize bycatch and facilitated the implementation of effective conservation measures (e.g., delineation of restricted areas, prohibited areas, direction of resources) necessary to minimize sea turtle takes and reduce mortality. Atlantic sturgeon hotspots will be similarly managed as trends emerge.

In order to proactively manage for hotspots certain steps can be taken for the adaptive management strategy which NCDMF utilizes:

- Observer data will be examined daily/weekly to determine the amount of interactions occurring in a given management unit or subunit.
- Observer coverage will be increased immediately in areas of concern.
- Interaction data will be compared to allowable takes and if the threshold of allowable takes is being approached the management unit will close for the remainder of the season.
- Once the management unit re-opens the following season NCDMF will continue increased levels of observer coverage to ensure interactions are minimal.
- If the management unit or subunit closes for multiple seasons throughout a year or closes for similar seasons over a two-year period it will be considered a hotspot and will be closed temporarily.
- If a management unit or subunit is determined to be a hotspot and closed temporarily, NCDMF will examine the interaction data and available fishery-independent gill-net survey data from the management unit to determine if the entire management unit shows high interaction levels or if certain areas within the management unit or subunit are the areas of concern.

- For management units or subunits that are entirely defined as a hotspot, NCDMF will close the management unit seasonally or annually according to the interaction data.
- For management units or subunits that have certain areas that are defined as a hotspot, NCDMF will close the area within the management unit or subunit seasonally or annually according to the interaction data.

### Seasonal and Area Closures

A seasonal closure is a management measure designed to limit effort and to reduce protected species interactions. The Sea Turtle Lawsuit Settlement Agreement included a partial season closure limiting fishing with unattended gill nets  $\geq 4.0$  inches stretched mesh to 4 days per week from Croatan and Roanoke sounds at the Highway 64/264 bridges to the mouth of Taylor's Creek in Beaufort and 5 days per week from Beaufort to the South Carolina state line. Unattended gill nets  $\geq 4.0$  ISM can be fished 7 days per week in areas exempted by the Settlement Agreement. If estimated takes are approached for any species and disposition (alive/dead) in a management unit for any given season, the management unit will be closed for the duration of the season (eg., for the summer—June through August—in management unit B, if the estimated allowable takes for alive Atlantic sturgeon is approached, then management unit B will close to all large mesh gill nets for the remainder of the summer season and not reopen until the fall—September through November). Adaptive seasonal and area closures will allow NCDMF to reduce interactions in areas with high Atlantic sturgeon abundance for a partial season and prevent approaching allowable takes for the entire management unit and season.

Area closures are a way to address hotspots or locations with high incidences of protected species interactions as compared with other locations confirmed by observations or fishery-independent surveys. Gill nets  $> 4.25$  inches stretch mesh are prohibited in the deep water portions of Pamlico Sound and areas around Oregon, Hatteras, and Ocracoke inlets from September 1 through December 15 to minimize sea turtle interactions. The shallow water portions of Pamlico Sound are open during this time as a result of a Section 10(a)(1)(B) ITP for the PSGNRA; these waters would also be closed without the ITP. Management unit D1 is annually closed from May 8 through October 14 to unattended large mesh gill nets  $\geq 4.0$  inches due to high sea turtle interactions (Figure 12). Gill nets are prohibited in all inland designated waters managed by the NC Wildlife Resources Commission. Gill nets in western Albemarle Sound are prohibited from February 1 to mid-November in the area southwest of a line from

Black Walnut Point 35° 59.3833'N -76° 41.0060'W; running 138° (M) to a point 35° 56.3333'N -76° 36.0333'W at the mouth of Mackey's Creek, including Roanoke, Cashie, Middle, and Eastmost rivers. The purpose of this rule is to protect striped bass during their migrations into the Roanoke River.

Other hotspots for Atlantic sturgeon may exist in estuarine waters, but additional observer coverage is needed to document them. Identifying these hotspots and managing them proactively provides the best chance to minimize interactions and to avoid early season closures in the management units where these hotspots occur. *Information was requested by NMFS after the last revision of the application and is provided in Appendix N.*

Area closures tend to result in fishermen shifting their fishing effort to open areas if it is feasible. If the effort shifts to an area where Atlantic sturgeon are not commonly found, then the area closure will reduce interactions with protected species. Shifting fishing effort in other areas could lead to increased protected species interactions, which could result in more area and season closures. If any shift in effort occurs, the NCDMF Observer Program will also shift effort to continue required levels of coverage for the fishery.

These management measures can be implemented individually or in conjunction with one another and can be applied statewide or to specific areas. A combination of management measures may be an effective way to minimize Atlantic sturgeon interactions. The potential management options provide the necessary flexibility to implement management measures that are most effective in terms of minimizing protected species interactions and still providing fishing opportunities for the commercial estuarine gill net fishery for a particular area.

## **Funding Opportunities**

North Carolina's Observer Program is largely funded through state appropriations. The program has also received federal funds from NOAA in recent years through the Atlantic Coastal Cooperative Statistics Program (ACCSP), the National Fish and Wildlife Foundation, and the Species Recovery Grant Program (Section 6). These funds have supported seasonal observers (April to November) to provide coast-wide coverage during peaks in fishing activities.

Grant awards under the ACCSP have ended and the sub-recipient grant award under Section 6 was terminated due to severe cuts to the program funding (NOAA Award NA10NMF4720035 to the South Carolina Department of Natural Resources, “Cooperative multi-state management of the Northern Recovery Unit of the loggerhead sea turtle”). The Species Recovery Grant Program seems ideal for identifying and quantifying fishing activity threats and impacts to ESA-listed species in which to base future management actions to conserve the species. However, according to the ESA, once a Section 7 or 10 permit is issued requiring mandatory observer coverage in which to quantify these threats and impacts, Section 6 funds can no longer be used.

Currently, NCDMF employs 10 to 17 observers statewide to cover all estuarine waters and will continue to fund the positions. If funding becomes unavailable to comply with the ITP, then NCDMF will close management units or portions thereof where observer coverage cannot be obtained. If this continues, NCDMF will close the estuarine gill net fisheries to comply with the ITP.

The CP adaptive approach recognizes the need to allow fishing to continue if adequate safeguards for protected resources exist, balanced by the legitimate interests of state fisheries, which are an important part of the economy, history, and culture of eastern North Carolina. In conjunction with a reliable level of observer coverage, this will allow NCDMF to target specific problem fisheries by adding further gear or effort restrictions or by closing certain areas to fishing altogether. On the other hand, where conditions and observation indicate that interactions are not likely, the fishing restrictions can be relaxed and this adaptive approach will result in more efficient assignment of resources and a high level of protection for protected resources.

## **Alternatives Considered**

### **Alternative 1. No-Action Alternative**

Implications of no action to the State of North Carolina:

If NCDMF did not apply for a permit, it believes that it would be immune to suit pursuant to its sovereign immunity. By applying for this permit, the state does not waive and explicitly preserves that immunity. However, if NCDMF does not apply for a permit, it would be more difficult to gather important data about Atlantic sturgeon from the fishermen who actively fish



North Carolina waters. These data will, in turn, be used to develop management measures for the enhancement of the Atlantic sturgeon, as well as for the balanced development of the fisheries as a whole.

If NCDMF did not apply for a permit, the fishermen conducting fishing operations and having interactions with Atlantic sturgeon could be subject to suit under the ESA. Those fishermen could be sued under civil and criminal provisions by the federal agencies charged with administering the ESA or by individuals under the civil provisions allowing citizen suit actions under the ESA. This would impose a litigation risk on the fishermen, already struggling in a time of economic downturn. Fishermen have the option to apply individually for an incidental take permit. NCDMF sees that process as one imposing huge burdens on fishermen. Fishermen do not have the staff to do data collection and analysis and can only do management on an ad hoc basis. This piecemeal approach to management would not offer the same level of protection to the Atlantic sturgeon that could be achieved through comprehensive management by NCDMF.

For these reasons, NCDMF believes that permit application is in the best interests of the state and rejects the no action alternative.

## **Alternative 2. No Application**

Alternative 2 is to not apply for an ITP and to close state waters to all commercial gill net gear except those that do not have incidental takes. This action might provide the greatest protection for Atlantic sturgeon but would not allow for collection of long-term comprehensive data that might assist in the eventual recovery of the species. A full closure of gill net fisheries in North Carolina would have a severe and unprecedented economic impact on participating fishermen, as well as on the local and regional economy. Closing these waters would be directly contradictory to the NCDMF's mission of: "Ensuring sustaining marine and estuarine fisheries and habitats for the benefit of the people of North Carolina."

Closure of the gill net fisheries would also shift demand to other fisheries to provide food for the markets currently served by North Carolina fishermen. This increased demand could drive prices up quickly, placing seafood out of reach economically for many consumers. In addition, this would push North Carolina consumers away from their fresh, locally caught sources of

seafood and towards imported seafood with associated pressures on costly refrigerated transportation and fuel consumption.

Recovery of Atlantic sturgeon could be hampered through the closure of commercial fisheries due to loss of available data. Much of what is known about Atlantic sturgeon and their biology has come from samples collected through commercial gears. Many commercial fishermen provide tag return data to the U.S. Fish and Wildlife Service and observers have the potential to collect genetic samples to assist in verifying the DPSs and Atlantic sturgeon movements. The loss of these fisheries could result in limited data sets that would no longer provide information to the NMFS or states for use to effectively monitor the populations of Atlantic sturgeon.

Because a gill net fishery closure would not guarantee recovery of the species, would deprive North Carolina of information that it can use to manage the species, and because of the tremendous economic, social, and historic importance of the fisheries, NCDMF has rejected the option to close the gill net fisheries (Alternative 2).

### **Alternative 3. Large Mesh Reduction**

Large mesh gill net effort could be reduced further throughout the state by reducing yardage, limiting soak time, and requiring attendance—potentially reducing Atlantic sturgeon interactions. After the implementation of Proclamation M-8-2010, gill net effort decreased considerably based on gill net effort comparisons from 2009 (pre-settlement agreement) through 2011 (post-settlement agreement). The large mesh gill net restrictions led to a large reduction in large mesh trips from 2009 through 2010 ( $n = 5,155$  fewer trips) and continued to decrease from 2010 through 2011 ( $n = 4,325$  fewer trips) for an overall effort reduction of 41% (Table 3). Similar trends occurred in the amount of gill net (yd) being fished with a 38% reduction of large mesh gill nets from 2009 through 2010 and 30% from 2010 through 2011 creating a total reduction of 57% over the three-year period (Table 4).

Requiring large mesh gill net attendance in estuarine waters would likely reduce mortalities with Atlantic sturgeon by minimizing the time the animals are entangled. Additional reductions of interactions and mortalities would likely result from reduced effort in terms of both number of trips made and yards of gill net fished and from fishermen choosing not to fish.

NCDMF believes that the mitigation measures put into place by the Settlement Agreement for large mesh gill nets, which reduced gill net effort drastically statewide, has proven to be an optimal management option to continue the fisheries and reduce Atlantic sturgeon interactions. The limited overnight soak time during the night and implementing proclamation M-37, which reduced the maximum yardage of large mesh gill nets in waters within units A and C from 3,000 to 2,000 yards, is believed to have reduced the number of interactions and mortalities in the large mesh fisheries. While the fisheries may fluctuate periodically, the effort will not increase above the levels in 2010 due to the stringent management measures. NCDMF believes that any additional restrictions to the gill net fishery would be detrimental to the industry and are not practicable at this time. NCDMF does not recommend further mitigation measures to reduce large mesh gill net effort at this time; therefore, Alternative 3 was rejected.

#### **Alternative 4. Expand Weekly Closures**

Currently, all areas that are exempt from the Settlement Agreement (portions of management unit A and C) do not have weekly closures. Expanding the 3-day weekly closures to the rest of the state to reduce effort from unattended gill nets  $\geq 4.0$  ISM could reduce Atlantic sturgeon interactions. This is dependent on effort not appreciably increasing during days when fishing is allowed. A seasonal closure that occurs when adult Atlantic sturgeon are present in North Carolina's estuarine waters would provide the most protection. Another possibility would be to limit season closures to areas where Atlantic sturgeon are more common or during months of high water temperatures when discard mortality is higher.

NCDMF believes the mitigation measures detailed in the CP including hotspot closures, gear modifications, and effort reductions provide adequate protection for Atlantic sturgeon in estuarine waters of NC. NCDMF believes that any additional restrictions to the gill net fisheries would be detrimental to the industry and are not practicable at this time. Area and seasonal closures are not justified at this time; therefore, Alternative 4 was rejected.

#### **Alternative 5. Small Mesh Reduction**

Small mesh gill net effort could be reduced throughout the state by reducing yardage, limiting soak time, and requiring attendance—possibly reducing Atlantic sturgeon interactions. From 2009 through 2011, there has been a reduction (12%) of small mesh gill net yardage used and

trips in estuarine waters with the number of trips averaging 9,648 and 7,938,148 yards per year for the three-year period (Tables 3, 4). Attendance is already required in most areas of North Carolina from May through November (Figure 2). Implementing a maximum yardage limit for small mesh gill nets could provide additional protection to Atlantic sturgeon by reducing the yardage of small mesh gill nets in the water at any given time, assuming that fishing effort does not increase. Any reduction in the maximum yardage limit will need to ensure that it will appreciably reduce yardage for a particular water body, which means a uniform yardage limit for gill nets < 4.0 ISM in all water bodies might not be appropriate. Currently, much of Albemarle Sound has a maximum small mesh yardage limit of 800 yards. Further restrictions to small mesh gill nets are not necessary at this time; therefore Alternative 5 was rejected.

### **Alternative 6. Adaptive Management**

With the current best available information, the NCDMF will use proclamation authority to implement management measures necessary to reduce Atlantic sturgeon takes in estuarine gill net fisheries in North Carolina. The identification of the impact of any proposed take levels requires availability of up-to-date biological information on the listed species within the plan area. Notably, if such information is inadequate, additional biological studies to support the CP will be needed. This flexibility is a necessary component of an ITP as increased knowledge will be acquired through extensive bycatch monitoring, outreach, and other data collection programs. Proclamation authority allows the NCDMF to implement timely regulatory changes which may provide increased protection of Atlantic sturgeon. The need for additional management measures or better direction of resources will be determined by the NCDMF in consultation with the NMFS-OPR and the NMFS-SERO throughout the ITP process.

Appropriate restrictions may include gear or area restrictions, attendance requirements, modifications in observer coverage, and/or increased enforcement. The NCDMF will consult regularly with the NMFS-SERO and the NMFS-OPR to ensure that monitoring and management programs maintain the flexibility for the NCDMF to monitor, anticipate, respond, and implement needed action. This flexibility was a vital component of the NCDMF management of the PSGNRA and will apply to our monitoring and management strategy for gill net fisheries prosecuted in internal coastal waters of the state. A long-term adaptive approach will provide for the protection and conservation of Atlantic sturgeon and other protected species. This alternative offers the best practicable protection for Atlantic sturgeon and is the alternative

chosen for this application, because this alternative allows for management measures to be implemented as needed, and for those measures to be adjusted as conditions change and new data are gathered.

## **Application**

The North Carolina Division of Marine Fisheries, PO Box 769, Morehead City, NC 28557, (Phone 252-726-7021) makes application for a General Incidental Take Permit under Section 10 of the Endangered Species Act authorizing implementation of management measures for protection of endangered Atlantic sturgeon and other ESA listed species while allowing fisheries to be prosecuted in the waters of North Carolina. This request is being made to cover activities described herein for ten years after the date of authorization.

The North Carolina Division of Marine Fisheries acknowledges the magnitude of estimating and requesting annual takes of Atlantic sturgeon proposed in this ITP application. It is highly unlikely that the total authorized take level will be reached in a season or a year because the NCDMF will close a management unit for the remainder of that season if takes approach the authorized level for any disposition. The NCDMF believes that gear restrictions, adaptive management, extensive monitoring, delineation of management units, and estimate of takes monthly in each of the seven management units will ensure continued protection for endangered Atlantic sturgeon.

North Carolina fishermen and communities depend greatly upon the fisheries resources of this state. The industry remains committed to working with managers to address bycatch problems in gill net fisheries. The NCDMF will continue to address protected species bycatch issues through timely management actions, development of bycatch reducing gears, and outreach to the fishing industry.

The requested ten-year ITP will allow for the establishment of a comprehensive CP with a monitoring infrastructure to provide for management measures to be implemented for protection of Atlantic sturgeon and other protected species in North Carolina waters. The monitoring program will allow for characterization of the gill net fisheries and Atlantic sturgeon distributions and interactions in these waters. This information will provide managers with the tools to address concerns in the short term and the information needed to plan and manage resources in the long term both for the conservation of protected species and the opportunity for various

user groups to access North Carolina fisheries resources. This program will remain adaptive and flexible throughout its course as the NCDMF will continue to work with the NMFS to address protected species issues in North Carolina fisheries.

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## Tables

Table 1. Summary of significant gill net restrictions and exemptions implemented by NCDMF through proclamation from May 2010 through September 2012.

M-8-2010 May 15, 2010	With the exception of western Albemarle and Currituck sounds and the PSGNRA from September through November: Large mesh gill nets (4.0-6.5 in.) must be fifteen (15) meshes deep with lead lines, floats prohibited north of Hwy. 58 bridge, allowed south of it. Maximum 2,000 yds. North of Hwy. 58 bridge, 1,000 yds South. No more than 100 yds set in a continuous line and 25 yds. between sets with four nights fishing (Tuesday – Friday)
M-2-2011 January 20, 2011	In order to have a shad harvest season, Albemarle Sound management unit(ASMA), Pamlico Sound and its tributaries (including Pamlico, Pungo, Bay and Neuse rivers) and the Cape Fear River were exempted from the four day fishing week, the mesh height, lead line and float requirements, and the 100 yard continuous length limit. These exemptions were in place until March 28, 2011.
M-27-2011 September 12, 2011	Large mesh gill net restrictions were no longer required in Albemarle, Croatan and Roanoke sounds north and west of Hwy 64/264 bridges as well as Pamlico, Bay and Neuse rivers.
M-30-2011 September 18, 2011	An extra day (Monday) was allowed for setting large mesh gill nets south of Beaufort Inlet.
M-6-2012 February 2, 2012	In order to have a shad harvest season, the ASMA, Pamlico Sound and its tributaries (including Pamlico, Pungo, Bay and Neuse rivers), upper New River and the Cape Fear River were exempted from the four day fishing week, the mesh height, lead line and float requirements, and the 100 yard continuous length limit. These exemptions were in place until March 28, 2012.
M-23-2012 May 20, 2012	Southern Core Sound (D1) was closed to large mesh gill nets and 2,000 yd. maximum length restriction is reduced to 1,000 yds. from Beaufort to the Hwy. 58 bridge.
M-37-2012 September 3, 2012	Limit large mesh gill nets to 2,000 in exempted areas within the Albemarle Sound, Pamlico, Bay, and Neuse rivers, and make it unlawful to fail to present at nets at least once in a 24 hour period no later than noon each day.

Table 2. Overview of management actions for gill net  $\geq 4.0$  ISM by management unit and season taken by the North Carolina Division of Marine Fisheries to reduce sea turtle bycatch in the large mesh gill net fisheries. Some restrictions may not fall exactly on the start and end dates of seasons.

Management Unit	Season			
	Spring	Summer	Fall	Winter
A	*	*	*	*****
B	*	*	*	*****
C	*****	*****	*****	*****
D1	**	**	**	*****
D2	***	***	***	*****
E	****	****	****	*****
*Sea Turtle Restrictions: With the exception of western Albemarle and Currituck sounds: Large mesh gill nets (4.0-6.5 ISM.) must be fifteen (15) meshes deep with lead lines, floats prohibited, maximum 2,000 yds, no more than 100 yds. set in a continuous line, and 25 yds. between sets with four nights fishing (Tuesday – Friday). Restrictions apply when water temperatures average above 55°F.				
**Sea Turtle Restrictions: with 1,000 yard limit and closed from May 8 through October 14 as hotspot				
***Sea Turtle Restrictions: with 1,000 yard limit				
****Sea Turtle Restrictions: with 1,000 yard limit and floats allowed				
*****Exempt from Sea Turtle Restrictions				

Table 3. Large ( $\geq 5$  ISM) and small ( $< 5$  ISM) mesh gill net trips from 2009 through 2011 by season and management unit.

Season	Management Unit	Large Mesh			Small Mesh		
		2009	2010	2011	2009	2010	2011
Winter	A*	351	1,262	782	1,265	1,029	1,211
	B	43	95	4	562	476	305
	C	112	45	114	276	242	67
	D1	0	1	0	3	14	5
	D2	2	0	0	30	37	30
	E	48	64	54	124	222	72
Spring	A*	2,141	3,359	2,121	1,299	1,116	762
	B	841	754	500	1,368	1,691	1,797
	C	1,282	960	776	546	263	155
	D1	105	54	48	19	33	27
	D2	131	64	80	24	10	36
	E	399	272	299	197	149	177
Summer	A*	2,448	1,016	535	480	427	332
	B	2,917	1,548	2,214	922	1,324	1,139
	C	1,214	392	588	323	155	141
	D1	205	73	105	2	1	7
	D2	306	123	189	17	24	49
	E	825	287	406	215	198	138
Fall	A*	4,755	2,931	922	558	346	411
	B	2,413	3,055	2,256	812	838	1,024
	C	1,048	577	653	282	155	93
	D1	113	95	73	43	35	66
	D2	346	242	285	81	103	320
	E	866	487	427	780	477	987
Total		22,911	17,756	13,431	10,228	9,365	9,351

\*Data were not available to categorize unit A into sub units A1, A2, and A3.

Table 4. Large ( $\geq 5$  ISM) and small ( $< 5$  ISM) mesh gill net yardage from 2009 through 2011 by season and management unit.

Season	Management Unit	Large Mesh (yd)			Small Mesh (yd)		
		2009	2010	2011	2009	2010	2011
Winter	A*	332,189	1,312,172	500,200	752,449	695,988	824,186
	B	36,523	83,202	4,800	705,676	522,012	326,929
	C	110,987	37,623	79,399	221,371	170,255	22,450
	D1	0	700	0	2,025	11,775	5,644
	D2	1,400	0	0	19,935	24,955	24,000
	E	22,681	30,553	42,285	92,074	165,432	26,354
Spring	A*	3,011,533	3,682,803	1,730,120	1,256,836	970,158	438,950
	B	2,046,312	1,320,080	811,256	1,467,240	1,731,793	1,570,196
	C	1,105,661	765,123	403,027	498,492	221,066	92,234
	D1	276,789	105,425	79,482	18,764	30,252	19,034
	D2	342,992	133,528	131,159	25,447	8,913	22,589
	E	456,161	227,565	206,044	194,735	50,471	38,127
Summer	A*	4,307,992	1,361,150	714,480	289,818	341,600	265,600
	B	5,560,461	2,114,562	3,117,286	842,451	1,402,865	1,224,451
	C	1,371,981	454,055	724,393	186,454	85,417	79,100
	D1	463,431	121,901	175,337	1,414	561	3,925
	D2	691,963	205,339	315,536	12,023	13,457	27,475
	E	980,382	239,549	338,739	128,700	69,850	49,700
Fall	A*	7,928,117	3,997,608	1,126,191	473,546	282,900	311,550
	B	3,395,242	4,221,255	3,170,975	703,854	765,791	868,379
	C	1,216,431	676,270	766,873	166,294	91,200	53,700
	D1	195,245	148,794	114,446	21,633	16,090	29,270
	D2	606,707	381,423	453,884	40,317	51,257	158,641
	E	1,028,478	379,987	328,264	218,120	406,083	862,150
Total		35,489,658	22,000,666	15,334,175	8,339,669	8,130,141	7,344,634

\*Data were not available to categorize unit A into sub units A1, A2, and A3.

Table 5. Average landings value and trips from the estuarine gill net fishery in the internal waters of North Carolina from 2001 through 2011.

Year	10 Years		Top 10 Species Landed	2011 Only	
	Ex- Vessel Value in Total Dollars (\$)	Number of Trips		Ex-Vessel Value of Species (\$)	Number of Trips with Species
2001	5,876,630	44,511	Flounder, Southern	1,399,451	11,414
2002	5,556,470	40,696	Mullet, Striped	928,204	6,236
2003	5,256,143	38,717	Mackerel, Spanish	718,028	2,240
2004	4,732,574	34,989	Striped Bass	413,532	4,330
2005	5,158,074	34,424	Spot	332,684	3,979
2006	6,095,758	35,537	Bluefish	298,216	6,217
2007	6,120,551	36,088	Perch, White	193,742	2,889
2008	6,596,931	36,371	Shad, American	179,448	2,754
2009	6,385,463	36,062	Drum, Red	148,391	4,696
2010	5,937,914	30,052	Mullet, Sea	120,652	2,714
2011	5,148,125	25,431			
Total	62,864,632	392,878	Total	4,732,348	



Table 6. Annual observer coverage (percent) in North Carolina's inshore large mesh gill net fishery by season and management unit for 2010 and 2011.

Season	Management Unit	Actual Effort		Observed Trips		Coverage (%)	
		2010	2011	2010	2011	2010	2011
Winter	A*	1,364	956	0	0	0.00	0.00
	B	227	172	1	0	0.44	0.00
	C	89	142	11	24	12.36	16.90
	D1	8	5	0	0	0.00	0.00
	D2	0	0	0	0	n/a	n/a
	E	65	61	5	3	7.69	4.92
Spring	A*	3,685	2,303	0	5	0.00	0.22
	B	1,265	790	7	16	0.55	2.03
	C	1,020	843	18	22	1.76	2.61
	D1	61	59	2	12	3.29	20.41
	D2	59	68	11	17	18.64	25.00
	E	276	302	9	45	3.26	14.90
Summer	A*	1,030	538	4	2	0.39	0.37
	B	1,585	2,219	35	124	2.21	5.59
	C	392	591	60	20	15.31	3.38
	D1	123	134	41	31	33.43	23.19

Table 6. Continued. Annual observer coverage (percent) in North Carolina's inshore large mesh gill net fishery by season and management unit for 2010 and 2011.

Season	Management Unit	Actual Effort		Observed Trips		Coverage (%)	
		2010	2011	2010	2011	2010	2011
Fall	D2	74	175	39	61	52.70	34.86
	E	287	409	53	91	18.47	22.25
	A*	2,938	928	9	7	0.31	0.75
	B	3,129	2,275	189	184	6.04	8.09
	C	577	654	36	12	6.24	1.83
	D1	109	92	13	17	11.97	18.57
	D2	212	277	62	50	29.25	18.05
	E	487	429	53	95	10.88	22.14
	Total	19,062	14,422	658	838	3.45	5.81

\*Data were not available to categorize unit A into sub units A1, A2, and A3.

Table 7. Number of Atlantic sturgeon observed in North Carolina's estuarine gill net fishery by the NCDMF Observer Program by year, season, mesh size, and management unit from 2004 through 2011.

		Management Unit					Management Unit					
		≥ 5.0 ISM					<5.0 ISM					
Year	Season	A	B	C	D	E	A	B	C	D	E	Total
2004	Winter	0	0	0	0	0	0	0	0	0	0	0
	Spring	2	0	0	0	0	0	1	0	0	0	3
	Summer	15	2	0	0	0	0	0	0	0	0	17
	Fall	4	1	0	0	0	0	0	0	0	0	5
2005	Winter	2	0	0	0	0	3	0	0	0	0	5
	Spring	5	0	1	0	0	2	0	0	0	0	8
	Summer	4	3	2	0	0	0	0	0	0	0	9
	Fall	0	4	0	0	0	0	2	0	0	0	6
2006	Winter	0	0	0	0	0	1	0	0	0	0	1
	Spring	30	0	0	0	0	3	0	0	0	0	33
	Summer	0	0	1	0	0	0	0	0	0	0	1
	Fall	0	4	0	0	0	0	0	0	0	0	4
2007	Winter	0	0	0	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	0	0	0	0	0	0	0
	Summer	0	0	0	0	0	0	0	0	0	0	0
	Fall	0	0	0	0	0	0	0	0	0	0	0
2008	Winter	0	0	0	0	0	1	0	0	0	0	1
	Spring	15	0	0	0	0	1	0	0	0	0	16
	Summer	1	0	0	0	0	0	0	0	0	0	1
	Fall	0	0	0	0	0	0	0	0	0	0	0
2009	Winter	0	0	0	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	0	0	0	0	0	0	0
	Summer	0	0	0	0	0	0	0	0	0	0	0
	Fall	0	0	0	0	0	0	0	0	0	0	0
2010	Winter	0	0	0	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	0	0	0	0	0	0	0
	Summer	0	0	0	0	0	0	0	0	0	0	0
	Fall	0	0	0	0	0	0	0	0	0	0	0
2011	Winter	0	0	0	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	0	0	1	0	0	0	1
	Summer	0	1	0	0	0	0	0	0	0	0	1
	Fall	0	0	0	0	1	0	0	0	0	0	1
Total		78	15	4	0	1	11	4	0	0	0	113

Table 8. Number of Atlantic sturgeon observed in the NCDMF Striped Bass Independent Gill Net Survey by year, season, and mesh size from 2004 through 2011.

		Mesh Size		
		5.0, 5.5 6.0 ISM	3.0, 3.5 ISM	
Year	Season	A	A	Total
2004	Winter	0	0	0
	Spring	0	1	1
	Fall	3	4	7
2005	Winter	5	10	15
	Spring	0	1	1
	Fall	2	4	6
2006	Winter	8	15	23
	Spring	4	1	5
	Fall	4	3	7
2007	Winter	5	3	8
	Spring	0	0	0
	Fall	6	14	20
2008	Winter	10	15	25
	Spring	13	8	21
	Fall	3	3	6
2009	Winter	3	3	6
	Spring	5	4	9
	Fall	3	2	5
2010	Winter	7	1	8
	Spring	1	1	2
	Fall	0	4	4
2011	Winter	2	0	2
	Spring	1	2	3
	Fall	4	5	9
Total		89	104	193

Table 9. Estimated coefficients of predictors and their standard errors for the ZIP GLM fit to the Atlantic sturgeon data.

Count Part (Poisson with log link)			Zero-Inflation Part (binomial with logit link)		
Covariate	Coefficient	Std. Error	Covariate	Coefficient	Std. Error
Intercept	-6.5232	0.3147	Intercept	1.6842	0.3404
Year—2005	0.9627	0.2543	Season—Spring	-1.1310	0.4433
Year—2006	1.3932	0.2534	Season—Summer	-1.9294	0.5658
Year—2007	1.1199	0.2859	Season—Winter	-0.9486	0.5247
Year—2008	1.6345	0.2470			
Year—2009	0.8020	0.3137			
Year—2010	0.4993	0.3475			
Year—2011	0.6262	0.3254			
Mesh—Small	0.4971	0.1390			
Season—Spring	-1.7190	0.3463			
Season—Summer	-1.4877	0.3902			
Season—Winter	-1.5408	0.4147			
Unit—B	-4.0762	0.2772			
Unit—C	-3.1965	0.5186			
Unit—E	-3.9248	1.0230			

Table 10. Results of the model selection for the ZIP GLM fit to the Atlantic sturgeon data.

			Likelihood Ratio Test	
Dropped Term	df	AIC	Test Statistic	P-value
none	19	2,479		
Year in log link	12	2,525	60.0543	<0.0001
Mesh in log link	18	2,489	12.6066	0.0018
Season in log link	16	2,491	18.0932	0.0012
Unit in log link	16	2,771	298.6079	<0.0001

Table 11. Predicted number of annual interactions with Atlantic sturgeon in North Carolina's large mesh ( $\geq 5.0$  ISM) estuarine gill net fishery assuming effort levels equal to those observed from 2004 through 2011 by management unit, season, and year.

Management Unit	Season	2004		2005		2006		2007	
		Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities
A*	Winter	346	14	708	28	1,097	44	1,260	50
	Spring	449	18	744	30	1,626	65	1,241	50
	Summer	583	23	1,184	47	2,438	98	1,384	55
	Fall	1,277	51	3,922	157	6,385	255	5,934	237
B	Winter	0	0	0	0	0	0	1	0
	Spring	2	0	4	0	12	0	8	0
	Summer	12	0	26	1	48	2	33	1
	Fall	12	0	34	1	53	2	44	2
C	Winter	1	0	2	0	3	0	2	0
	Spring	6	0	12	0	21	1	16	1
	Summer	5	0	18	1	24	1	14	1
	Fall	10	0	21	1	35	1	29	1
E	Winter	3	0	1	0	0	0	1	0
	Spring	1	0	2	0	3	0	3	0
	Summer	3	0	7	0	12	0	7	0
	Fall	3	0	6	0	14	1	10	0
TOTAL		2,713	106	6,691	266	11,771	470	9,987	398

\*Data were not available to categorize unit A into sub units A1, A2, and A3.

Table 11 Continued. Predicted number of annual interactions with Atlantic sturgeon in North Carolina's large mesh ( $\geq 5.0$  ISM) estuarine gill net fishery assuming effort levels equal to those observed from 2004 through 2011 by management unit, season, and year.

Management Unit	Season	2008		2009		2010		2011	
		Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities
A*	Winter	551	22	90	4	199	8	56	2
	Spring	1,811	72	797	32	614	25	472	19
	Summer	3,789	152	1,533	61	209	8	124	5
	Fall	9,369	375	4,648	186	1,117	45	367	15
B	Winter	1	0	0	0	0	0	0	0
	Spring	20	1	5	0	2	0	1	0
	Summer	88	4	31	1	6	0	9	0
	Fall	72	3	28	1	23	1	19	1
C	Winter	3	0	1	0	0	0	1	0
	Spring	16	1	8	0	4	0	2	0
	Summer	27	1	15	1	3	0	5	0
	Fall	34	1	20	1	6	0	7	0
E	Winter	0	0	0	0	0	0	0	0
	Spring	3	0	2	0	1	0	1	0
	Summer	13	1	7	0	1	0	1	0
	Fall	15	1	9	0	1	0	1	0
TOTAL		15,812	634	7,194	287	2,186	87	1,066	42

\*Data were not available to categorize unit A into sub units A1, A2, and A3.

Table 12. Predicted number of annual interactions with Atlantic sturgeon in North Carolina's small mesh (<5.0 ISM) estuarine gill net fishery assuming effort levels equal to those observed from 2004 through 2011 by management unit, season, and year.

Management Unit	Season	2004		2005		2006		2007	
		Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities
A*	Winter	183	15	420	34	456	36	283	23
	Spring	196	16	539	43	583	47	449	36
	Summer	17	1	61	5	67	5	29	2
	Fall	143	11	306	24	569	46	555	44
B	Winter	1	0	3	0	8	1	5	0
	Spring	5	0	17	1	18	1	16	1
	Summer	1	0	5	0	6	0	5	0
	Fall	6	0	12	1	22	2	15	1
C	Winter	2	0	5	0	8	1	4	0
	Spring	2	0	6	0	7	1	9	1
	Summer	0	0	0	0	2	0	2	0
	Fall	1	0	3	0	7	1	8	1
E	Winter	0	0	0	0	1	0	1	0
	Spring	1	0	1	0	1	0	1	0
	Summer	1	0	1	0	1	0	1	0
	Fall	0	0	1	0	1	0	1	0
TOTAL		559	43	1,380	108	1,757	141	1,384	109

\*Data were not available to categorize unit A into sub units A1, A2, and A3.



Table 12. Continued. Predicted number of annual interactions with Atlantic sturgeon in North Carolina's small mesh (<5.0 ISM) estuarine gill net fishery assuming effort levels equal to those observed from 2004 through 2011 by management unit, season, and year.

Management Unit	Season	2008		2009		2010		2011	
		Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities
A*	Winter	1,186	95	367	29	210	17	223	18
	Spring	1,222	98	458	37	263	21	121	10
	Summer	68	5	52	4	86	7	76	6
	Fall	496	40	360	29	124	10	165	13
B	Winter	9	1	4	0	1	0	1	0
	Spring	22	2	9	1	7	1	6	0
	Summer	5	0	5	0	4	0	4	0
	Fall	22	2	8	1	4	0	5	0
C	Winter	7	1	2	0	1	0	0	0
	Spring	14	1	5	0	2	0	1	0
	Summer	4	0	2	0	1	0	1	0
	Fall	8	1	3	0	1	0	0	0
E	Winter	1	0	0	0	1	0	0	0
	Spring	2	0	1	0	0	0	0	0
	Summer	4	0	1	0	0	0	0	0
	Fall	1	0	1	0	2	0	4	0
TOTAL		3,071	246	1,278	101	707	56	607	47

\*Data were not available to categorize unit A into sub units A1, A2, and A3.

Table 13. Requested number of estimated incidental takes for management unit A and observed incidental takes for management units B through E per year for the North Carolina Atlantic Sturgeon ITP.

Management Unit	Season	Annual $\geq$ 5.0 ISM		Annual $<$ 5.0 ISM		Annual Total	
		Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities
A*	Winter	199	8	210	17	409	25
	Spring	614	25	263	21	877	46
	Summer	209	8	86	7	295	15
	Fall	1,117	45	124	10	1,241	55
B	Winter	**2	***1	**2	***1	4	2
	Spring	**2	***1	**7	***2	9	3
	Summer	**6	***2	**4	***1	10	3
	Fall	**23	***2	**4	***1	27	3
C	Winter	**2	***1	**2	***1	4	2
	Spring	**4	***1	**2	***1	6	2
	Summer	**3	***1	**2	***1	5	2
	Fall	**6	***2	**2	***1	8	3
D*	Annual	**8	***2	**8	***2	16	4
E	Annual	**8	***2	**8	***2	16	4
TOTAL		2,203	101	724	68	2,927	169

\*Data were not available to categorize units A and D into sub units A1, A2, A3, D1, and D2.

\*\*These interactions are actual number observed not estimated based on observer coverage.

\*\*\*Mortality estimates could not be completed for management units B-E due to low take requests, the following was done. If observed interactions were  $\leq$  5 requested mortality was one, if requested observed interactions were  $>$ 5 requested mortality was two.

Table 14. Requested number of incidental takes for large and small mesh gill net per year for the North Carolina Division of Marine Fisheries Atlantic sturgeon ITP for the 10 year lifespan of the ITP.

Year	Annual Large Mesh ( $\geq 5$ ISM)		Annual Small Mesh ( $< 5.0$ ISM)		Annual Total	
	Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities
2013	2,203	101	724	68	2,927	169
2014	2,203	101	724	68	2,927	169
2015	2,203	101	724	68	2,927	169
2016	2,203	101	724	68	2,927	169
2017	2,203	101	724	68	2,927	169
2018	2,203	101	724	68	2,927	169
2019	2,203	101	724	68	2,927	169
2020	2,203	101	724	68	2,927	169
2021	2,203	101	724	68	2,927	169
2022	2,203	101	724	68	2,927	169
Total	22,030	1,010	7,240	680	29,270	1,690

Table 15. Estimated number of incidental takes of Atlantic sturgeon from the North Carolina large mesh estuarine gill net fishery that could be allocated to other DPSs.

Management Unit	Season	2004		2005		2006		2007	
		Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities
A*	Winter	13	1	26	1	126	5	126	5
	Spring	17	1	28	1	187	7	124	5
	Summer	22	1	44	2	280	11	138	6
	Fall	49	2	145	6	734	29	593	24
B	Winter	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	1	0	1	0
	Summer	0	0	1	0	6	0	3	0
	Fall	0	0	1	0	6	0	4	0
C	Winter	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	2	0	2	0
	Summer	0	0	1	0	3	0	1	0
	Fall	0	0	1	0	4	0	3	0
E	Winter	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	0	0	0	0
	Summer	0	0	0	0	1	0	1	0
	Fall	0	0	0	0	2	0	1	0
Total		104	5	248	10	1,354	53	999	40

\*Data were not available to categorize units A into sub units A1, A2, and A3.

Table 15. Continued. Estimated number of incidental takes of Atlantic sturgeon from the North Carolina large mesh estuarine gill net fishery that could be allocated to other DPSs.

Management Unit	Season	2008		2009		2010		2011	
		Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities
A*	Winter	27	1	16	1	50	2	25	1
	Spring	88	4	145	6	154	6	210	8
	Summer	185	7	279	11	52	2	55	2
	Fall	457	18	846	34	279	11	163	7
B	Winter	0	0	0	0	0	0	0	0
	Spring	1	0	1	0	1	0	0	0
	Summer	4	0	6	0	2	0	4	0
	Fall	4	0	5	0	6	0	8	0
C	Winter	0	0	0	0	0	0	0	0
	Spring	1	0	1	0	1	0	1	0
	Summer	1	0	3	0	1	0	2	0
	Fall	2	0	4	0	2	0	3	0
E	Winter	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	0	0	0	0
	Summer	1	0	1	0	0	0	0	0
	Fall	1	0	2	0	0	0	0	0
Total		772	30	1,309	52	547	21	473	18

\*Data were not available to categorize units A into sub units A1, A2, and A3.

Table 16. Estimated number of Atlantic sturgeon from the NC small mesh estuarine gill net fishery that could be allocated to a different DPS.

Management Unit	Season	2004		2005		2006		2007	
		Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities
A*	Winter	0	0	19	2	0	0	0	0
	Spring	0	0	25	2	0	0	0	0
	Summer	0	0	3	0	0	0	0	0
	Fall	0	0	14	1	0	0	0	0
B	Winter	0	0	0	0	0	0	0	0
	Spring	0	0	1	0	0	0	0	0
	Summer	0	0	0	0	0	0	0	0
	Fall	0	0	1	0	0	0	0	0
C	Winter	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	0	0	0	0
	Summer	0	0	0	0	0	0	0	0
	Fall	0	0	0	0	0	0	0	0
E	Winter	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	0	0	0	0
	Summer	0	0	0	0	0	0	0	0
	Fall	0	0	0	0	0	0	0	0
Total		0	0	63	5	0	0	0	0

\*Data were not available to categorize units A into sub units A1, A2, and A3.

Table 16. Continued. Estimated number of Atlantic sturgeon from the NC small mesh estuarine gill net fishery that could be allocated to a different DPS.

Management Unit	Season	2008		2009		2010		2011	
		Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities	Total Interactions	# Mortalities
A*	Winter	42	3	0	0	35	3	28	2
	Spring	44	3	0	0	44	4	15	1
	Summer	2	0	0	0	14	1	10	1
	Fall	18	1	0	0	21	2	21	2
B	Winter	0	0	0	0	0	0	0	0
	Spring	1	0	0	0	1	0	1	0
	Summer	0	0	0	0	1	0	1	0
	Fall	1	0	0	0	1	0	1	0
C	Winter	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	0	0	0	0
	Summer	0	0	0	0	0	0	0	0
	Fall	0	0	0	0	0	0	0	0
E	Winter	0	0	0	0	0	0	0	0
	Spring	0	0	0	0	0	0	0	0
	Summer	0	0	0	0	0	0	0	0
	Fall	0	0	0	0	0	0	1	0
Total		110	7	0	0	118	10	76	6

\*Data were not available to categorize units A into sub units A1, A2, and A3.

Table 17. Atlantic sturgeon collection numbers, mortality, and length information from the North Carolina Observer Program, all units combined for 2001 through 2011.

Year	Atlantic Sturgeon Collected (n)	Mortalities (n)	Mortality (%)	Minimum Fork Length (mm)	Maximum Fork Length (mm)	Average Fork Length (mm)
2001	0	0				
2002	0	0				
2003	1	0	0	N/A	N/A	N/A
2004	25	3	12	330	820	581
2005	28	2	7	467	814	631
2006	39	2	5	336	1,135	600
2007	0	0				
2008	18	0	0	480	845	639
2009	0	0				
2010	0	0				
2011	3	0	0	464	1,386	809
Total	114	7	6	330	1,386	616



Table 18. Total number of Atlantic sturgeon by management unit from the North Carolina Observer Program from 2001 through 2011.

Management Unit	Year											Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A1				17	6	14		15				52
A2				2								2
A3				2	9	20		3				34
B			1	4	10	4					2	21
C					3	1						4
D1												
D2												
E											1	1
Total	0	0	1	25	28	39	0	18	0	0	3	114

Table 19. Total number of trips by management unit from the North Carolina Observer Program from 2001 through 2011.

Unit	Year											Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A1				63	23	36		14				136
A2				22	7	5						34
A3	3			26	33	34		11				107
B	175	171	116	234	238	215	125	190	173	172	297	2,106
C				138	122	69		43	21	34	45	472
D1		7	2	21	3		2		26	1	19	81
D2					6				10		12	28
E					9	41		4	4	5	57	120
Total	178	178	118	504	441	400	127	262	234	212	430	3,084

Table 20. Total yards of net fished observed by management unit from the North Carolina Observer Program from 2001 through 2011.

Unit	Year											Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A1				98,293	28,931	46,868		17,000				191,092
A2				31,270	2,650	1,800						35,720
A3	1,200			20,075	35,697	22,206		10,760				89,938
B	180,042	209,015	121,200	253,304	271,749	276,473	164,834	258,076	263,324	218,775	376,660	2,593,452
C				122,822	114,654	45,619		31,288	15,530	14,889	20,236	365,038
D1		13,290	2,925	24,470	5,300		3,100		15,300	300	30,550	95,235
D2					7,960				9,450		8,120	25,530
E					8,650	43,605		2,300	6,040	10,200	30,477	101,272
Total	181,242	222,305	124,125	550,234	475,591	436,571	167,934	319,424	309,644	244,164	466,043	3,497,277

Table 21. Total number of large mesh flounder trips by management unit completed in North Carolina from 2001 through 2011.

Management Unit	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
A*	9,580	7,367	5,464	5,724	5,088	6,514	7,047	7,742	7,909	3,742	1,241	67,418
B	4,488	4,046	3,384	4,454	3,919	4,557	3,923	4,502	4,000	4,117	3,619	45,009
C	3,785	3,956	4,222	3,363	3,165	3,349	3,373	2,619	3,251	1,404	1,483	33,970
D*	1,909	2,025	2,179	2,360	2,364	2,616	3,293	4,328	3,499	1,793	2,208	28,574
E	1,817	2,202	2,417	1,706	1,394	1,785	1,703	1,568	2,081	1,035	1,098	18,806
Total	22,579	19,596	17,666	17,607	15,930	18,821	19,339	20,759	20,740	12,091	9,649	193,777

\*Data were not available to categorize units A and D into sub units A1, A2, A3, D1, and D2.

Table 22. Total number of large mesh shad trips by management unit completed in North Carolina from 2001 through 2011.

Management Unit	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
A*	2,633	2,187	2,588	2,034	1,945	1,854	1,910	1,174	1,338	2,436	1,933	22,032
B	389	197	187	87	149	196	194	97	202	126	46	1,870
C	613	703	699	815	839	718	603	369	508	424	411	6,702
D*	9	6	24	5	18	3	3	3	3	17	1	92
E	52	85	132	205	165	99	192	109	125	139	165	1,468
Total	3,696	3,178	3,630	3,146	3,116	2,870	2,902	1,752	2,176	3,142	2,556	32,164

\*Data were not available to categorize units A and D into sub units A1, A2, A3, D1, and D2.

Table 23. Total number of small mesh trips by management unit completed in North Carolina from 2001 through 2011.

Management Unit	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
A*	8,465	8,603	8,650	6,217	6,409	5,029	4,594	4,926	4,106	5,115	4,017	66,131
B	4,660	3,425	3,672	3,278	4,012	3,431	3,577	3,247	3,069	3,755	3,621	39,747
C	1,411	1,813	1,485	877	1,117	1,198	1,457	1,272	1,273	866	671	13,440
D*	1,099	590	907	815	540	681	639	631	530	620	1,088	8,140
E	1,291	1,055	1,073	1,270	983	1,057	1,073	1,261	1,212	954	1,325	12,554
Total	16,926	15,486	15,787	12,457	13,061	11,396	11,340	11,337	10,190	11,310	10,722	140,012

\*Data were not available to categorize units A and D into sub units A1, A2, A3, D1, and D2.

Table 24. Total number of Atlantic sturgeon collected in small mesh nets by management unit from the North Carolina Observer Program from 2001 through 2011.

Management Unit	Year											Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A1					2			2				4
A2												
A3					2	2						4
B				1	2			1				4
C											1	1
D1												0
D2												0
E												0
Total	0	0	0	1	6	2	0	2	0	0	1	12

Table 25. Total number of small mesh trips by management unit from the North Carolina Observer Program from 2001 through 2011.

Management Unit	Year											Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A1				13	14	18		4				49
A2				10	7	5						22
A3				12	26	12		1				51
B	56	17	32	33	50	26	5	10	14	6	54	303
C				11	19	18		8	4	15	20	95
D1				1					12	1		14
D2									1			1
E					1	6			4	5		16
Total	56	17	32	80	117	85	5	23	35	27	74	551

Table 26. Total yards of small mesh net fished observed by management unit from the North Carolina Observer Program from 2001 through 2011.

Management Unit	Year											Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A1				7,043	12,131	10,650		1,968				31,792
A2				4,450	2,650	1,800						8,900
A3				5,125	17,853	4,885		150				28,013
B	42,403	16,155	14,620	18,995	30,215	24,110	5,025	8,680	25,200	5,600	35,635	226,638
C				4,795	8,730	11,115		3,355	1,300	2,200	5,600	37,095
D1				100					2,950	300		3,350
D2									200			200
E					800	4,500			4,200	8,650		18,150
Total	42,403	16,155	14,620	40,508	72,379	57,060	5,025	14,153	33,850	16,750	41,235	354,138

Table 27. Total number of Atlantic sturgeon collected in large mesh nets by management unit from the North Carolina Observer Program from 2001 through 2011.

Management Unit	Year											Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A1				17	4	14		13				48
A2				2								2
A3				2	7	18		3				30
B			1	3	8	4					1	17
C					3	1						4
D1												0
D2												0
E											1	1
Total	0	0	1	24	22	37	0	16	0	0	2	102

Table 28. Total number of large mesh trips by management unit from the North Carolina Observer Program from 2001 through 2011.

Management Unit	Year											Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A1				58	9	24		14				105
A2				16								16
A3	3			24	15	24		11				77
B	133	155	100	209	204	202	120	183	160	169	253	1,888
C				132	108	57		42	19	31	33	422
D1		7	2	20	3		2		17		19	51
D2					6				10		12	16
E					8	40		4	1	3	57	113
Total	136	162	102	459	353	347	122	254	207	203	374	2,688

Table 29. Total yards of large mesh net fished observed by management unit from the North Carolina Observer Program from 2001 through 2011.

Management Unit	Year											Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A1				91,250	16,800	36,218		15,032				159,300
A2				26,820								26,820
A3	1,200			14,950	17,844	17,321		10,610				69,925
B	137,639	192,860	106,580	234,309	241,534	252,363	159,809	249,396	238,124	213,175	341,025	2,366,814
C				118,027	105,924	34,504		27,933	14,230	12,689	14,636	327,943
D1		13,290	2,925	24,370	5,300		3,100		12,350		30,550	91,885
D2					7,960				9,250		8,120	25,330
E					7,850	39,105		2,300	1,840	1,550	30,477	83,122
Total	138,839	206,150	109,505	509,726	403,212	379,511	162,909	305,271	275,794	227,414	424,808	3,143,139

Table 30. Average fork length (millimeters) of Atlantic sturgeon collected from the North Carolina Observer Program from 2001 through 2011. Min and max lengths in parentheses.

Management Unit	Year											Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A1				565 (330, 820)	585 (530, 655)	455 (336, 584)		650 (480, 845)				562
A2				594 (578, 610)								594
A3				663 (630, 695)	642 (472, 745)	643 (408, 789)		584 (563, 613)				639
B				605 (500, 750)	645 (467, 814)	981 (790, 1,135)					521 (464, 578)	681
C					645 (603, 687)	633 (633, 633)						641
D1												0
D2												0
E											1,386 (1,386)	1,386
Total	0	0	0	581	631	600	0	0	0	0	809	616

Table 31. Average weight (kg) of Atlantic sturgeon collected from the North Carolina Observer Program from 2001 through 2011. Min and max weights in parentheses.

Management Unit	Year											Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
A1				1.5 (0.3, 4.2)	1.7 (1.1, 3.0)	0.6 (0.2, 1.5)		1.5 (1.0, 3.1)				1.3
A2				1.5 (1.5, 1.5)								1.5
A3				2.1 (1.8, 2.3)	1.8 (0.6, 3.5)	2.2 (0.3, 3.8)		1.2 (0.3, 1.8)				2.0
B				1.5 (0.8, 2.6)	2 (0.7, 3.0)	5.3 (3.2, 6.6)					3.1 (1.8, 4.4)	2.6
C					2.3 (2.3, 2.3)	1.8 (1.8, 1.8)						2.1
D1												
D2												
E												
Total	0	0	0	1.5	1.9	1.9	0	1.4	0	0	3.1	1.7

Table 32. The North Carolina Observer Program Atlantic sturgeon collection numbers, mortality, and length information from the Albemarle Sound (management subunit A1) from 2001 through 2011.

Year	Atlantic Sturgeon Collected (n)	Mortalities (n)	Mortality (%)	Trips (n)	Minimum Fork Length (mm)	Maximum Fork Length (mm)	Average Fork Length (mm)
2001	0						
2002	0						
2003	0						
2004	17	1	6	63	330	820	565
2005	6	0	0	23	530	655	585
2006	14	0	0	36	336	584	455
2007	0						
2008	15	0	0	14	480	845	650
2009	0						
2010	0						
2011	0						
Total	52	1	2	136	330	845	562



Table 33. The North Carolina Observer Program Atlantic sturgeon collection numbers, mortality, and length information for Croatan/Roanoke Sounds (management subunit A3) from 2001 through 2011.

Year	Atlantic Sturgeon Collected (n)	Mortalities (n)	Mortality (%)	Trips (n)	Minimum Fork Length (mm)	Maximum Fork Length (mm)	Average Fork Length (mm)
2001	0	0		3			
2002							
2003							
2004	2	0	0	26	630	695	663
2005	9	1	11	33	472	745	642
2006	20	2	10	34	408	789	643
2007							
2008	3	0	0	11	563	613	584
2009							
2010							
2011	0	0					
Total	34	3	9	107	408	789	639

Table 34. The North Carolina Observer Program Atlantic sturgeon collection numbers, mortality, and length information from the Currituck Sound (management subunit A2) from 2001 through 2011.

Year	Atlantic Sturgeon Collected (n)	Mortalities (n)	Mortality (%)	Trips (n)	Minimum Fork Length (mm)	Maximum Fork Length (mm)	Average Fork Length (mm)
2001							
2002							
2003							
2004	2	1	50	22	578	610	594
2005				7			
2006				5			
2007							
2008							
2009							
2010							
2011							
Total	2	1	50	34	578	610	594

Table 35. The North Carolina Observer Program Atlantic sturgeon collection numbers, mortality, and length information from the Pamlico Sound (management unit B) from 2001 through 2011.

Year	Atlantic Sturgeon Collected (n)	Mortalities (n)	Mortality (%)	Trips (n)	Minimum Fork Length (mm)	Maximum Fork Length (mm)	Average Fork Length (mm)
2001				175			
2002				171			
2003	1	0	0	116	N/A	N/A	N/A
2004	4	1	25	234	500	750	605
2005	10	0	0	238	467	814	645
2006	4	0	0	215	790	1,135	981
2007				125			
2008				190			
2009				173			
2010				172			
2011	2	0		297	464	578	521
Total	21	1	5	2,106	464	1,135	681

Table 36. The North Carolina Observer Program Atlantic sturgeon collection numbers, mortality, and length information from the Pamlico, Pungo, and Neuse rivers (management unit C) from 2001 through 2011.

Year	Atlantic Sturgeon Collected (n)	Mortalities (n)	Mortality (%)	Trips (n)	Minimum Fork Length (mm)	Maximum Fork Length (mm)	Average Fork Length (mm)
2001				0			
2002				0			
2003				0			
2004				138			
2005	2	1	53	122	603	687	645
2006	1	0	0	69	633	633	633
2007				0			
2008				43			
2009				21			
2010				34			
2011				45			
Total	3	1	33	472	603	687	641

Table 37. Atlantic sturgeon CPUE and at-net mortality by year from the Albemarle Sound Independent Gill Net Survey from 1990 through 2011.

Year	***Effort	CPUE (per Net)	CPUE (per Yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
1990*	694	0.08069	0.00202	56	0	0
1991**	5,155	0.01164	0.00029	60	0	0
1992**	5,914	0.00457	0.00011	27	0	0
1993**	5,237	0.00592	0.00015	31	0	0
1994	4,305	0.00999	0.00025	43	0	0
1995	4,264	0.00492	0.00012	21	0	0
1996	4,230	0.00638	0.00016	27	0	0
1997	4,256	0.01433	0.00036	61	0	0
1998	4,187	0.02197	0.00055	92	0	0
1999	4,332	0.01270	0.00032	55	1	2
2000	4,297	0.03235	0.00081	139	0	0
2001	4,151	0.03180	0.00079	132	0	0
2002	4,176	0.00694	0.00017	29	2	7
2003	4,464	0.00493	0.00012	22	4	18
2004	4,172	0.00719	0.00018	30	2	7
2005	4,094	0.01172	0.00029	48	2	4
2006	4,081	0.01544	0.00039	63	2	3
2007	4,143	0.01714	0.00043	71	4	6
2008	4,088	0.03131	0.00078	128	13	10
2009	3,817	0.01467	0.00037	56	4	7
2010	3,639	0.00879	0.00022	32	3	9
2011	3,740	0.01283	0.00032	48	2	4
Total	91,436	0.01390	0.00035	1,271	39	3

\*ASIGNS 1990 only fished October–December

\*\*ASIGNS 1991-1993 fishing was year round

\*\*\*ASIGNS effort based on 1 40-yard net set 24 hours

Table 38. Atlantic sturgeon CPUE and at-net mortality by month from the Albemarle Sound Independent Gill Net Survey, NC from 1990 through 2011.

Month	**Effort	CPUE (per Net)	CPUE (per Yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
1	11,712	0.01366	0.00034	160	3	2
2	12,140	0.00997	0.00025	121	0	0
3	13,935	0.00703	0.00018	98	2	2
4	13,725	0.00590	0.00015	81	3	4
5	12,379	0.01406	0.00035	174	13	7
6*	1,260	0.00397	0.00010	5	0	0
7*	432	0.03241	0.00081	14	0	0
8*	437	0.03661	0.00092	16	0	0
9*	432	0.02778	0.00069	12	0	0
10*	526	0.05894	0.00147	31	0	0
11	12,252	0.03036	0.00076	372	15	4
12	12,206	0.01532	0.00038	187	3	2
Total	91,436	0.01390	0.00035	1,271	39	3

\*ASIGNS only fished June–October during 1991–1993

\*\*ASIGNS effort based on 1 40-yard net set 24 hours

Table 39. Atlantic sturgeon CPUE and at-net mortality by mesh size from the Albemarle Sound Independent Gill Net Survey, NC from 1990 through 2011.

Mesh Size (ISM)	*Effort	CPUE (per Net)	CPUE (per yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
2.5	7,778	0.02224	0.00056	173	5	3
3.0	7,797	0.02373	0.00059	185	6	3
3.5	7,830	0.02695	0.00067	211	7	3
4.0	7,756	0.02837	0.00071	220	10	5
4.5	7,879	0.02500	0.00063	197	5	3
5.0	7,829	0.01635	0.00041	128	2	2
5.5	7,312	0.00752	0.00019	55	1	2
6.0	7,370	0.00570	0.00014	42	0	0
6.5	7,306	0.00370	0.00009	27	2	7
7.0	7,341	0.00341	0.00009	25	0	0
8.0	7,975	0.00088	0.00002	7	0	0
10.0	7,259	0.00014	0.00000	1	1	100
Total	91,432	0.01390	0.00035	1,271	39	3

\*ASIGNS effort based on (1) 40-yard net set 24 hours

Table 40. Fork length measurements (mm; mean, minimum, maximum) of Atlantic sturgeon collected in the Albemarle Sound Independent Gill Net Survey, NC from 1990 through 2011.

Year	Zone																				
	2			3			4			5			6			7			Total		
	Min FL	Max FL	Ave FL	Min FL	Max FL	Ave FL	Min FL	Max FL	Ave FL	Min FL	Max FL	Ave FL	Min FL	Max FL	Ave FL	Min FL	Max FL	Ave FL	Min FL	Max FL	Ave FL
1990	438	494	466	369	535	480				254	527	457							254	535	467
1991	257	615	374	327	620	455	382	660	565	399	581	503	498	632	582	707	707	707	257	707	499
1992	207	550	399	382	453	418	530	585	552	408	570	512	513	513	513				207	585	457
1993	233	624	374	359	546	446	467	572	520	445	481	463	519	945	685				233	945	445
1994	248	573	408	415	730	554	491	520	506	439	505	472	478	510	494				248	730	449
1995	263	756	485	441	517	479	554	583	564				494	494	494				263	756	495
1996	191	539	400	398	520	451				390	518	446	423	555	472	510	510	510	191	555	434
1997	230	592	348	320	542	466	450	570	506	419	563	509	473	562	520	685	685	685	230	685	422
1998	286	675	462	330	618	498	511	610	560	317	634	522	153	743	485	423	585	520	153	743	489
1999	280	716	541	468	693	530	451	610	516	408	700	523	660	660	660	467	467	467	280	716	530
2000	176	518	337	295	526	451	335	490	413	410	515	474	469	770	575	470	583	530	176	770	393
2001	306	675	481	300	680	474	498	511	505	327	640	499	554	650	610	530	561	546	300	680	486
2002	233	731	471	609	747	678	600	600	600	452	697	599	510	724	617	461	657	558	233	747	541
2003	250	620	447	433	710	531				442	442	442	452	472	462	435	1,000	608	250	1,000	500
2004	262	475	402	321	535	424	386	695	541	450	464	457	494	645	554	464	782	614	262	782	479
2005	231	651	418	405	700	508	390	550	467	440	762	543	448	850	549	460	720	578	231	850	516
2006	328	756	532	390	1,473	603	530	530	530	406	672	520	230	765	578	520	767	665	230	1,473	570
2007	230	746	466	460	648	523	422	555	475	455	761	548	520	770	612	477	735	568	230	770	528
2008	257	840	532	435	765	574	480	654	571	475	640	540	355	702	538	358	760	580	257	840	543
2009	391	780	617	433	725	559	440	795	598	733	800	774	610	700	659	658	787	724	391	800	629
2010	395	721	548	466	655	542	450	812	667	477	715	554	460	775	663	630	690	652	395	812	579
2011	393	1,498	611	433	889	546	473	800	560	477	921	611	486	857	654	511	665	564	393	1,498	604
Total	176	1,498	461	295	1,473	492	335	812	537	254	921	519	153	945	576	358	1,000	600	153	1,498	498

Table 41. Atlantic sturgeon CPUE and at-net mortality by year from the Pamlico Sound Independent Gill Net Survey, NC from 2001 through 2011. Pamlico Sound effort base on 1 gang of nets (3.0–6.5 ISM) set for 12 hours.

Year	Sets (n)	CPUE (per Gang of Net)	CPUE (per Yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
2001	237	0.00000	0.00000	0	0	0
2002	320	0.00313	0.00001	1	0	0
2003	320	0.00313	0.00001	1	0	0
2004	320	0.01875	0.00008	6	1	17
2005	304	0.06579	0.00027	20	3	15
2006	320	0.04063	0.00017	13	0	0
2007	318	0.01572	0.00007	5	0	0
2008	320	0.00625	0.00003	2	0	0
2009	320	0.00313	0.00001	1	1	100
2010	320	0.01250	0.00005	4	0	0
2011	298	0.00000	0.00000	0	0	0
Total	3,397	0.01560	0.00007	53	5	9



Table 42. Atlantic sturgeon CPUE and at-net mortality by month from the Pamlico Sound Independent Gill Net Survey, NC from 2001 through 2011. No effort is expended during the month of January; Pamlico Sound effort based on 1 gang of nets (3.0–6.5 ISM) set for 12 hours.

Month	Sets (n)	CPUE (per Gang of Net)	CPUE (per Yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
2	160	0.00625	0.00003	1	0	0
3	320	0.00313	0.00001	1	0	0
4	318	0.06289	0.00026	20	1	5
5	352	0.03409	0.00014	12	1	8
6	352	0.01136	0.00005	4	1	25
7	336	0.00298	0.00001	1	0	0
8	346	0.01734	0.00007	6	1	17
9	336	0.00000	0.00000	0	N/A	N/A
10	349	0.00573	0.00002	2	0	0
11	352	0.01705	0.00007	6	1	17
12	176	0.00000	0.00000	0	0	0
Total	3,397	0.01560	0.00007	53	5	9

Table 43. Atlantic sturgeon CPUE and at-net mortality by mesh size from the Pamlico Sound Independent Gill Net Survey, NC from 2001 through 2011. Pamlico Sound effort based on 1 gang of nets (3.0–6.5 ISM) set for 12 hours.

Mesh Size (ISM)	Effort	CPUE (per Gang of Net)	CPUE (per yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
3.0	3,397	0.00147	0.00005	5	1	20
3.5	3,397	0.00177	0.00006	6	1	17
4.0	3,397	0.00236	0.00008	8	1	13
4.5	3,397	0.00206	0.00007	7	0	0
5.0	3,397	0.00236	0.00008	8	0	0
5.5	3,397	0.00294	0.00010	10	1	10
6.0	3,397	0.00118	0.00004	4	0	0
6.5	3,397	0.00147	0.00005	5	1	20
Total	27,176	0.00195	0.00007	53	5	9

Table 44. Fork length measurements (mm; mean, minimum, and maximum) of Atlantic sturgeon collected in the Pamlico Sound, and Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey from 2001 through 2011.

Year	Pamlico Sound			Pamlico, Pungo, and Neuse rivers		
	Mean fork length	Minimum fork length	Maximum fork length	Mean fork length	Minimum fork length	Maximum fork length
2001						
2002	657	657	657			
2003	765	765	765			
2004	531	460	685	607	470	802
2005	663	574	795	463	358	794
2006	687	522	790	627	480	735
2007	848	654	1,495	516	400	714
2008	795	643	947	532	532	532
2009	967	967	967	716	716	716
2010	606	500	698			
2011						2,300
Total	679	460	1,495	513	358	2,300

Table 45. Atlantic sturgeon CPUE and at-net mortality by year from the Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey, NC from 2003 through 2011. Pamlico, Pungo, and Neuse rivers effort based on 1 gang of nets (3–6.5 ISM) set for 12 hours.

Year	Sets (n)	CPUE (per Gang of Net)	CPUE (per Yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
2003	158	0.00000	0.00000	0	0	0
2004	320	0.02500	0.00010	8	0	0
2005	304	0.09539	0.00040	29	4	14
2006	320	0.01250	0.00005	4	2	50
2007	320	0.00938	0.00004	3	0	0
2008	320	0.00313	0.00001	1	0	0
2009	320	0.00313	0.00001	1	0	0
2010	320	0.00000	0.00000	0	0	0
2011	320	0.00313	0.00001	1	0	0
Total	2,702	0.01933	0.00008	47	6	13

Table 46. Atlantic sturgeon CPUE and at-net mortality by month from the Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey, NC from 2003 through 2011. No effort is expended during the month of January. Pamlico, Pungo, and Neuse rivers effort based on 1 gang of nets (3–6.5 ISM) set for 12 hours.

Month	Sets (n)	CPUE (per Gang of Net)	CPUE (per Yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
2	128	0.00781	0.00003	1	0	0
3	257	0.00000	0.00000	0	0	0
4	256	0.00781	0.00003	2	0	0
5	256	0.01563	0.00007	4	1	25
6	255	0.01961	0.00008	5	0	0
7	268	0.02239	0.00009	6	1	17
8	290	0.01379	0.00006	4	0	0
9	272	0.02206	0.00019	6	4	67
10	289	0.03114	0.00013	9	0	0
11	287	0.02091	0.00009	6	0	0
12	144	0.02778	0.00012	4	0	0
Total	2,702	0.01739	0.00007	47	6	13

Table 47. Atlantic sturgeon CPUE and at-net mortality by mesh size from the Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey, NC from 2003 through 2011. Pamlico, Pungo, and Neuse rivers effort based on 1 gang of nets (3–6.5 ISM) set for 12 hours.

Mesh Size (ISM)	Effort	CPUE (per Gang of Net)	CPUE (per yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
3.0	2,702	0.00481	0.00016	13	2	15
3.5	2,702	0.00444	0.00015	12	0	0
4.0	2,702	0.00259	0.00009	7	2	29
4.5	2,702	0.00222	0.00007	6	1	17
5.0	2,702	0.00111	0.00004	3	0	0
5.5	2,702	0.00111	0.00004	3	1	33
6.0	2,702	0.00074	0.00002	2	0	0
6.5	2,702	0.00037	0.00001	1	0	0
Total	21,616	0.00216	0.00007	47	6	13

Table 48. Atlantic sturgeon CPUE and at-net mortality by month from the Cape Fear River Independent Gill Net Survey, NC from 2008 through 2011. Cape Fear River effort based on 1 gang of nets (3.0–6.5 ISM) set for 12 hours.

Year	Sets (n)	CPUE (per Gang of Net)	CPUE (per Yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
2008	30	0.033333	0.000139	1	0	0
2009	42	0.023810	0.000099	1	0	0
2010	40	0.025000	0.000104	1	1	100
2011	40	0.025000	0.000104	1	0	0
Total	152	0.026316	0.000110	4	1	25

Table 49. Atlantic sturgeon CPUE and at-net mortality by month from the Long Bay Independent Gill Net Survey, NC from 2008 through 2011. Long Bay effort based on 1 gang of nets (3.0–6.5 ISM) set for 12 hours.

Year	Sets (n)	CPUE (per Gang of Net)	CPUE (per Yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
2008	3	0	0	0		
2009	8	0.500000	0.001852	4	0	0
2010	6	0.500000	0.001852	3	1	33
2011	6	0	0	0		
Total	23	0.304348	0.001268	7	1	14

Table 50. Atlantic sturgeon CPUE and at-net mortality by month from the New River Independent Gill Net Survey, NC from 2008 through 2011. New River effort based on 1 gang of nets (3.0–6.5 ISM) set for 12 hours.

Year	Sets (n)	CPUE (per Gang of Net)	CPUE (per Yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
2008	54	0	0	0		
2009	76	0	0	0		
2010	80	0	0	0		
2011	80	0	0	0		
Total	290	0	0	0		

Table 51. Atlantic sturgeon CPUE and at net mortality by month from the Onslow Bay Independent Gill Net Survey, NC from 2008 through 2011. Onslow bay effort based on 1 gang of nets (3.0–6.5 ISM) set for 12 hours.

Year	Sets (n)	CPUE (per Gang of Net)	CPUE (per Yard)	Atlantic Sturgeon (n)	Mortality (n)	Mortality (%)
2008	10	0	0	0		
2009	16	0	0	0		
2010	16	0	0	0		
2011	16	0.125000	0.000463	2	0	0
Total	58	0.034483	0.000144	2	0	

Table 52. Fork length measurements (mean, minimum, and maximum) of Atlantic sturgeon collected in the Cape Fear and Long Bay independent gill net surveys from 2008 through 2011.

Year	Cape Fear River			Long Bay		
	Mean fork length	Minimum fork length	Maximum fork length	Mean fork length	Minimum fork length	Maximum fork length
2008	700	700	700			
2009	569	569	569	600	412	870
2010	873	873	873	796	665	960
2011	765	765	765			
Total	727	569	873	684	412	960

## Figures

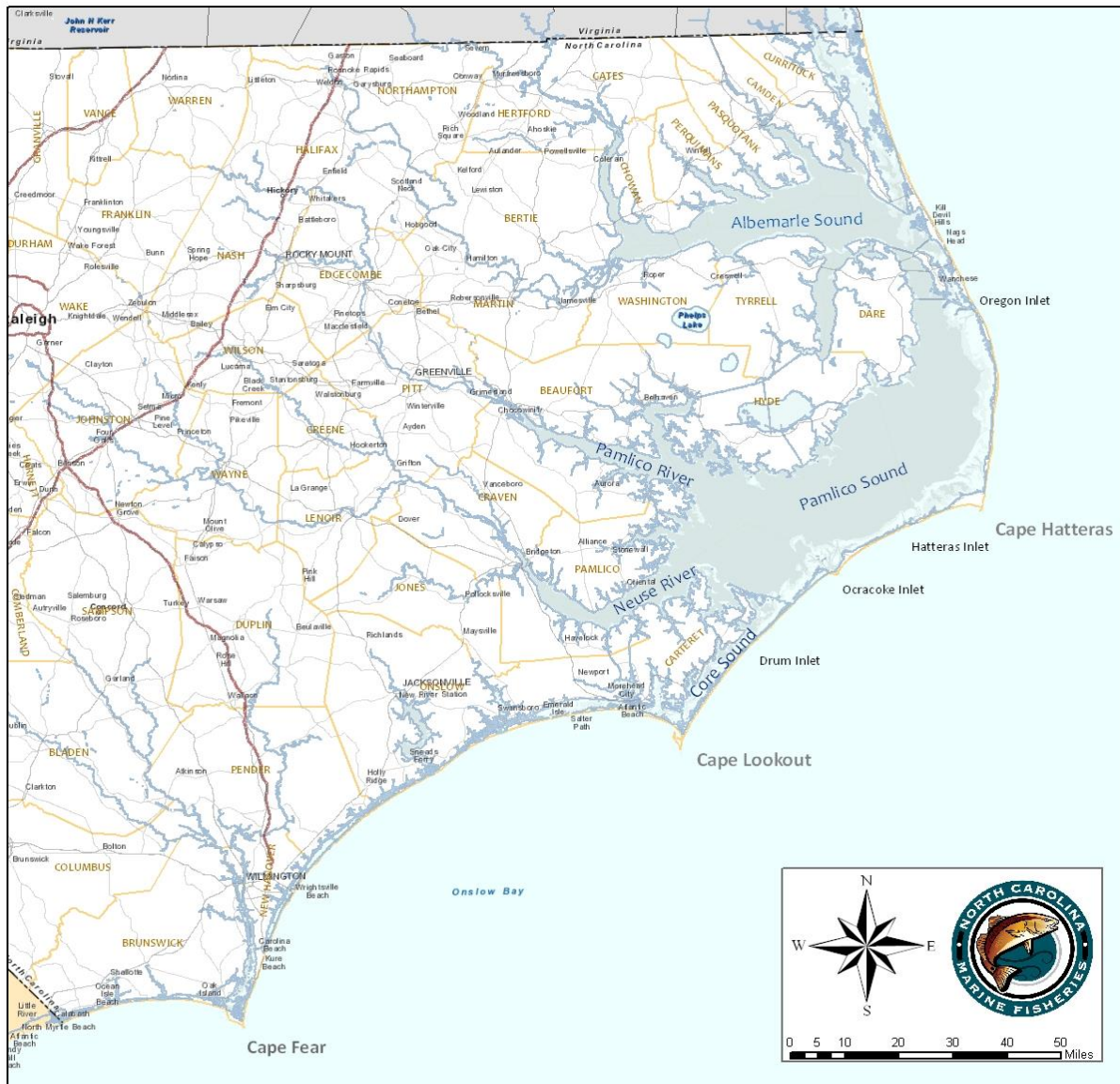


Figure 1. Map of North Carolina waters.

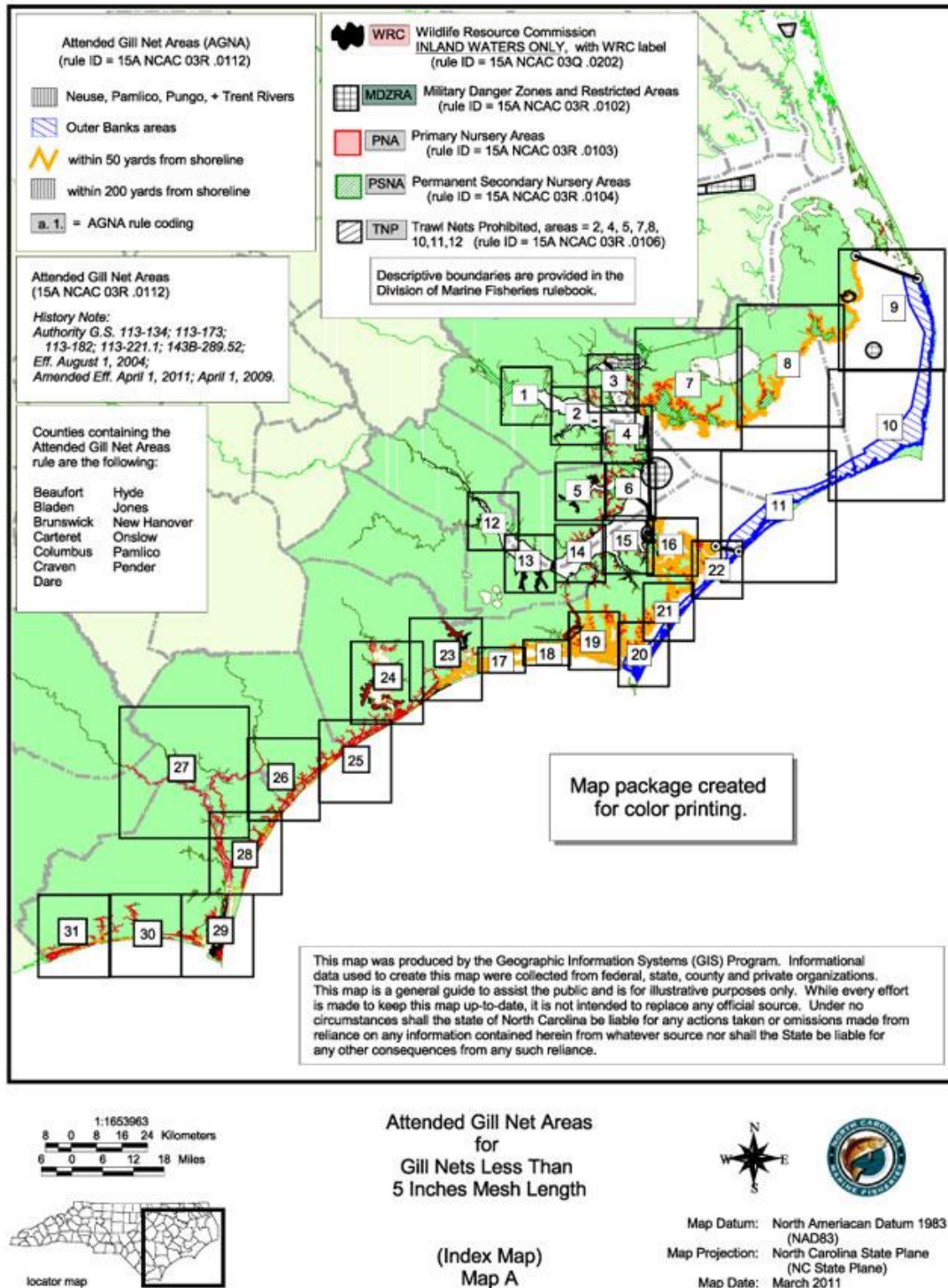


Figure 2. Map of the small mesh (<5.0 ISM) attendance requirements throughout North Carolina waters <http://portal.ncdenr.org/web/mf/attended-gill-net-areas>



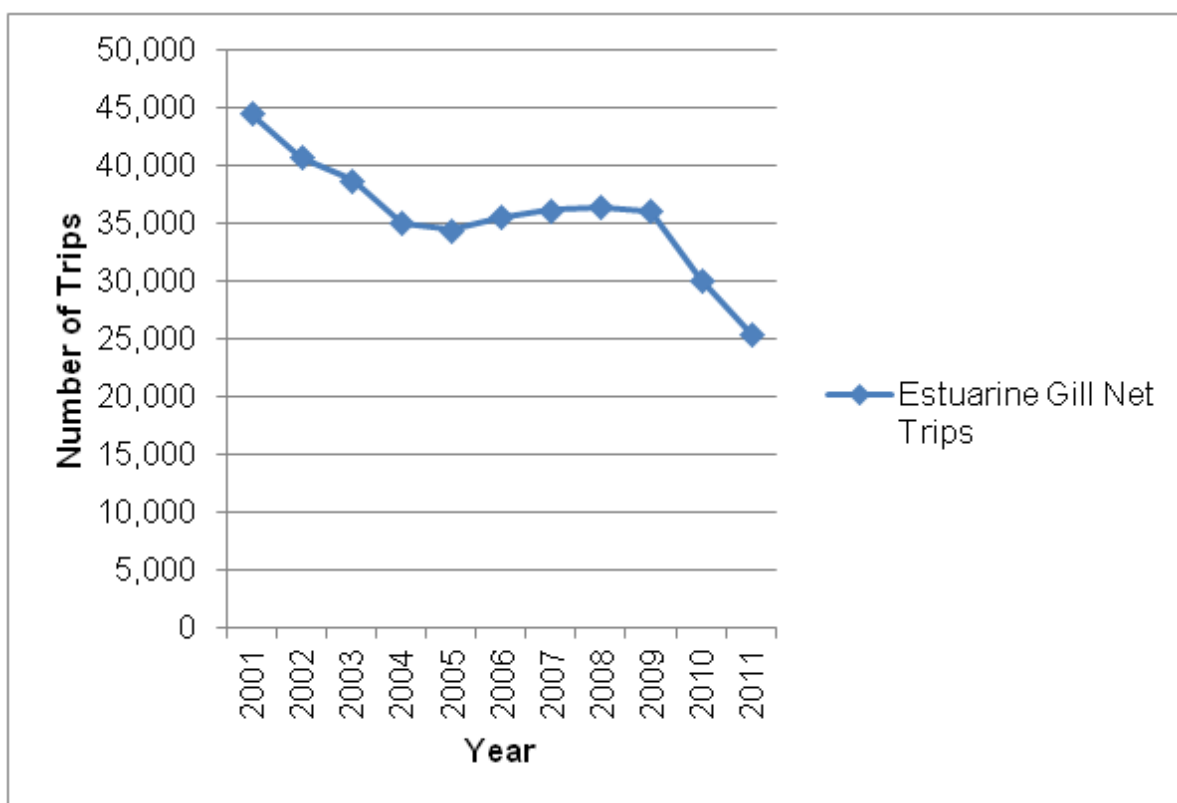


Figure 3. Number of trips by year for the North Carolina estuarine gill net fishery from 2001 through 2011.

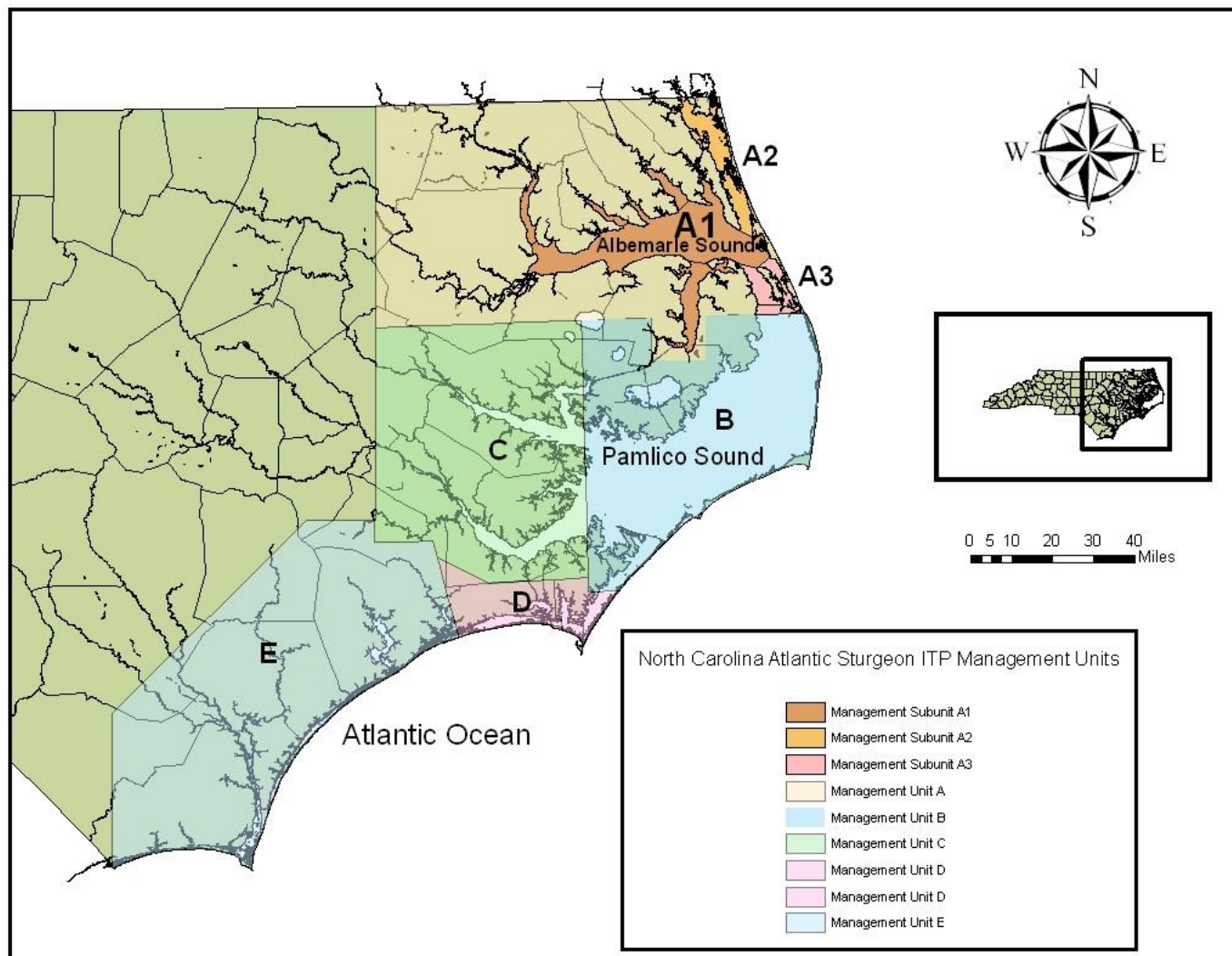


Figure 4. Management units for the North Carolina Atlantic sturgeon ITP application.

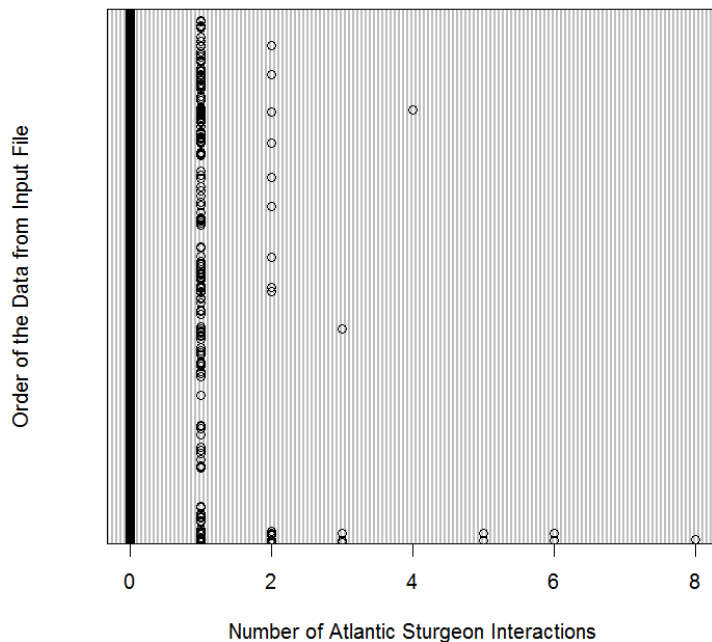


Figure 5. Cleveland dotplot for counts of Atlantic sturgeon in the North Carolina Observer Program and Striped Bass Independent Gill Net Survey from 2004 through 2011.

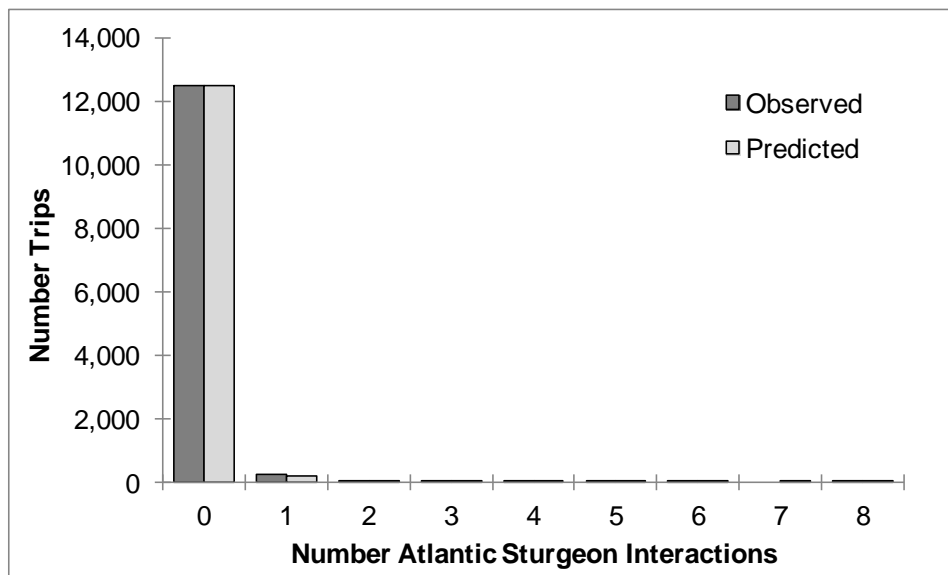


Figure 6. Comparison of observed frequencies to frequencies predicted by the ZIP GLM fit to the Atlantic sturgeon data.

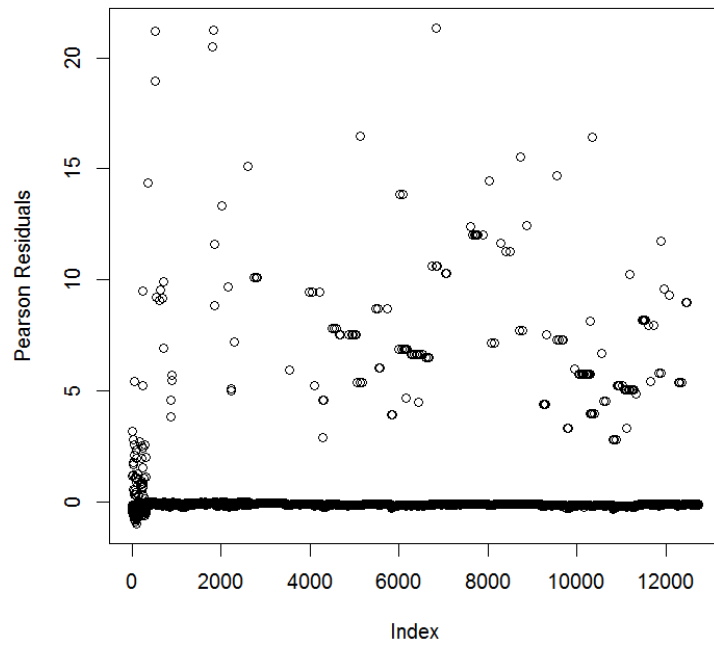


Figure 7. Index plot of Pearson residuals for the ZIP GLM fit to the Atlantic sturgeon data.

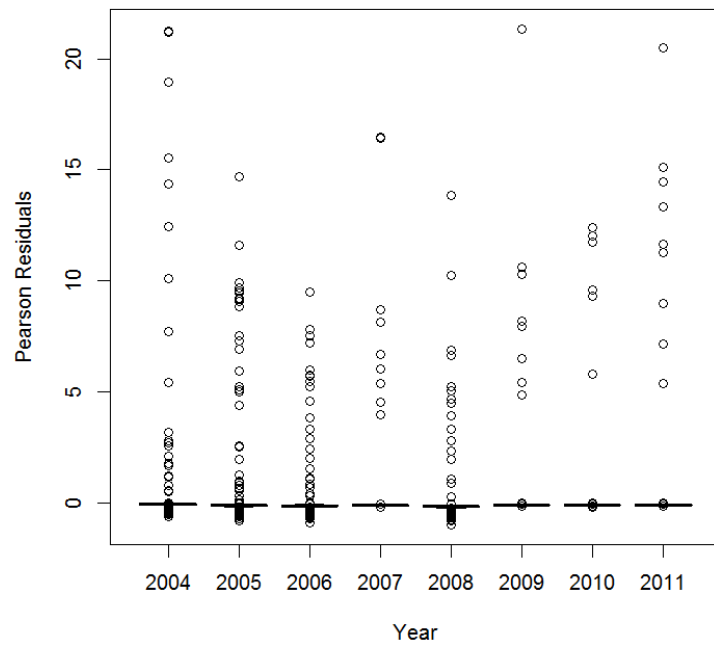


Figure 8. Annual average residuals from the ZIP GLM fit to the Atlantic sturgeon data.

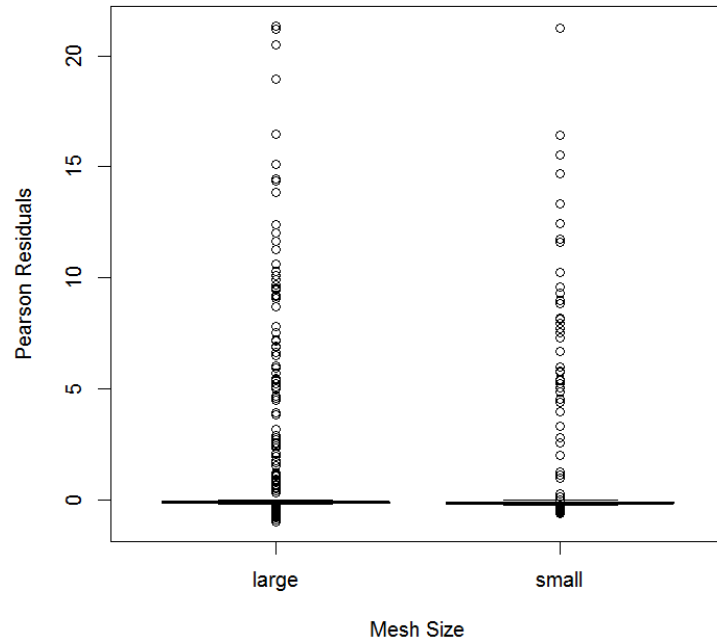


Figure 9. Average residuals by mesh size from the ZIP GLM fit to the Atlantic sturgeon data.

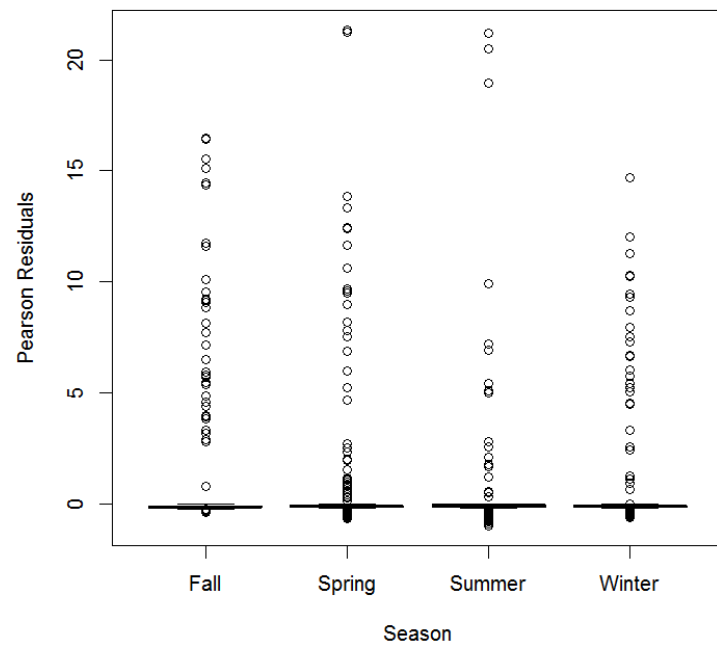


Figure 10. Average residuals by season from the ZIP GLM fit to the Atlantic sturgeon data.

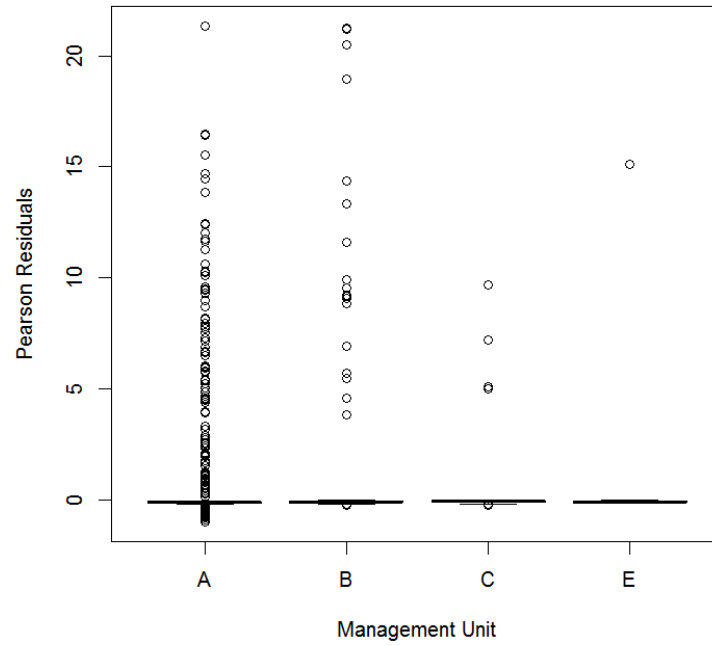


Figure 11. Average residuals by management unit from the ZIP GLM fit to the Atlantic sturgeon data.

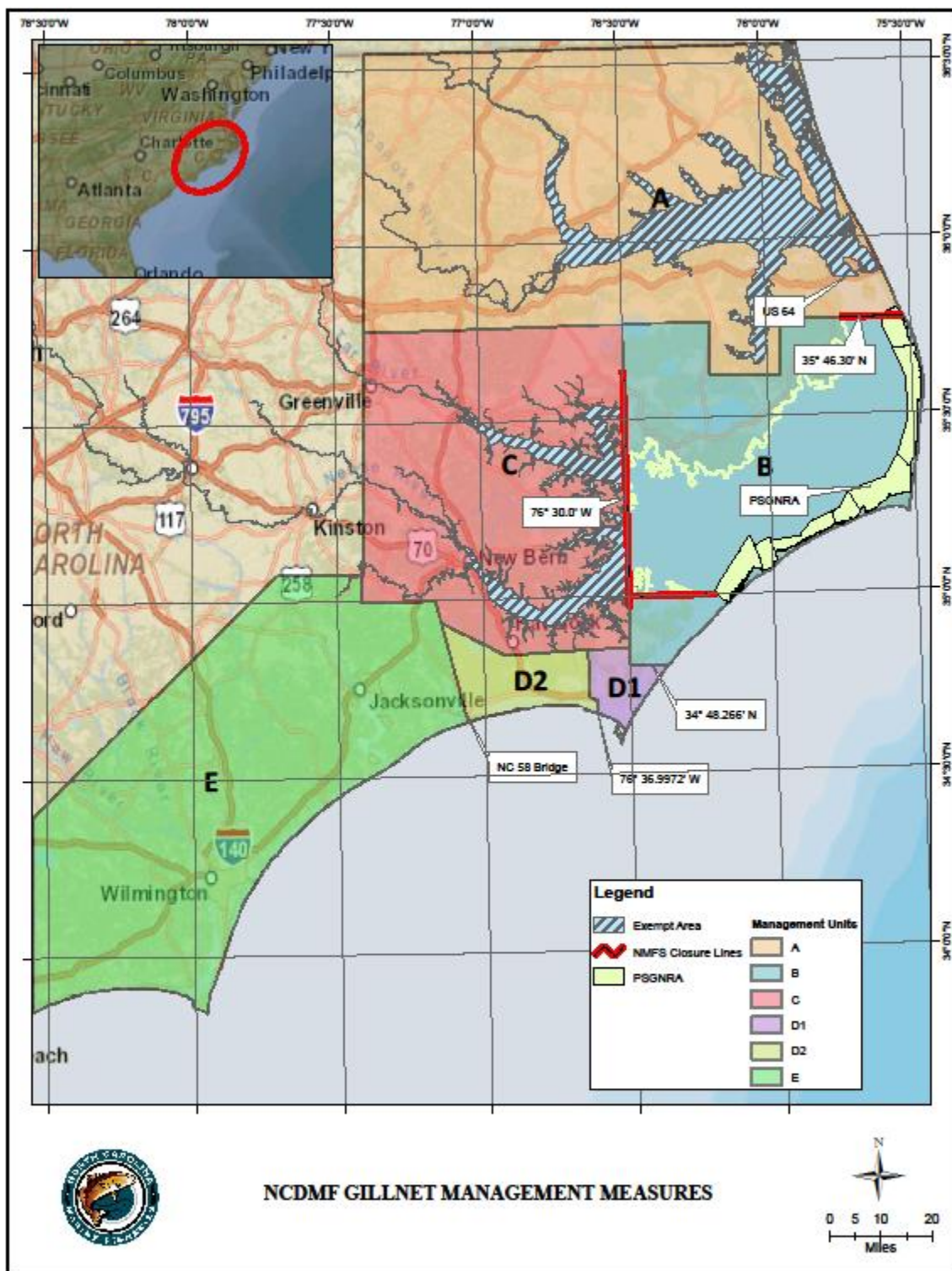


Figure 12. Management unit map with excluded gill net restricted area identified for the Albemarle Sound Area, management unit A.



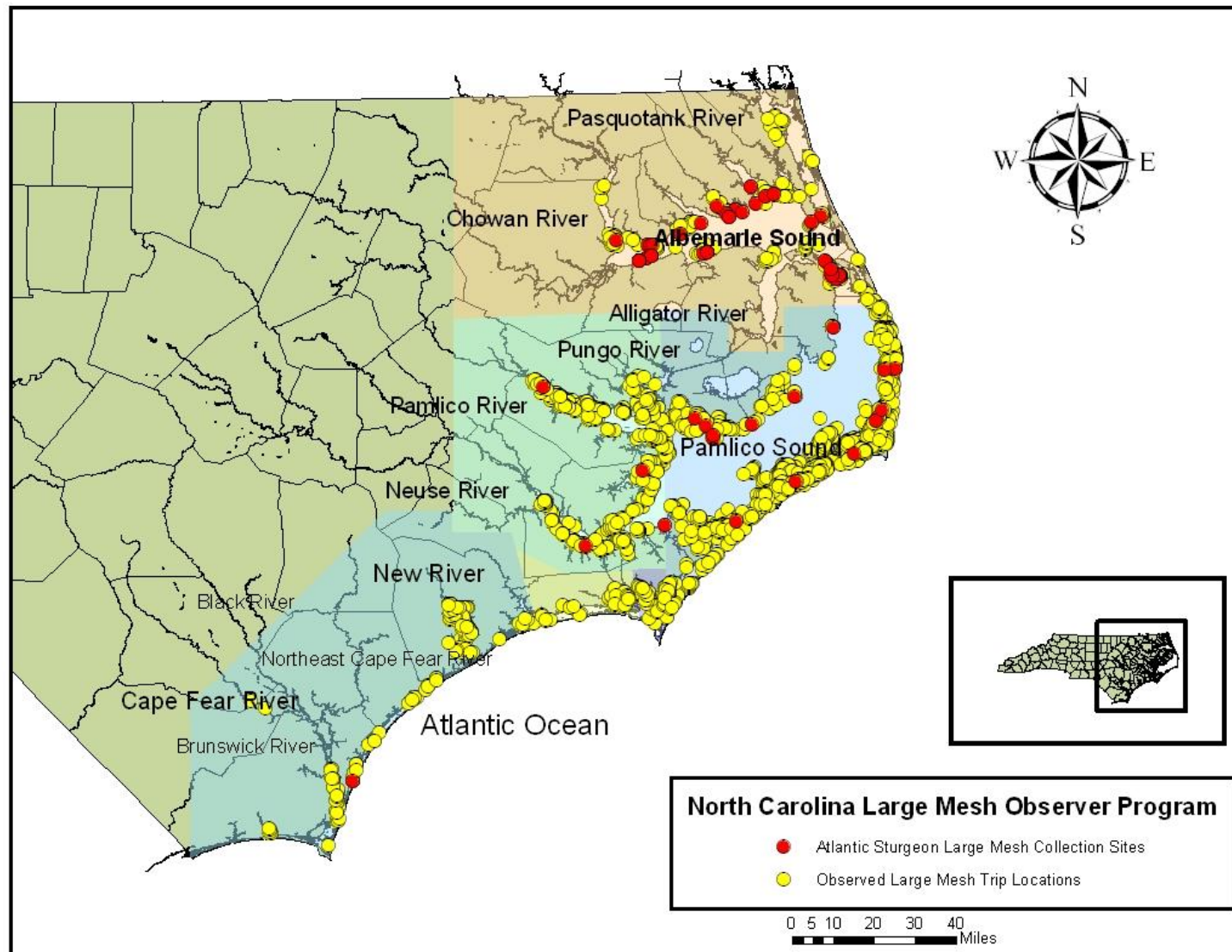


Figure 13. Locations of observed large mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program from 2001 through 2011.



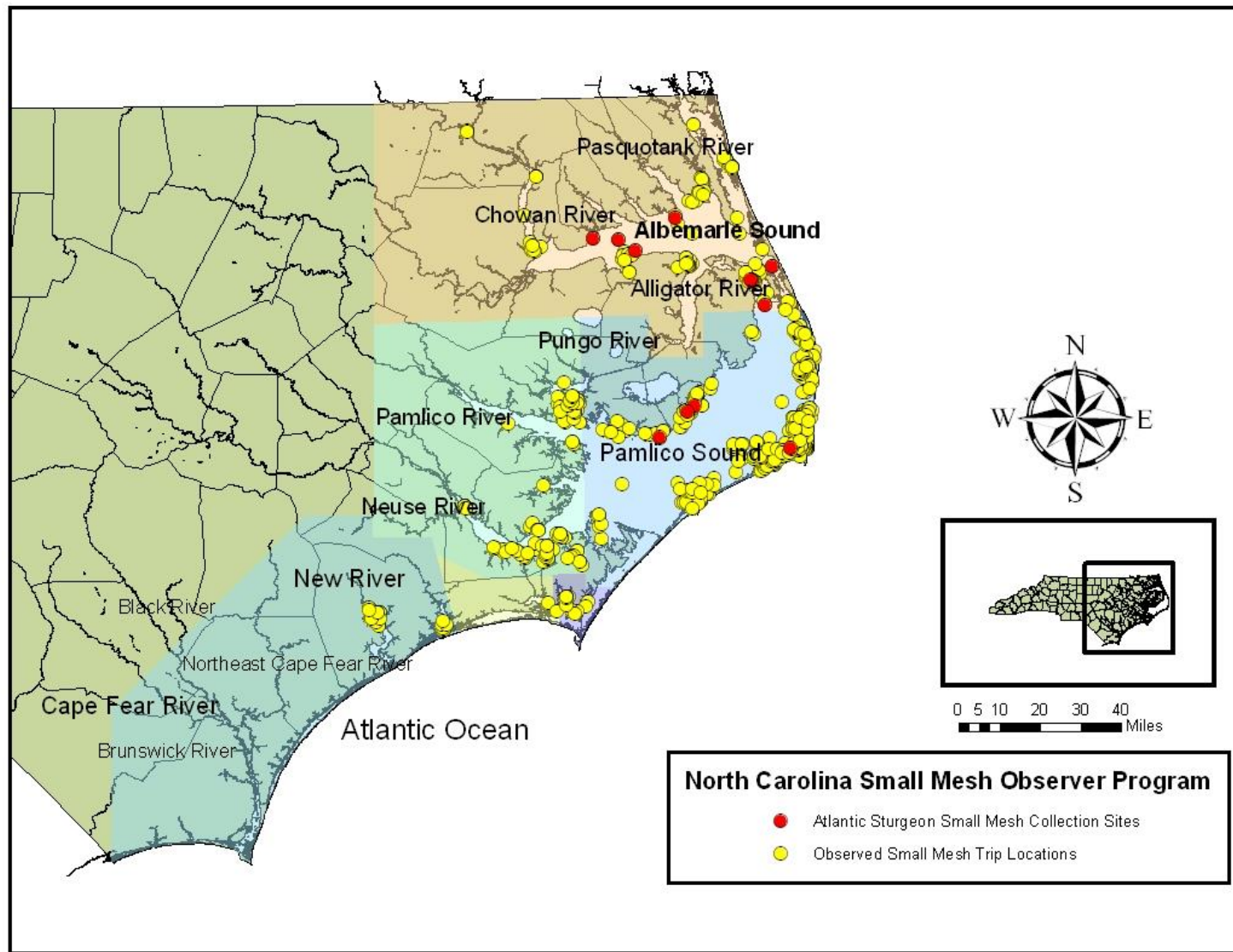


Figure 14. Locations of observed small mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program from 2001 through 2011.

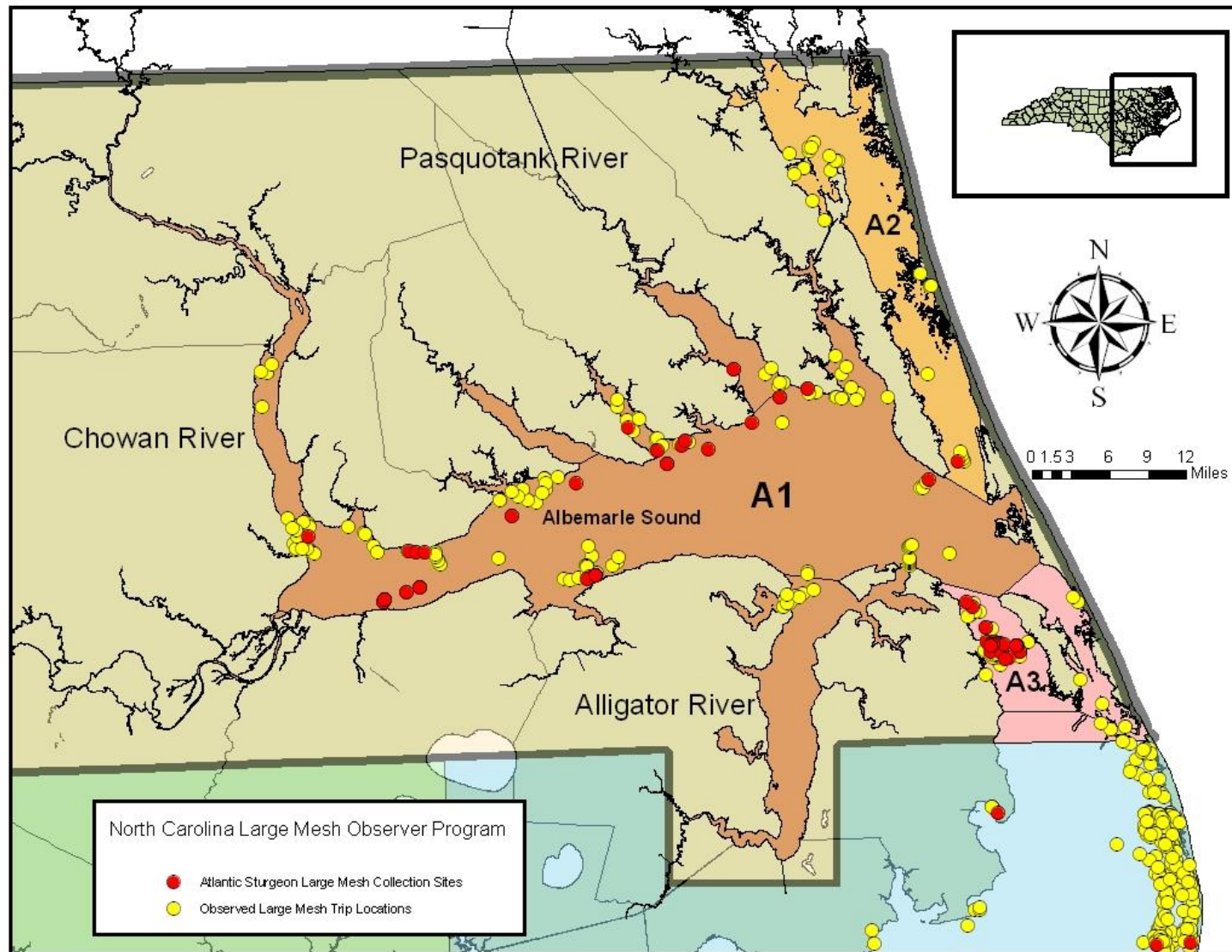


Figure 15. Locations of observed large mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program, management unit A from 2001 through 2011.

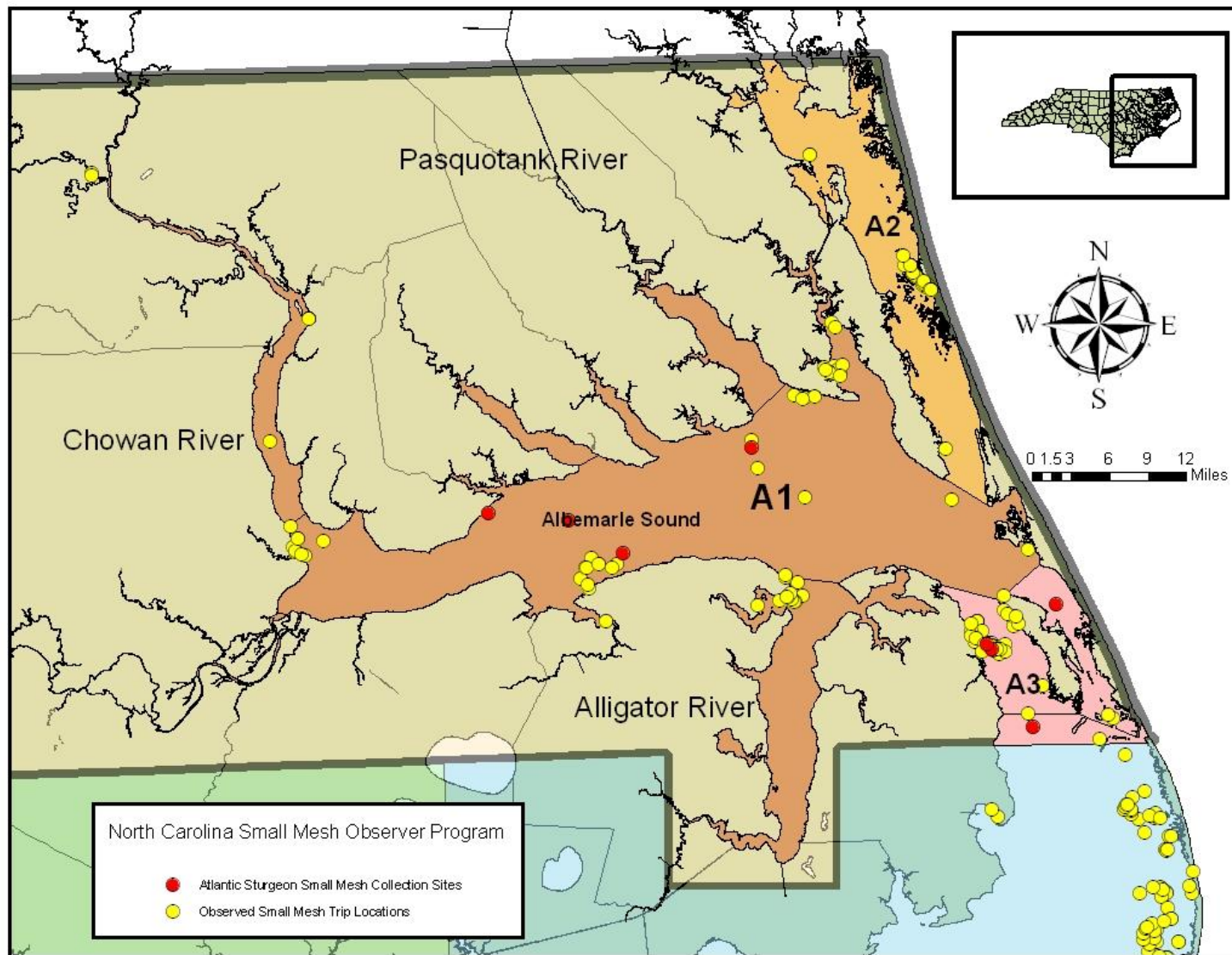


Figure 16. Locations of observed small mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program, management unit A from 2001 through 2011.



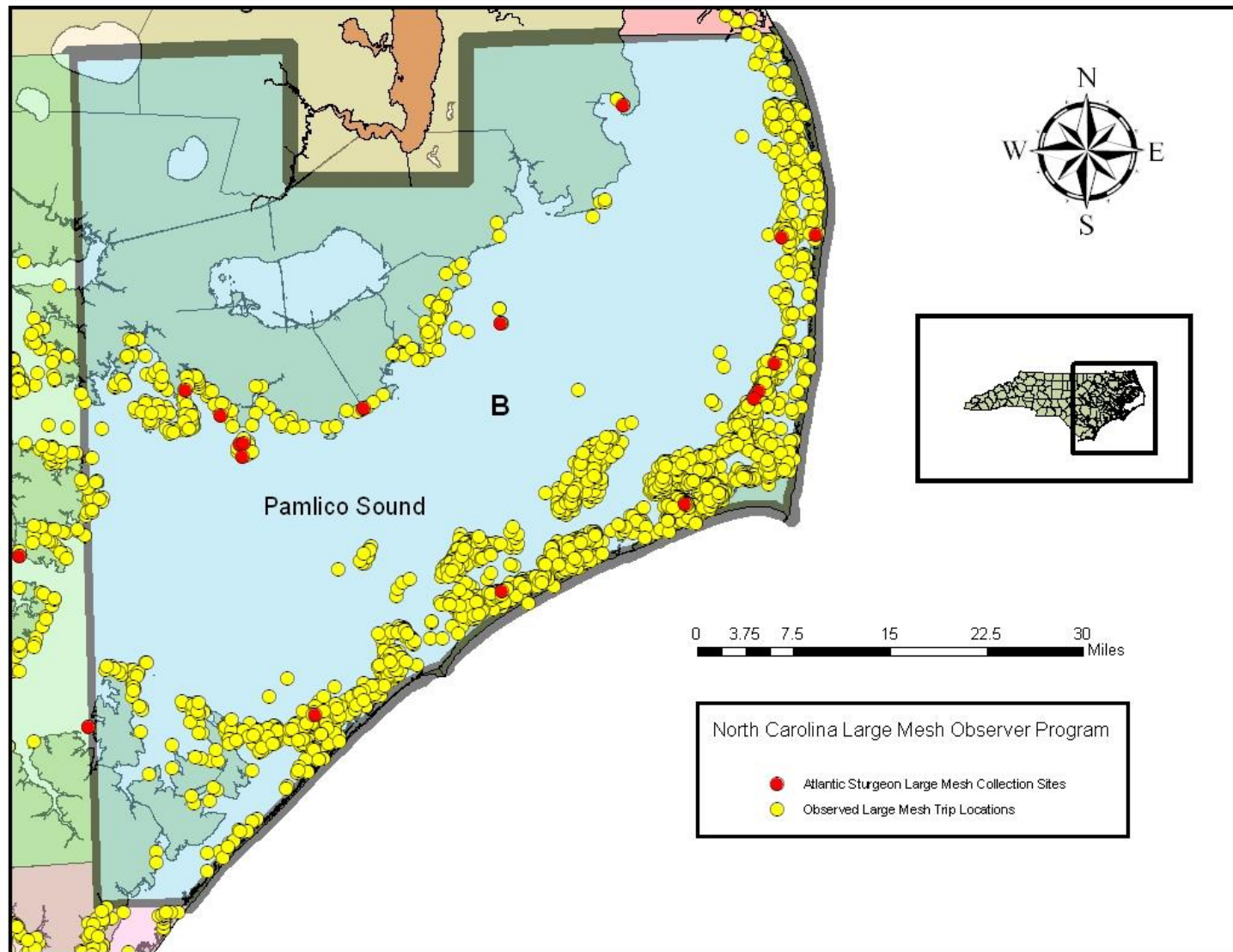


Figure 17. Locations of observed large mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program, management unit B from 2001 through 2011.

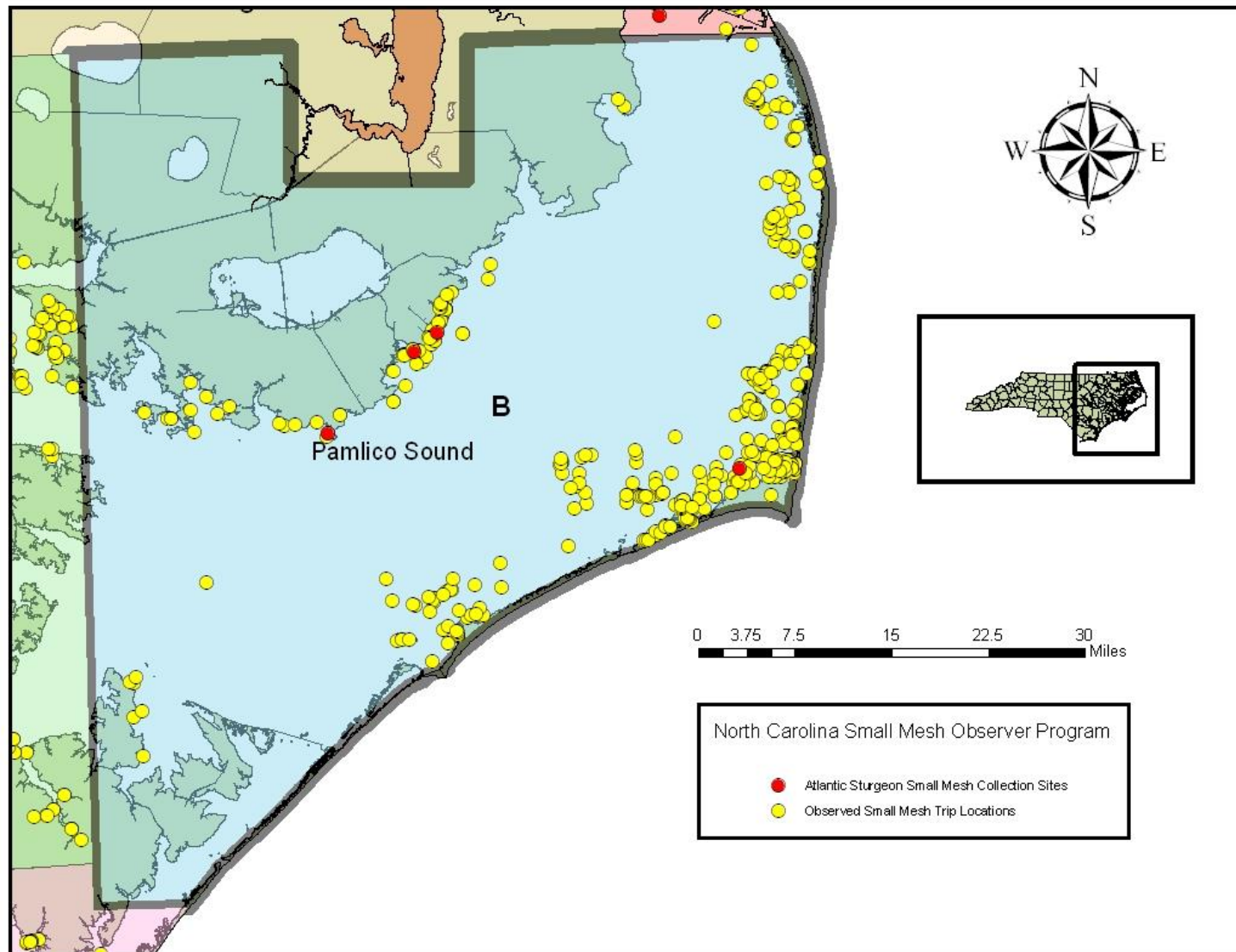


Figure 18. Locations of observed small mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program, management unit B from 2001 through 2011.

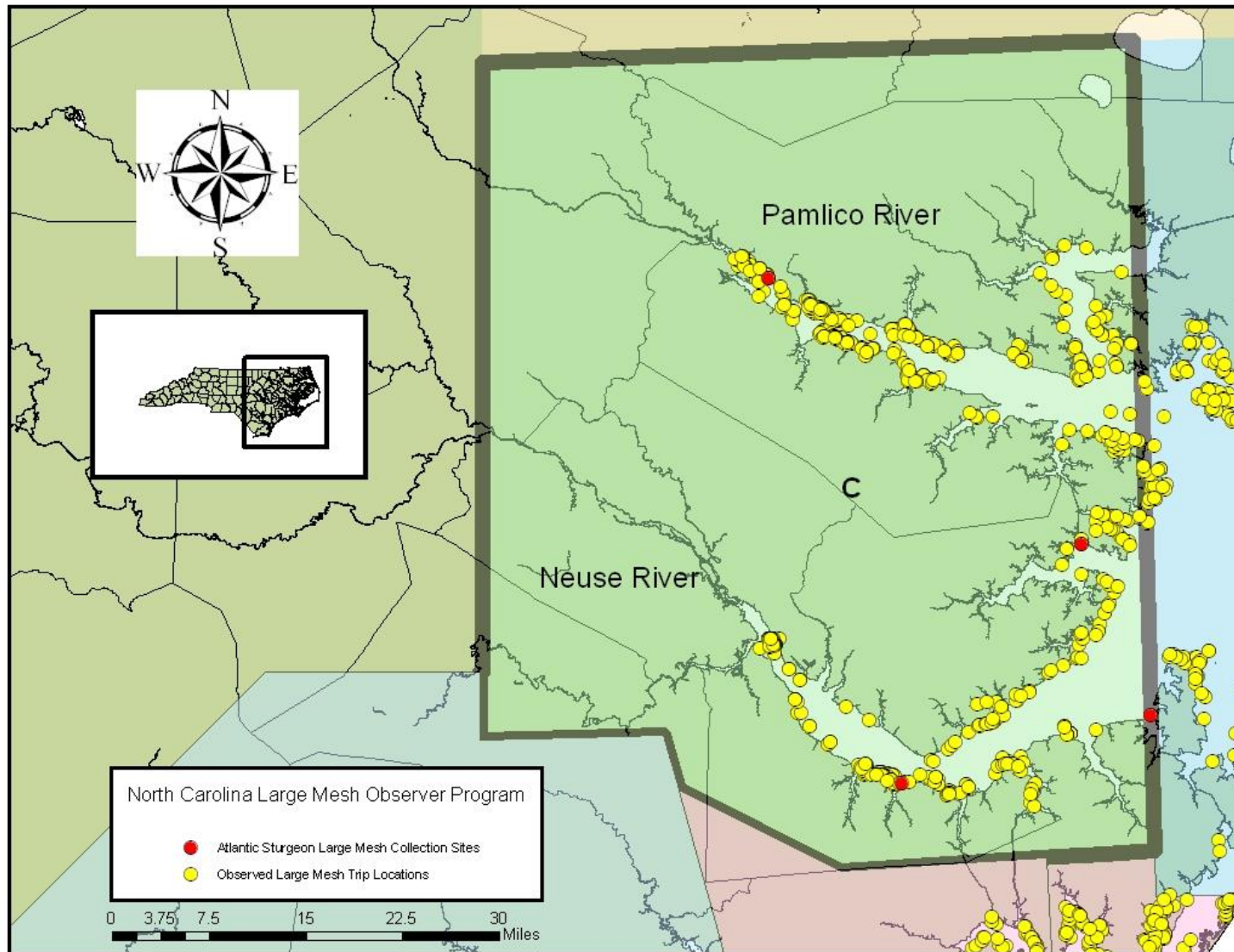


Figure 19. Locations of observed large mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program, management unit C from 2001 through 2011.



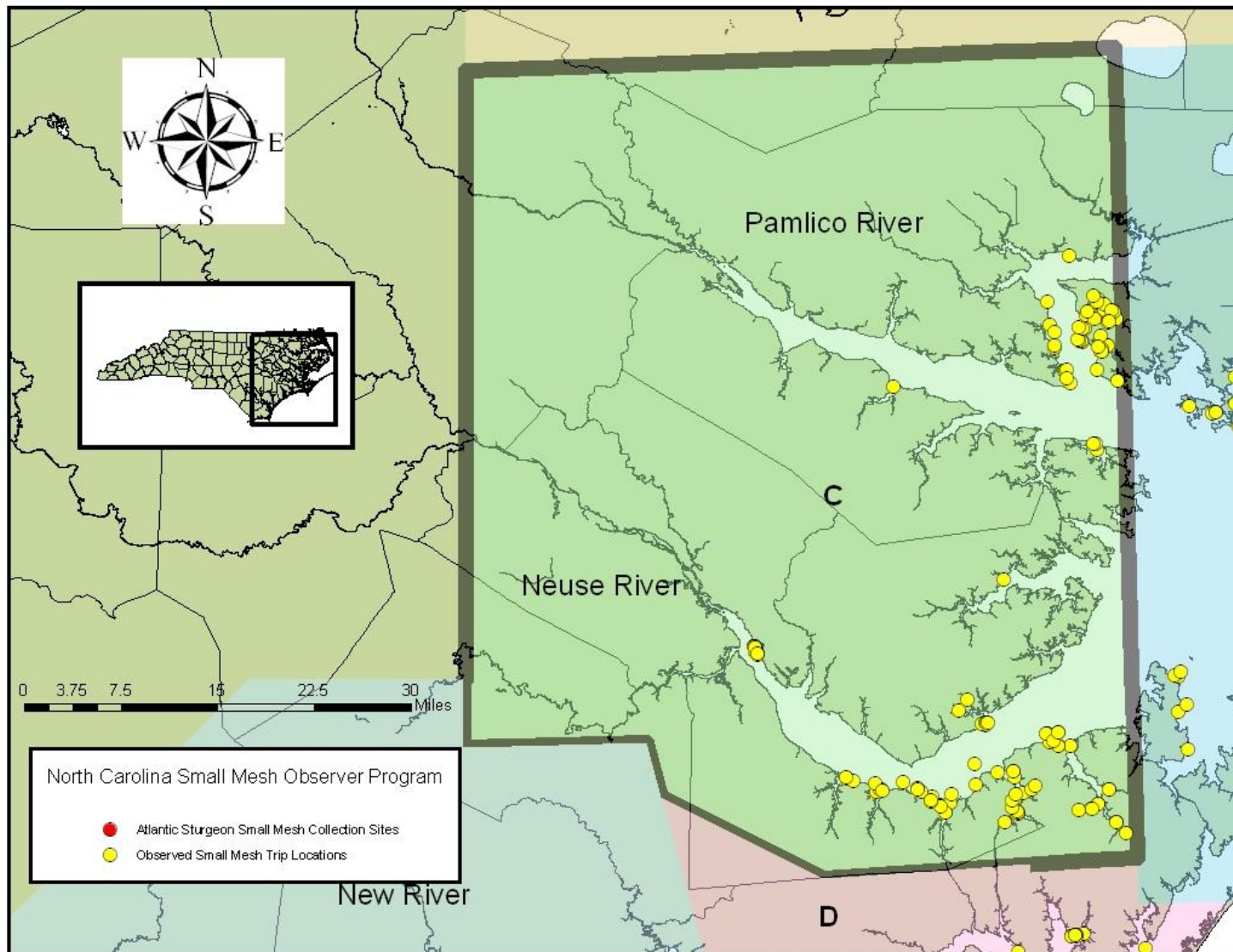


Figure 20. Locations of observed small mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program, management unit C through 2001 through 2011

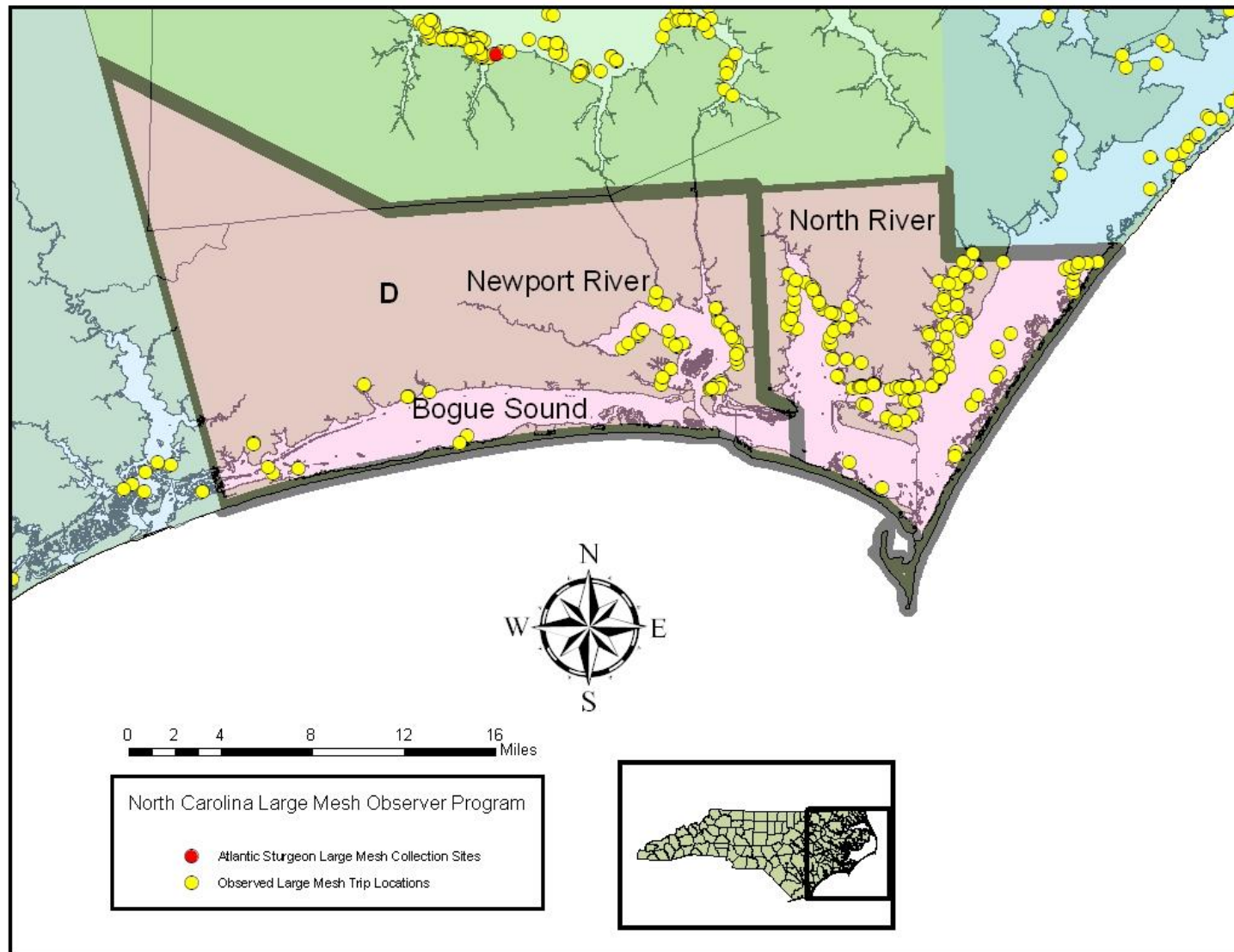


Figure 21. Locations of observed large mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program, management units, D1 and D2 from 2001 through 2011.



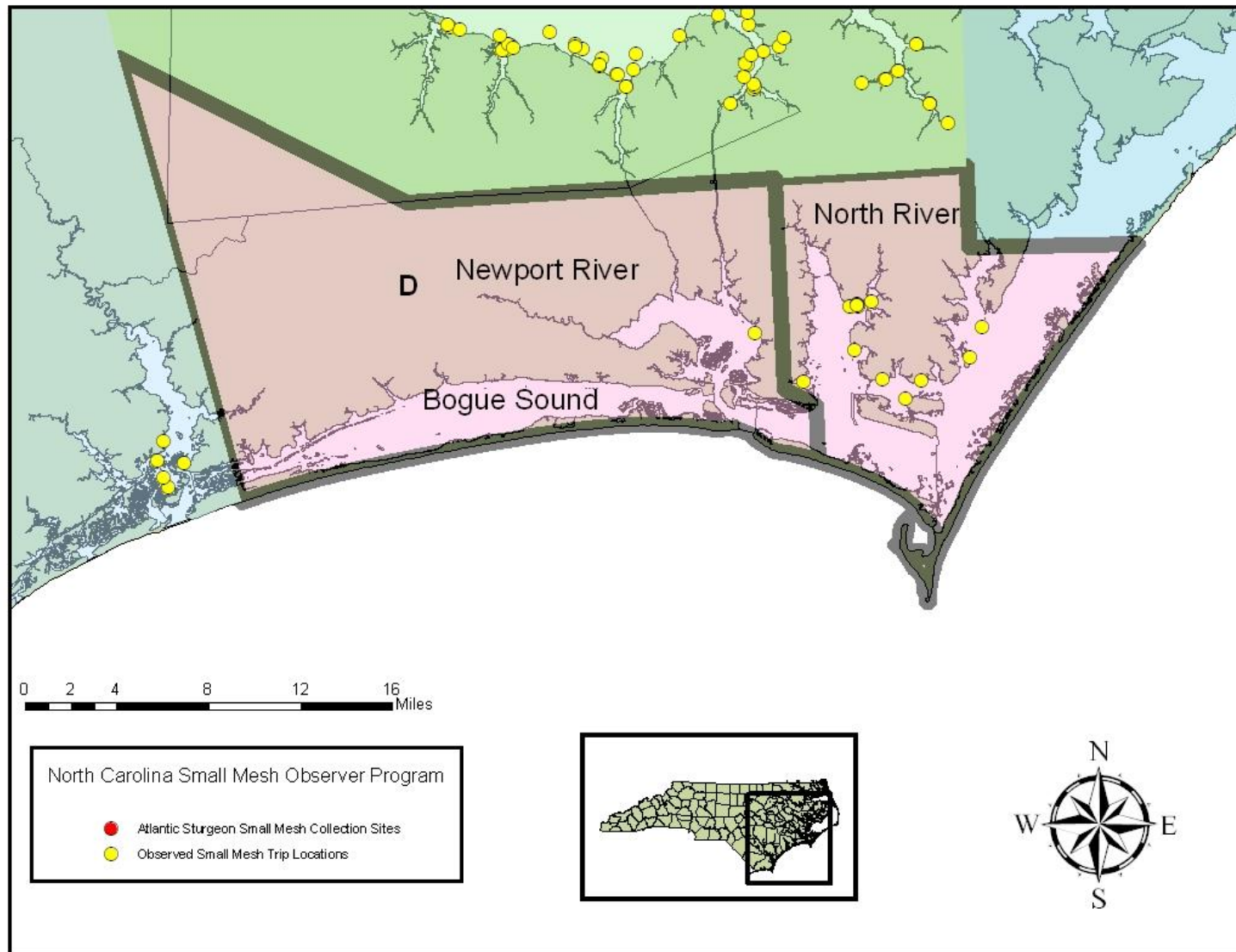


Figure 22. Locations of observed small mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program, management units, D1 and D2 from 2001 through 2011.

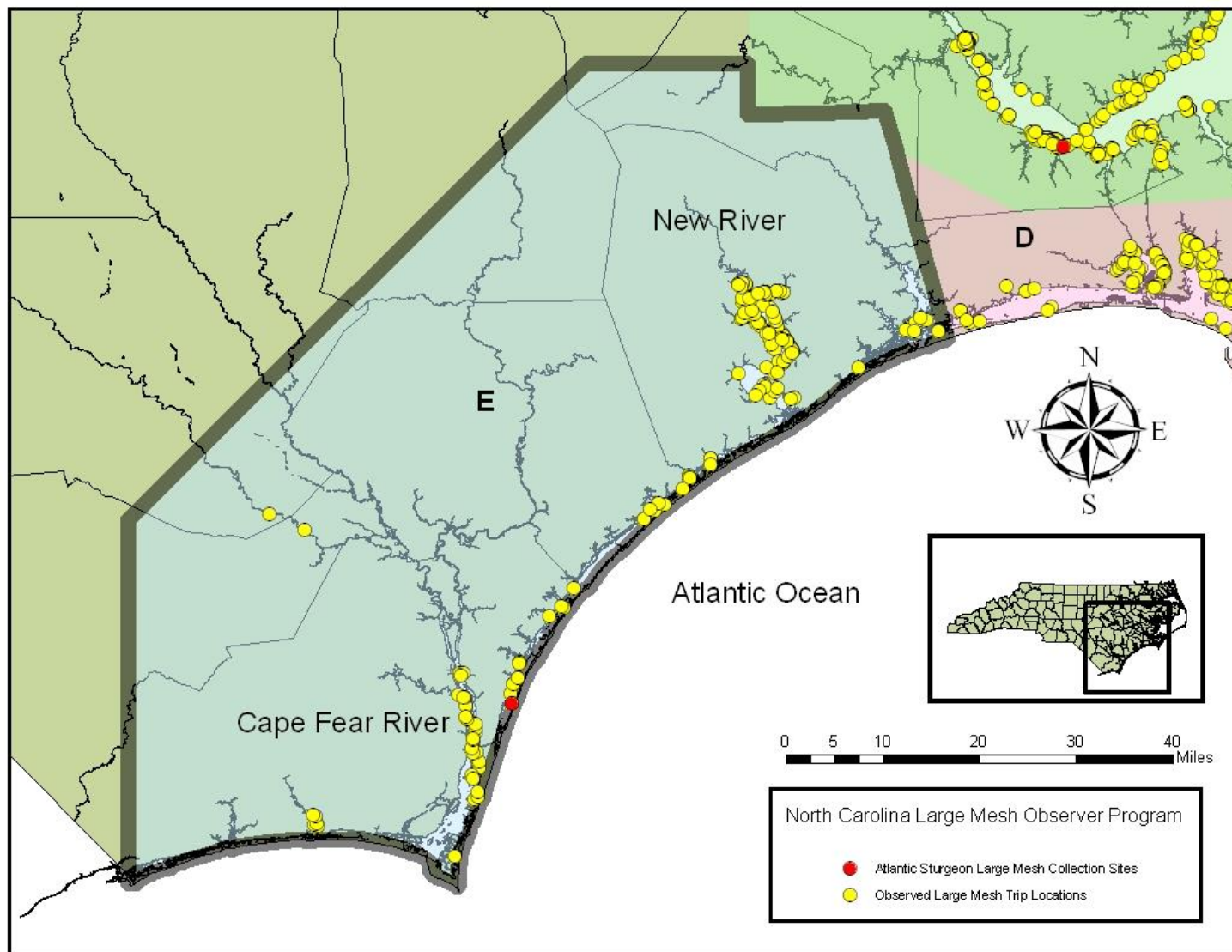


Figure 23. Locations of observed large mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program, management unit E from 2001 through 2011.

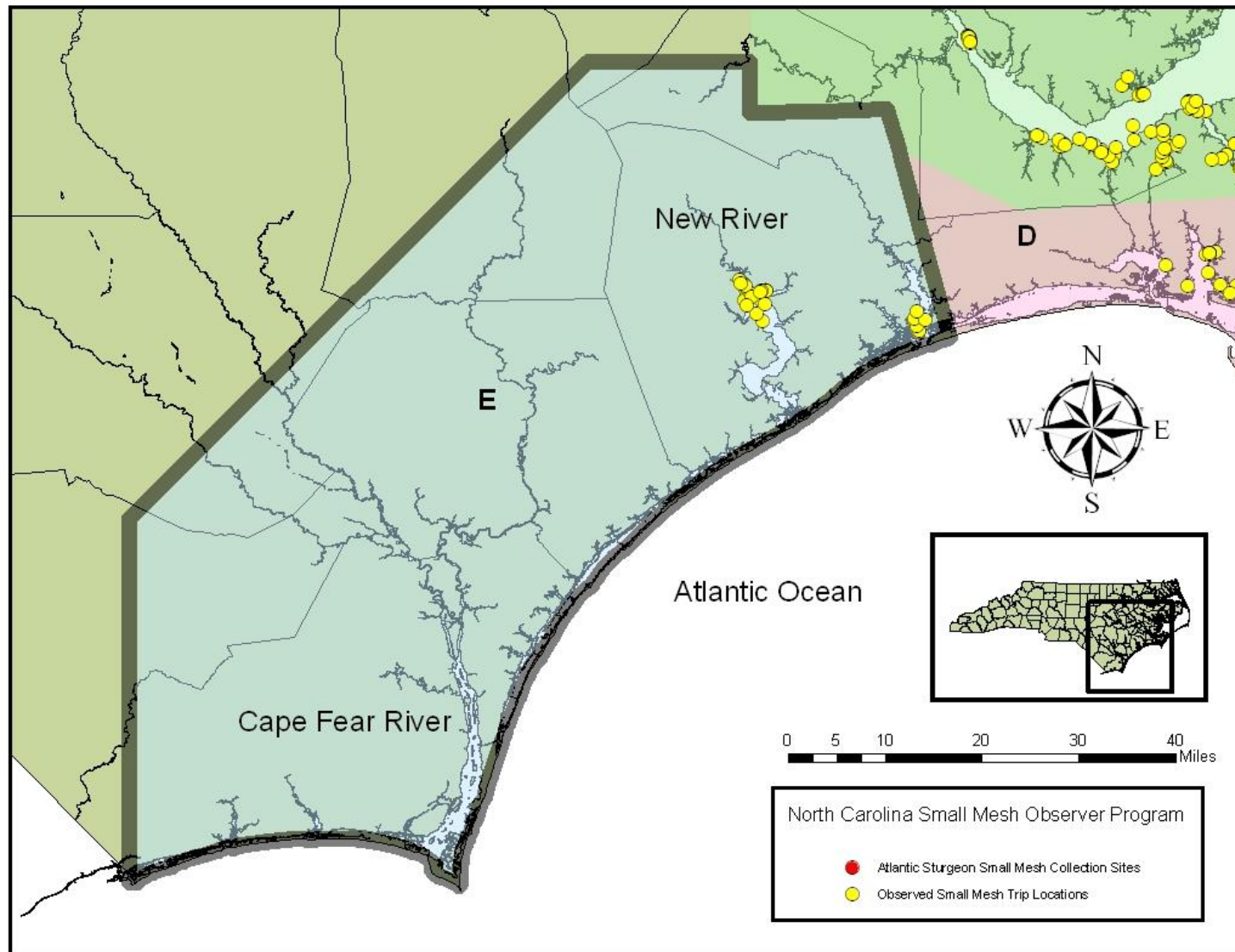


Figure 24. Locations of observed small mesh trips and interactions of Atlantic sturgeon from the North Carolina Gill Net Observer Program, management unit E from 2001 through 2011.

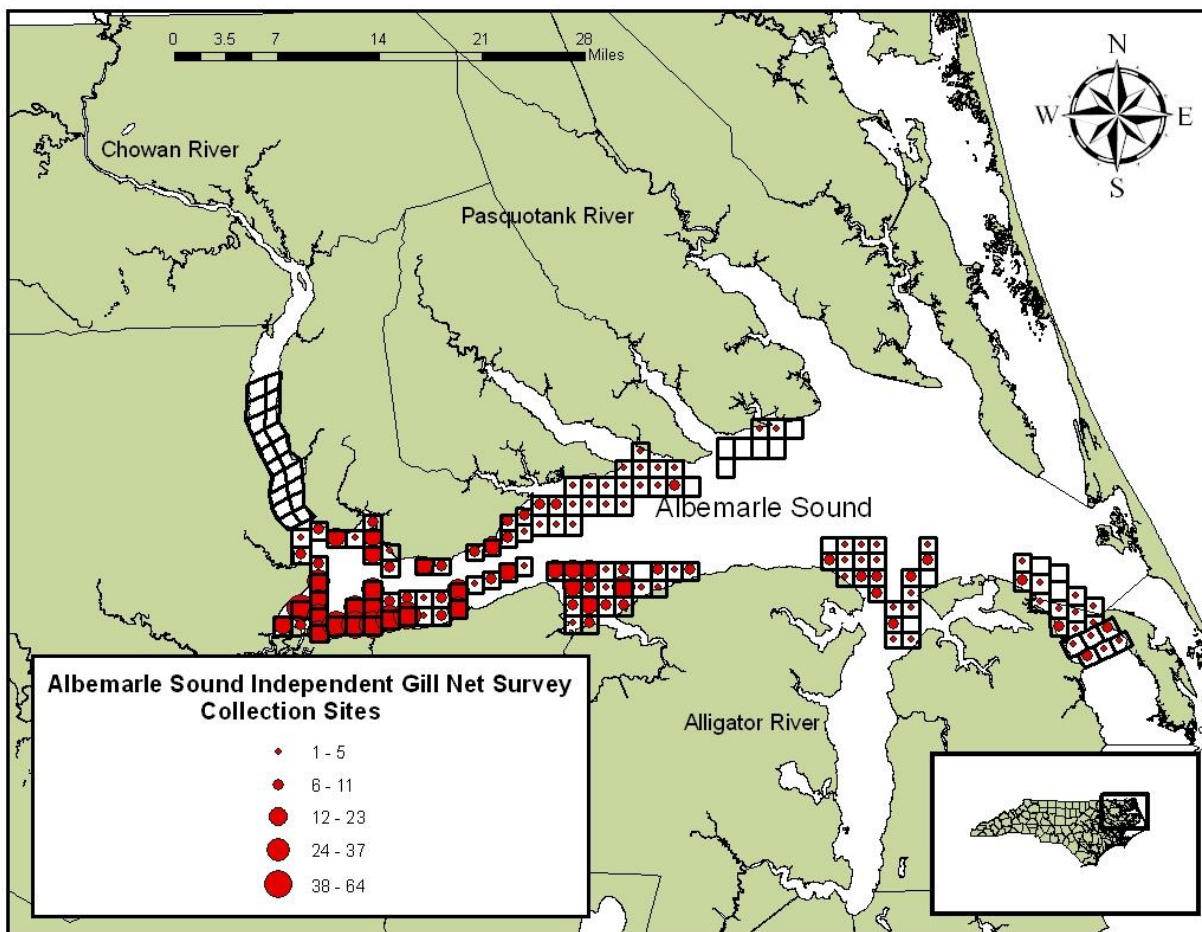


Figure 25. Atlantic sturgeon interactions by sampling zone from the Albemarle Sound Independent Gill Net Survey, NC from 1990 through 2011.



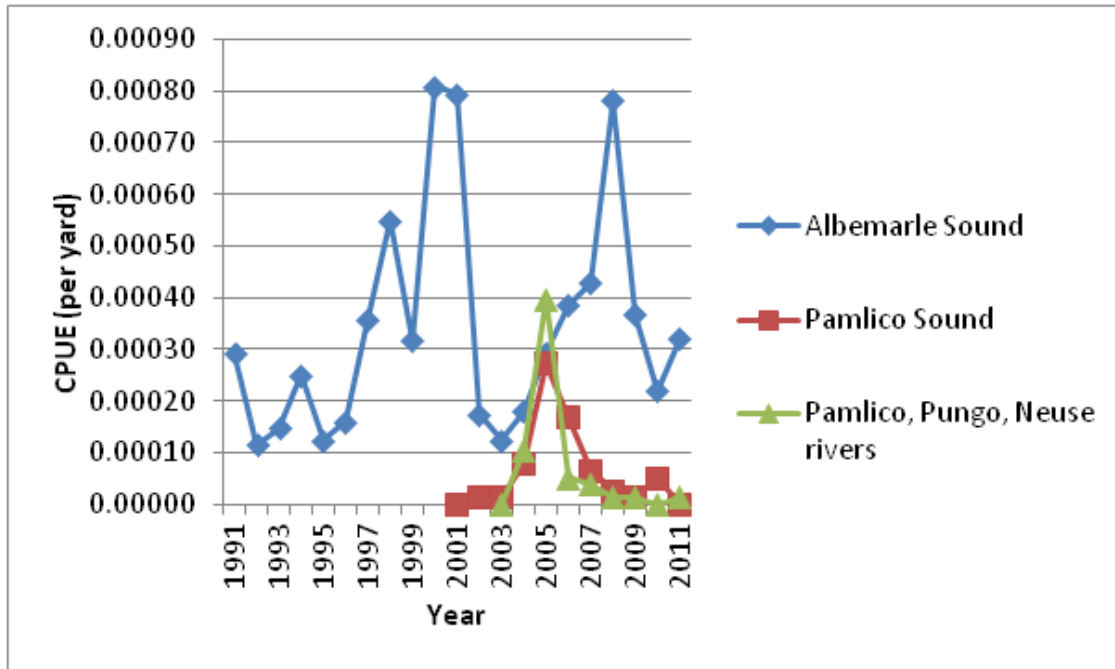


Figure 26. Atlantic sturgeon CPUE (per yard) from the North Carolina Division of Marine Fisheries independent gill net surveys from 1991 through 2011.

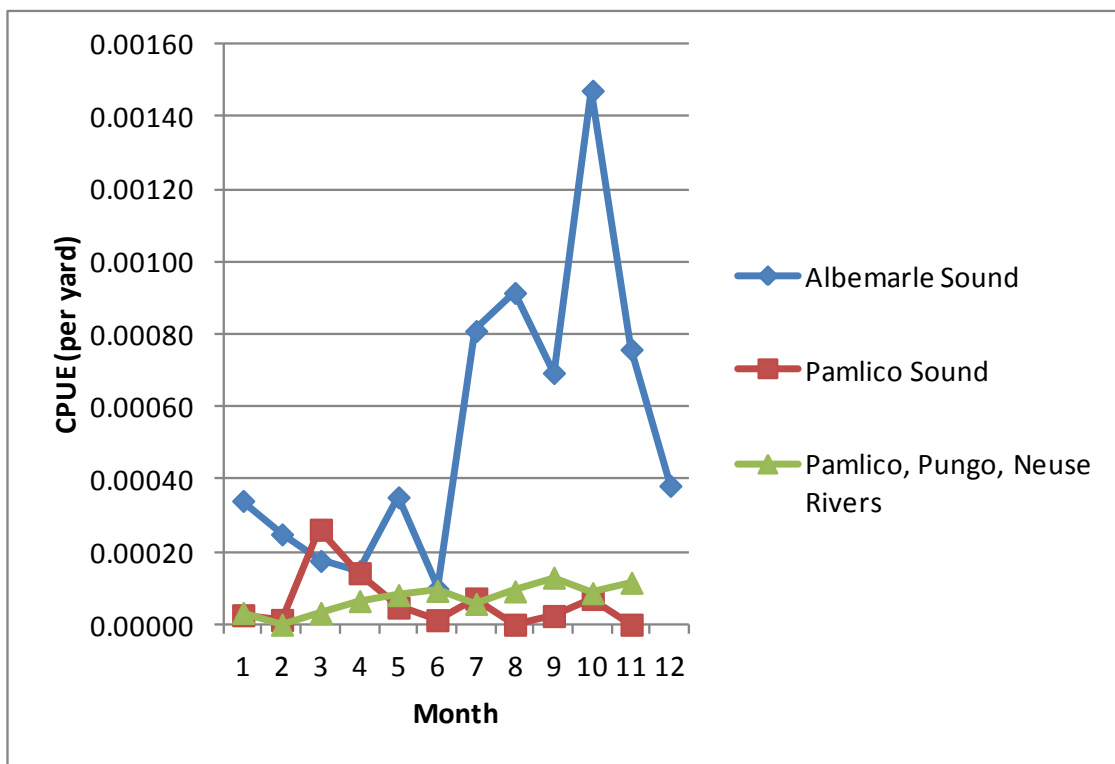


Figure 27. Atlantic sturgeon CPUE (per yard) by month from the North Carolina Division of Marine Fisheries independent gill net surveys from 1991 through 2011.

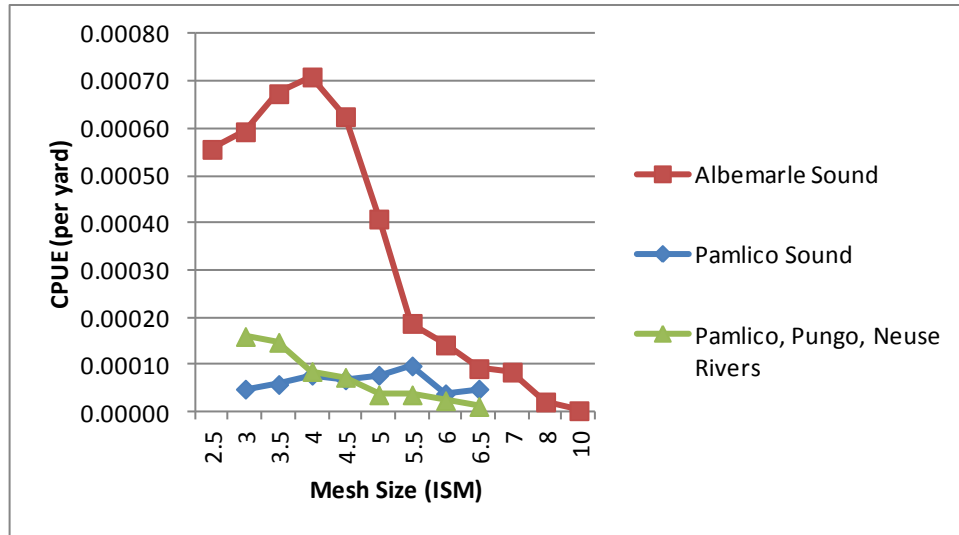


Figure 28. Atlantic sturgeon CPUE (per yard) by mesh size from the North Carolina Division of Marine Fisheries independent gill net surveys from 1991 through 2011.

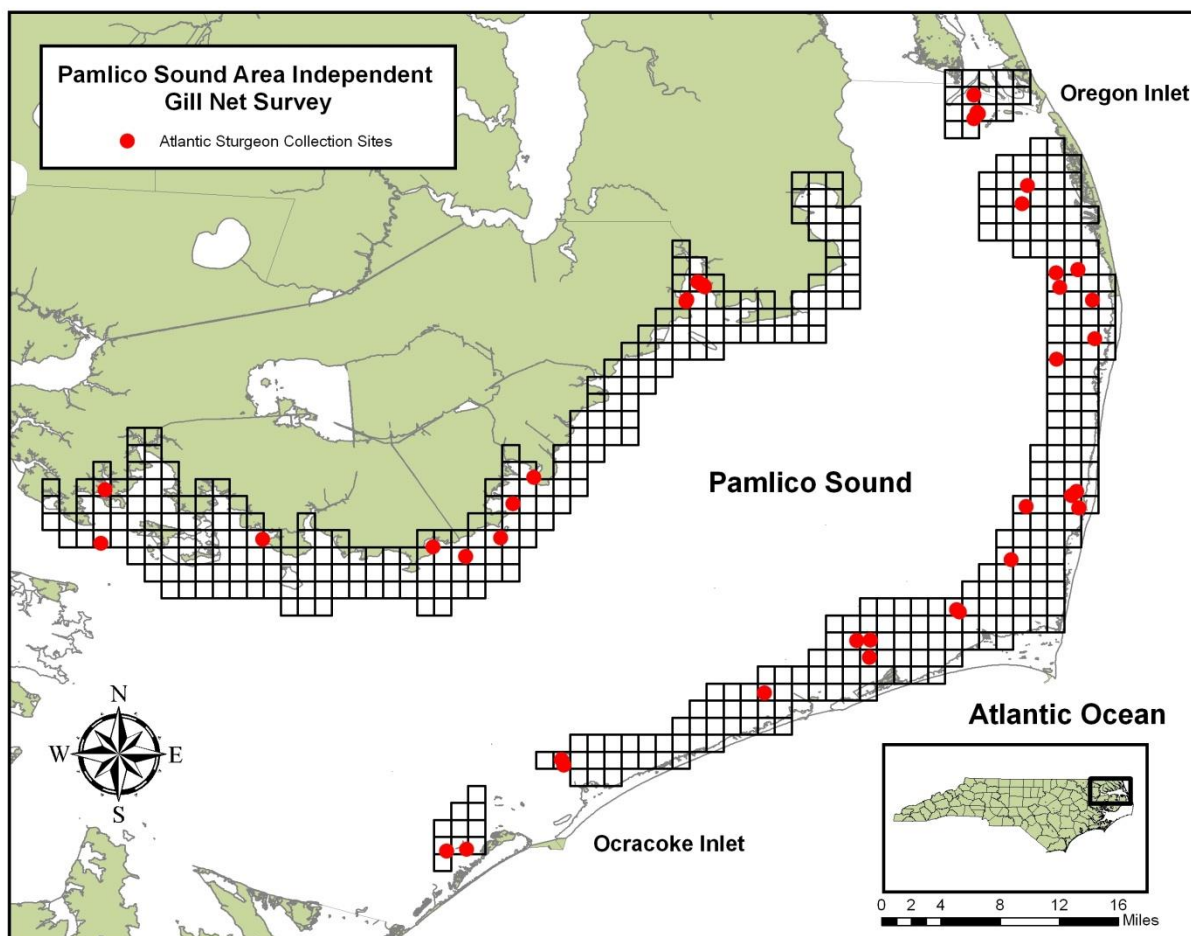


Figure 29. Atlantic sturgeon interactions by grid from the Pamlico Sound Independent Gill Net Survey, NC from 2001 through 2011.

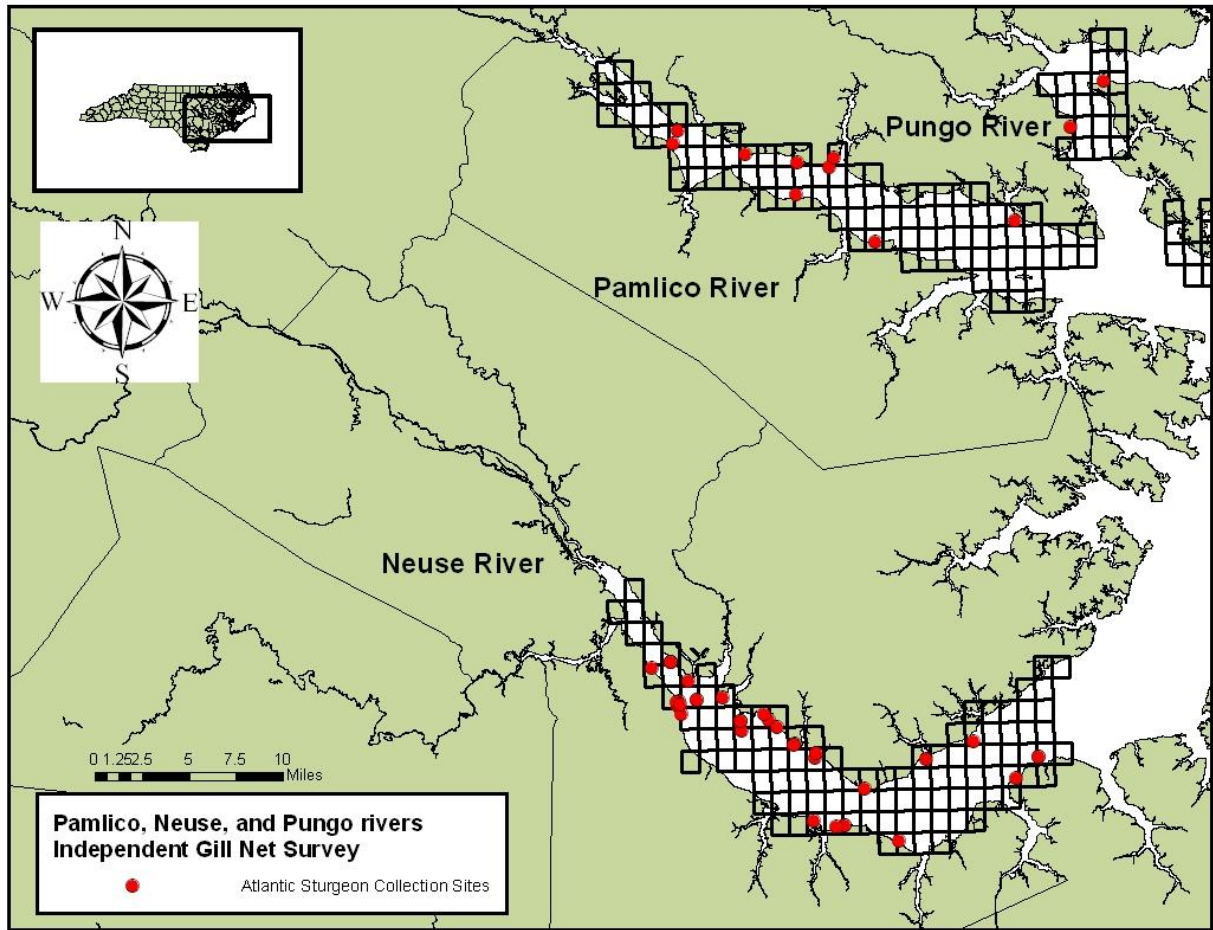


Figure 30. Atlantic sturgeon interactions by grid from the Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey, NC from 2003 through 2011.



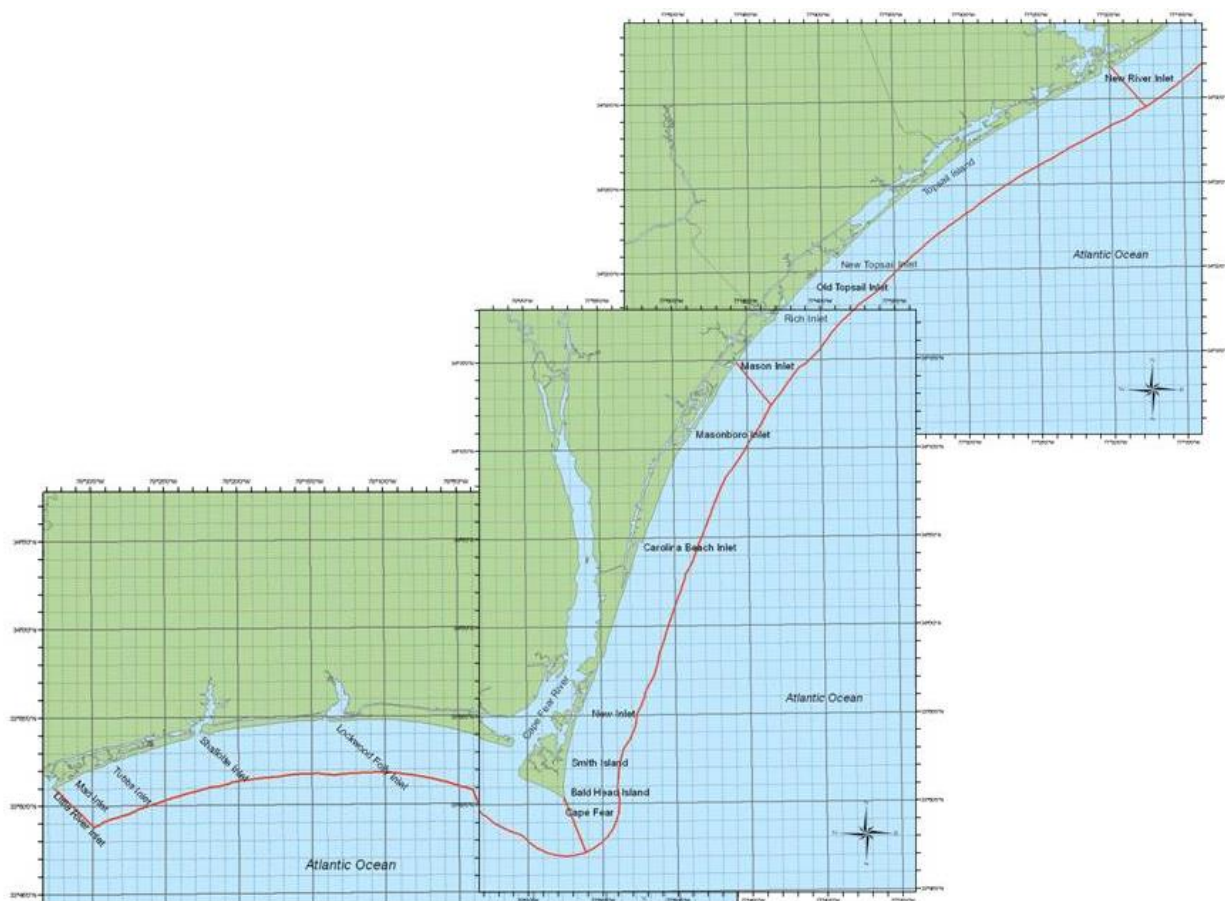


Figure 31. The sample regions and grid system for the Fisheries-Independent Assessment program (Atlantic Ocean) of North Carolina during 2010 including the Topsail, Masonboro, and Brunswick areas.

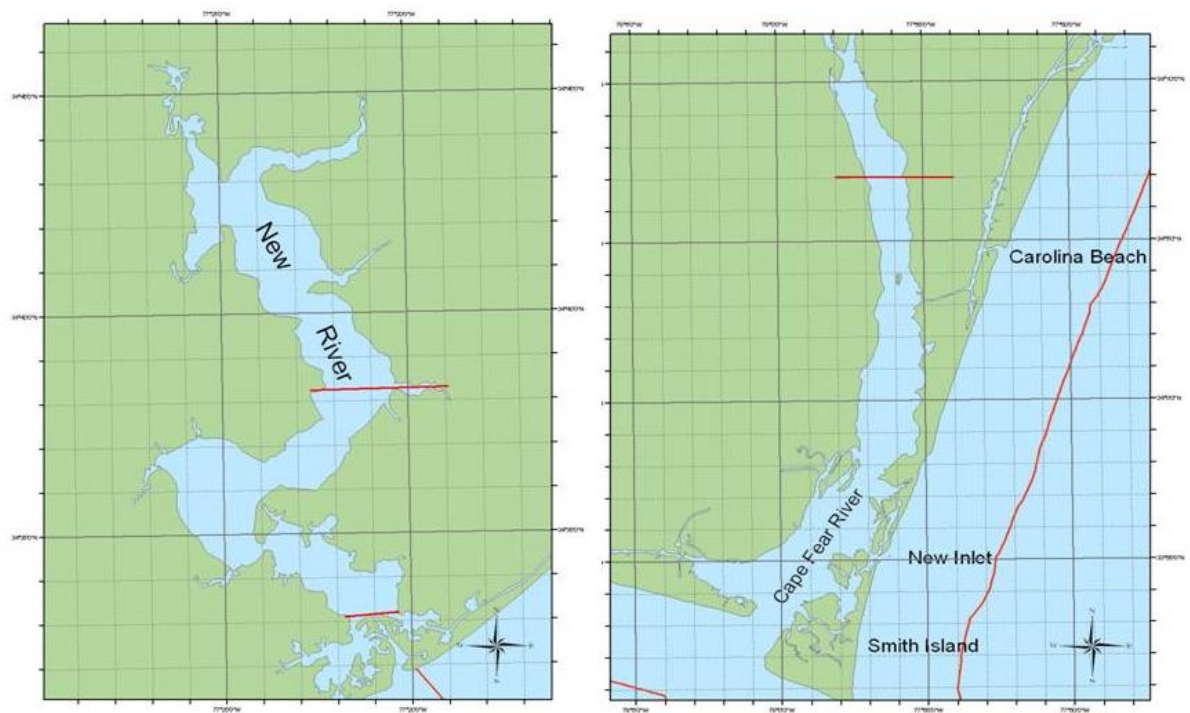


Figure 32. The sample regions and grid system for the Fisheries-Independent Assessment Program (New and Cape Fear rivers), North Carolina.

## **Appendix A. M-14-2009 Proclamation**

M- 14-2009

### **PROCLAMATION**

RE: COMMERCIAL LARGE MESH GILL NETS

Dr. Louis B. Daniel III, Director, Division of Marine Fisheries, hereby announces that effective 12:01 A.M., Monday, July 13, 2009, the following management measures will be implemented for commercial large mesh gill net operations in the following areas:

### **I. AREA DESCRIPTIONS**

#### **Core Sound to the Atlantic Beach Bridge:**

In the internal waters of the state from Core Sound south and west of a line beginning at a point on Core Banks at 34° 58.7963'N- 76° 10.0013'W; running northwesterly near Marker # 2CS at the mouth of Wainwright Channel at 35° 00.2780'N- 76° 12.1682'W; running westerly to a point on Camp Point 34° 59.7942'N - 76° 14.6514'W to the Atlantic Beach Bridge (SR 1182). North River, Newport River are included in this description. The COLREG Demarcation lines at Drum, Barden and Beaufort inlets delineate the division between the ocean and internal waters.

#### **Emerald Isle Bridge to Hammocks Beach State Park:**

In the internal waters of the state south and west of the Highway 58 Emerald Isle Bridge excluding tributaries as described below to a line on the west side of the Hammocks Beach State Park Ferry Channel beginning at a point at the Wildlife Resources Commission Shell Rock Landing boat ramp at 34° 39.1967'N – 77° 09.9383'W; running southeasterly to a point on Bear Island at 34° 37.9608'N - 77° 09.3698'W. White Oak River and Queens Creek are not included in this area. The Highway 24 Bridge at Swansboro is the boundary in the White Oak River. A line across the mouth of Queens Creek beginning at a point on the west shore 34° 39.8455'N - 77° 09.1203'W; running easterly to a point on the east shore 34° 40.1860'N - 77° 08.8383'W is the boundary for Queens Creek. The COLREGS Demarcation Line at Bogue Inlet delineates the division between the ocean and internal waters.

### **II GILL NET RESTRICTIONS**

It is unlawful to use large mesh gill nets (greater than or equal to 5 ½ inch stretched mesh) from 12:01 A.M. Monday, July 13 through midnight, August 31, 2009 in the internal waters described above, unless they meet the following parameters:

- A. It is unlawful to use more than 1000 yards of large mesh gill net per commercial fishing operation.
- B. It is unlawful to set more than 200 yards of large mesh gill net in a continuous line.
- C. It is unlawful to use large mesh gill nets without leaving a space of at least 25 yards between separate lengths of net.

D. It is unlawful to possess large mesh gill nets with a depth from floatline to leadline of more than 15 meshes.

E. It is unlawful to use tie-downs in large mesh gill nets.

### **III. GENERAL INFORMATION:**

A. This proclamation is issued under the authority of N.C.G. S. 113-134; 113-170.4; 113-170.5; 113-182; 113-221.1; 143B-289.52 and N.C. Fisheries Rules 15A NCAC 3H .0103, 3I .0107, 3I .0113, and 3J .0103.

B. It is unlawful to violate the provisions of any proclamation issued by the Fisheries Director under his delegated authority pursuant to N.C. Fisheries Rule 15A NCAC 3H .0103.

C. The intent of this proclamation is to implement management measures in the large mesh gill net fisheries in Core Sound, Back Sound and the vicinity of Hammocks Beach State Park that are expected to address the unlawful takes of Endangered Species Act-listed sea turtles.

D. Fishermen using large mesh gill nets shall take an observer if requested and shall supply catch and turtle interaction information requested by state or federal employees on the water or at landing sites.

E. This proclamation supplements, but does not supersede, the small mesh gill net attendance requirement for areas described in Marine Fisheries Rule 3J .0103 from May 1 through October 31 each year.

July 8, 2009  
2:30 P.M.  
M-14-2009  
/sab

## Appendix B. M-27-2011 Proclamation

**M-27-2011**

### **PROCLAMATION**

#### **RE: LARGE MESH GILL NETS: INTERNAL COASTAL WATERS**

Dr. Louis B. Daniel III Director, Division of Marine Fisheries, hereby announces that effective at **one hour before sunset on Monday, September 12, 2011**, the following provisions shall apply to the use of large mesh gill nets:

#### **I. SUSPENSION OF PORTION OF MARINE FISHERIES RULE 15A NCAC 03J .0103**

The following portion of Marine Fisheries Rules for Coastal Waters 15A NCAC 03J .0103 **is suspended:**

Section (i) (1), which reads:

(i) For gill nets with a mesh length five inches or greater, it is unlawful:

(1) To use more than 3,000 yards of gill net per vessel in internal waters regardless of the number of individuals involved.

The provisions below in this proclamation shall be complied with at all times.

#### **II. AREAS AND EXEMPTIONS**

A. This proclamation applies to all internal coastal waters except for portions of **Croatan and Roanoke sounds, Albemarle and Currituck sounds and their tributaries and the Neuse, Bay and Pamlico rivers described as follows:**

1. In Croatan and Roanoke sounds, the restrictions **do not apply north and west** of the Virginia Dare Memorial Bridge and the Washington Baum Bridge described below:

a. Croatan Sound - beginning at a point 35° 53.1720'N - 75° 45.6160' W on the mainland shore; running easterly along the south side of the Virginia Dare Memorial Bridge to a point at 35° 53.1630'N - 75° 40.1640'W on Roanoke Island.

b. Roanoke Sound - beginning at a point 35° 53.6240'N - 75° 38.4170' W on shore at Roanoke Island; running easterly along the south side of the Washington Baum Bridge to a point at 35° 54.3820'N - 75° 35.9240'W on the Outer Banks shore .

2. In Pamlico, Bay and Neuse rivers, the restrictions do not apply west of a line in the vicinity of the mouths of those waterbodies described below:

a. Pamlico River – a line beginning at a point at 35° 24.5920'N - 76° 32.3810'W near Currituck Point; running southwesterly to a point at 35° 19.6960'N - 76° 36.5360'W near Fulford Point.

b. Bay River – a line beginning at a point 35° 11.0760'N - 76° 31.6200'W near Bay Point; running southerly to a point at 35° 08.9290'N - 76° 32.2680'W near Maw Point.

c. Neuse River – a line beginning at a point 35° 08.9290'N - 76° 32.2680'W near Maw Point; running southerly to a point at 34° 59.29400'N – 76° 59.2940'N – 76° 34.8230'W on the east shore of the mouth of South River.

### III. EXEMPTION FOR RUN-AROUND, STRIKE OR DROP NETS

A run-around, strike or drop net that is used to surround a school of fish and then is immediately retrieved is exempted from the restrictions in this proclamation.

### IV. GILL NET CONSTRUCTION AND USE REQUIREMENTS

**It is unlawful** to use large mesh gill nets (defined as 4 inches to 6½ inches stretched mesh, inclusive) unless they comply with the following provisions:

A. It is unlawful to use large mesh gill nets of more than 15 meshes in height and without a lead core or leaded bottomline. It is unlawful to use cork, floats, or other buoys except those required for identification **except that floats are allowed south of the Highway 58 (B. Cameron Langston) Bridge**, beginning at a point on the north shore at 34° 40.7848'N - 77° 04.0273'W; running southerly to a point on the south shore at 34° 39.8620'N – 77° 03.7438'W.

B. It is unlawful to **use or possess** more than 2,000 yards of large mesh gill net per vessel north of the Highway 58 Bridge (coordinates above) and it is unlawful to use or possess more than 1,000 yards of large mesh gill net per vessel south of the Highway 58 Bridge.

C. It is unlawful to set more than 100 yards of large mesh gill net without leaving a space of at least 25 yards between separate lengths of net.

### V. GILL NET SETTING TIME REQUIREMENTS

**It is unlawful** to use large mesh gill nets (defined as 4 inches to 6½ inches stretched mesh inclusive) for daytime sets other than during the setting and retrieval periods specified below. Only single night overnight soaks are permitted, and are only lawful if set and retrieved as follows:

A. Nets set for Tuesday retrieval may be set no sooner than one hour before sunset on Monday and must be retrieved no later than one hour after sunrise on Tuesday.

B. Nets set for Wednesday retrieval may be set no sooner than one hour before sunset on Tuesday and must be retrieved no later than one hour after sunrise on Wednesday.

C. Nets set for Thursday retrieval may be set no sooner than one hour before sunset on Wednesday and must be retrieved no later than one hour after sunrise on Thursday.

D. Nets set for Friday retrieval may be set no sooner than one hour before sunset on Thursday and must be retrieved no later than one hour after sunrise on Friday.

**No other overnight sets are permitted, and in no case shall daytime sets occur other than during setting and retrieval periods as specified above.**

### VI. GENERAL INFORMATION

A. This proclamation is issued under the authority of N.C.G. S. 113-134; 113-170.4; 113-170.5; 113-182; 113-221.1; 143B-289.52 and N.C. Fisheries Rules 15A NCAC 03H .0103 and 03J .0101 and .0103.

B. It is unlawful to violate the provisions of any proclamation issued by the Fisheries Director under his delegated authority pursuant to N.C. Fisheries Rule 15A NCAC 03H .0103.

C. The intent of this proclamation is to implement gill net restrictions while the Division applies for a statewide incidental take permit from NMFS under Section 10 of the Endangered Species Act. It returns gill net restrictions for use of large mesh gill nets (defined as 4 inches to 6½ inches stretched mesh, inclusive) to those in existence prior to May of 2010 for the areas listed in II. A. 2.

D. The restrictions in this proclamation apply to gill nets used by Recreational Commercial Gear License holders as well as Standard and Retired Commercial Fishing Licenses holders.

**E. The small mesh gill net attendance requirements in N.C. Marine Fisheries Rule 15A NCAC 03J .0103 (h), size restrictions in 03J .0103(a)(2), the navigational passage requirements in 03J .0101, as well as all other existing gill net rules and proclamations remain in effect.**

F. Proclamation M-7-2011, dated February 25, 2011 prohibits the use of gill nets with a stretched mesh length more than 6 ½ inches.

G. This proclamation supersedes Proclamation M-18-2011 (Revised) dated July 12, 2011, M-22-2011 and M-23-2011, dated July 12, 2011. **It does not supersede Proclamation M-24-2011, dated July 14, 2011, which closed southern Core Sound, Back Sound, the Straits and North River to large mesh gill nets.**

September 7, 2011  
8:20 A.M.  
M-27-2011

## Appendix C. M-37-2012 Proclamation

### M-37-2012

#### PROCLAMATION

#### RE: LARGE MESH GILL NETS: INTERNAL COASTAL WATERS

Dr. Louis B. Daniel III Director, Division of Marine Fisheries, hereby announces that effective at **5:31 P.M. Monday, September 3, 2012**, the following provisions shall apply to the use of large mesh gill nets:

#### **I. SUSPENSION OF PORTION OF N.C. MARINE FISHERIES COMMISSION RULE 15A NCAC 03J .0103**

The following portion of N.C. Marine Fisheries Commission Rule 15A NCAC 03J .0103 is suspended:

Section (i) (1), which reads:

- (i) For gill nets with a mesh length five inches or greater, it is unlawful:
- (1) To use more than 3,000 yards of gill net per vessel in internal waters regardless of the number of individuals involved.

The provisions below in this proclamation shall be complied with at all times.

#### **II. AREAS AND EXEMPTIONS**

A. This proclamation applies to all internal coastal waters **including portions of Croatan and Roanoke sounds, Albemarle and Currituck sounds and their tributaries and the Neuse, Bay and Pamlico rivers described as follows:**

1. In Croatan and Roanoke sounds, **the net construction and use requirements in Section IV. and the net setting times in Section V. below do not apply north and west of the** Virginia Dare Memorial Bridge and the Washington Baum Bridge described below:
  - a. Croatan Sound - beginning at a point 35° 53.1720' N - 75° 45.6160' W on the mainland shore; running easterly along the south side of the Virginia Dare Memorial Bridge to a point at 35° 53.1630' N - 75° 40.1640' W on Roanoke Island.
  - b. Roanoke Sound - beginning at a point 35° 53.6240' N - 75° 38.4170' W on shore at Roanoke Island; running easterly along the south side of the Washington Baum Bridge to a point at 35° 54.3820' N - 75° 35.9240' W on the Outer Banks shore.
2. In Pamlico, Bay and Neuse rivers, **the net construction and use requirements in Section IV. and the net setting times in Section V. below do not apply** west of a line in the vicinity of the mouths of those waterbodies described below:
  - a. Pamlico River – a line beginning at a point at 35° 24.5920' N - 76° 32.3810' W near Currituck Point; running southwesterly to a point at 35° 19.6960' N - 76° 36.5360' W near Fulford Point.
  - b. Bay River – a line beginning at a point 35° 11.0760' N - 76° 31.6200' W near Bay Point; running southerly to a point at 35° 08.9290' N - 76° 32.2680' W near Maw Point.
  - c. Neuse River – a line beginning at a point 35° 08.9290' N - 76° 32.2680' W near Maw Point; running southerly to a point at 34° 59.29400' N – 76° 59.2940' N – 76° 34.8230' W on the east shore of the mouth of South River.
3. **In the areas described in II.A. 1. and 2. above, the maximum large mesh gill net yardage allowed is 2,000 yards.**



4. It is unlawful to fail to be present at the nets at least once during a 24 hour period no later than noon each day.

#### **B. CLOSED AREA DESCRIPTION**

It is unlawful to use large mesh gill nets (defined as 4 inches to 6½ inches stretched mesh, inclusive) in the area described in II. B. below from April 1 through November 30:

#### **SOUTHERN CORE SOUND, BACK SOUND, THE STRAITS, NORTH RIVER AND**

**TRIBUTARIES** –The area bound in the north by a line at latitude 34° 48.2660' N which runs approximately from the Club House on Core Banks westerly to a point on the shore at Davis near Marker “1”, bound in the west by a line at longitude 76° 36.9972' W, which runs northerly from a point on Shackleford Banks to Lennoxville Point, then to the head of Turner Creek, and northerly up the western side of North River, **and bound in the east by the COLREGS demarcation line at Barden Inlet** including southern Core Sound, Back Sound, The Straits, North River and all tributaries. (See Map)

#### **III. EXEMPTION FOR RUN-AROUND, STRIKE OR DROP NETS**

A run-around, strike or drop net that is used to surround a school of fish and then is immediately retrieved is exempt from the restrictions in this proclamation.

#### **IV. GILL NET CONSTRUCTION AND USE REQUIREMENTS**

It is unlawful to use large mesh gill nets (defined as 4 inches to 6½ inches stretched mesh, inclusive) unless they comply with the following provisions:

A. It is unlawful to use large mesh gill nets of more than 15 meshes in height and without a lead core or leaded bottomline. It is unlawful to use cork, floats, or other buoys except those required for identification **except that floats are allowed south of the Highway 58 (B. Cameron Langston) Bridge**, beginning at a point on the north shore at 34° 40.7848'N - 77° 04.0273'W; running southerly to a point on the south shore at 34° 39.8620'N – 77° 03.7438'W.

B. It is unlawful to **use or possess more than 2,000 yards** of large mesh gill net per fishing operation regardless of the number of vessels involved in coastal fishing waters **north of a line** at latitude 34° 48.2660' N which runs approximately from the Club House on Core Banks westerly to a point on the shore at Davis near Marker “1”.

C. It is unlawful to **use or possess more than 1,000 yards** of large mesh gill net per fishing operation regardless of the number of vessels involved in coastal fishing waters bound in the north by a **line** at longitude 76° 36.9972' W, which runs northerly from a point on Shackleford Banks to Lennoxville Point, then to the head of Turner Creek, and northerly up the western side of North River and **bound in the south by the North Carolina-South Carolina border**.

D. It is unlawful to set more than 100 yards of large mesh gill net without leaving a space of at least 25 yards between separate lengths of net.

#### **V. GILL NET SETTING TIME REQUIREMENTS**

It is unlawful to use large mesh gill nets (defined as 4 inches to 6 1/2 inches stretched mesh inclusive) for daytime sets other than during the setting and retrieval periods specified below.

Only single night overnight soaks are permitted, and are only lawful if set and retrieved as follows:

**In all areas subject to the restrictions in this proclamation:**

A. Nets set for Tuesday retrieval may be set no sooner than one hour before sunset on Monday and must be retrieved no later than one hour after sunrise on Tuesday.

B. Nets set for Wednesday retrieval may be set no sooner than one hour before sunset on Tuesday and must be retrieved no later than one hour after sunrise on Wednesday.

C. Nets set for Thursday retrieval may be set no sooner than one hour before sunset on Wednesday and must be retrieved no later than one hour after sunrise on Thursday.

D. Nets set for Friday retrieval may be set no sooner than one hour before sunset on Thursday and must be retrieved no later than one hour after sunrise on Friday.

**In the area bound in the north by a line at longitude 76° 36.9972'W which runs from a point on Shackelford Banks northerly to Lennoxville Point, then to the head of Turner Creek, and northerly up the western side of North River, and bound in the south by the North Carolina-South Carolina border, an additional overnight soak period is permitted in addition to V. A. through D above:**

E. Nets set for Monday retrieval may be set no sooner than one hour before sunset on Sunday and must be retrieved no later than one hour after sunrise on Monday.

**No other overnight sets are permitted, and in no case shall daytime sets occur other than during setting and retrieval periods as specified above.**

**VI. GENERAL INFORMATION**

A. This proclamation is issued under the authority of N.C.G.S. 113-134; 113-170.4; 113-170.5; 113-182; 113-221.1; 143B-289.52 and N.C. Marine Fisheries Commission Rules 15A NCAC 03H .0103 and 03J .0101 and .0103.

B. It is unlawful to violate the provisions of any proclamation issued by the Fisheries Director under his delegated authority pursuant to N.C. Marine Fisheries Commission Rule 15A NCAC 03H .0103.

C. The intent of this proclamation is to implement gill net restrictions while the Division applies for a statewide incidental take permit from NMFS under Section 10 of the Endangered Species Act. **It closes southern Core Sound, Back Sound, the Straits and North River to large mesh gill nets from April through November. It also reduces the maximum yardage of large mesh gill nets allowed between Lennoxville Point (near Beaufort) and the North**

**Carolina-South Carolina border from 2,000 yards to 1,000 yards. In addition, it reduces the maximum yardage of large mesh gill nets in the formerly exempted rivers and Albemarle Sound Management Area and adds a requirement to be present at the nets in those areas at least once a day by noon.**

D. The restrictions in this proclamation apply to gill nets used by Recreational Commercial Gear License holders as well as Standard and Retired Standard Commercial Fishing Licenses holders.

**E. N.C. Marine Fisheries Commission Rule 15A NCAC 03I .0113 specifies that it is unlawful for any licensee under Chapter 113, Subchapter IV of the General Statutes to refuse to allow the Fisheries Director or his agents to obtain biological data, harvest information, or other statistical data necessary or useful to the conservation and management of marine and estuarine resources from fish in the licensee's possession. The Division of Marine Fisheries has implemented an observer program as an inspection procedure to obtain such data.**

F. The small mesh gill net attendance requirements in N.C. Marine Fisheries Commission Rule 15A NCAC 03J .0103 (h), size restrictions in 03J .0103(a)(2), the navigational passage requirements in 03J .0101, as well as all other existing gill net rules and proclamations remain in effect.

G. Proclamation M-7-2012, dated February 23, 2012 prohibits the use of gill nets with a stretched mesh length more than 6 ½ inches.

H. This proclamation supersedes Proclamation M-33-2012, dated August 24, 2012.

August 29, 2012  
1:00 P.M.  
M-37-2012

## Appendix D. M-38-2012 Proclamation

### M-38-2012

#### PROCLAMATION

#### RE: GILL NETS – ALBEMARLE SOUND AREA

Dr. Louis B. Daniel III, Director, Division of Marine Fisheries, hereby announces that effective at **5:31 P.M. on Monday, September 3, 2012**, the following provisions shall apply to the use of gill nets in the following areas:

#### I. AREA DESCRIPTION

A. In Croatan and Roanoke, Albemarle and Currituck sounds, **north and west** of the Virginia Dare Memorial Bridge and the Washington Baum Bridge described below:

1. Croatan Sound – beginning at a point 35° 53.1720' N – 75° 45.6160'W on the mainland shore; running easterly along the south side of the Virginia Dare Memorial Bridge to a point at 35° 53.1630'N – 75° 40.1640'W on Roanoke Island.
2. Roanoke Sound – beginning at a point 35° 53.6240'N – 75° 38.4170'W on shore at Roanoke Island; running easterly along the south side of the Washington Baum Bridge to a point at 35° 54.3820'N – 75° 35.9240'W on the Outer Banks shore.

B. The area between the lines referenced in I.A.1. and 2. and the southern boundary of the Albemarle Sound Management Area described as **a line beginning at a point 35° 48.3693'N – 75° 43.7232'W on Roanoke Marshes Point, running southeasterly to a point 35° 44.1710'N – 75° 31.0520'W on the north point of Eagle Nest Bay.**

#### II. NET RESTRICTIONS

Only gill nets meeting the specified mesh lengths may be used in the described areas. A fishing operation, regardless of the number of vessels or persons involved, shall adhere to the gill net restrictions specified for the following areas:

##### A. Albemarle, Currituck, Roanoke and Croatan sounds (areas described in I.A.1. and 2):

1. Gill nets with a mesh length less than 3 inches shall not be used.
2. Gill nets with a mesh length of 3 inches through 4 inches shall not exceed 800 yards, and must be attended at all times.
3. Gill nets with a mesh length greater than 4 inches and less than 5 ½ inches shall not be used.
4. Gill nets with a mesh length of 5 ½ inches and larger are required to be equipped with tie downs spaced no farther apart than 10 yards, restricting the vertical distance between the top and bottom lines to 48 inches or less **unless** they are equipped with floats that do not exceed 2 inches in diameter and 6 inches in length placed a minimum of 10 yards apart, not to exceed 11 floats per 100 yards of net. Gill nets must be set so as to fish the bottom not to exceed a vertical height of 48 inches.
5. Gill nets with a mesh length of 5 ½ inches and larger can only be used as described in II.A.4

and may not exceed **2,000 yards combined**.

6. It is unlawful to fail to be present at the nets at least once during a 24 hour period no later than noon each day.

7. No gill nets may be used in the area southwest of a line from Black Walnut Point 35° 59.3833'N - 76° 41.0060'W; running southeasterly to a point 35° 56.3333'N - 76° 36.0333'W at the mouth of Mackey's Creek, including Roanoke, Cashie, Middle and Eastmost rivers.

#### **B. Area of southern Albemarle Sound Management Area described in I.B. above**

1. Gill nets with a mesh length less than 3 inches shall not be used.

2. Gill nets with a mesh length of 3 inches but less than 4 inches shall not exceed 800 yards and must be attended at all times.

3. Gill nets with a mesh length of 4 inches to 6 ½ inches stretched mesh (inclusive) must adhere to the requirements in **Proclamation M-37-2012, dated August 29, 2012**.

4. Gill nets with a mesh length larger than 6 ½ inches shall not be used.

#### **III. DRIFT GILL NETS**

Drift gill nets may not be used in the Joint Fishing Waters portion of the Roanoke, Middle, Eastmost, Cashie, Chowan and Meherrin rivers and all other joint water tributaries of the Albemarle Sound Management Area.

#### **IV. GENERAL INFORMATION**

A. This proclamation is issued under the authority of N.C.G.S. 113-170.4; 113-170.5; 113-182; 113-221.1; 143B-289.52 and N.C. Marine Fisheries Commission Rules 15A NCAC 03H .0103 and 03J .0103, 03Q .0107(c); 03M .0202 and 03M .0513.

B. It is unlawful to violate provisions of any proclamation issued by the Fisheries Director under his delegated authority pursuant to N.C. Marine Fisheries Commission Rule 15A NCAC 03H .0103.

C. "Attended" is defined in N.C. Marine Fisheries Commission Rule 15A NCAC 3I .0101.

D. Attended gill net areas are defined in N.C. Marine Fisheries Commission Rule 15A NCAC 3R.0112.

**E. N.C. Marine Fisheries Commission Rule 15A NCAC 03I .0113 specifies that it is unlawful for any licensee under Chapter 113, Subchapter IV of the General Statutes to refuse to allow the Fisheries Director or his agents to obtain biological data, harvest information, or other statistical data necessary or useful to the conservation and management of marine and estuarine resources from fish in the licensee's possession. The Division of Marine Fisheries has implemented an observer program as an inspection procedure to obtain such data.**

F. This proclamation supersedes Proclamation M-32-2012 (Revised) dated August 27, 2012. **It reduces the maximum yardage of large mesh gill nets in the formerly exempted portion**

**of the Albemarle Sound Management Area and adds a requirement to be present at the nets in those areas at least once a day by noon.**

August 29, 2012

1:15 P.M.

M-38-2012

## **Appendix E. Other Gear Restrictions in the North Carolina Estuarine Gill Net Fishery**

### Closed area in Western Albemarle Sound

The NCDMF enacted a rule during 1987 closing an area in western Albemarle Sound to all gill net fishing operations. No gill nets may be used in the area southwest of a line from Black Walnut Point 35° 59.3833'N - 76° 41.0060'W; running 138° (M) to a point 35° 56.3333'N - 76° 36.0333'W at the mouth of Mackey's Creek, including Roanoke, Cashie, Middle and Eastmost rivers. The purpose of this rule is to protect striped bass during their migrations into the Roanoke River. However, Albemarle Sound independent gill net data have shown this area also has large collections of Atlantic sturgeon and this closure has benefitted the juvenile sturgeon that inhabit this area of the estuary before they migrate to the oceans, as well as, adults on their way into the Roanoke River for spawning. Recent data analysis has shown that Atlantic sturgeon tend to move throughout the western portion of Albemarle Sound between the Highway 32 bridge and the Highway 17 bridge.

### Small Mesh Gill Net Attendance Albemarle Sound Management Area

All small mesh gill net fisherman operating in the Albemarle Sound Management Area are required to attend their nets at all times from May 15<sup>th</sup> through November 18<sup>th</sup>.

### Commercial Gill Net Attendance Requirements

#### South of Albemarle Sound Management Area

#### Small Mesh Gill Nets (less than 5 inch stretched mesh)

Attend small mesh gill nets (less than 5 inch stretched mesh) from May 1 through November 30 in primary and secondary nursery areas and in the Attended Gill Net Areas along the Outer Banks specified in 3R .0112 (b) (2).

Along the Outer Banks, the Attended Gill Net Area is a modification of the NO TRAWL line that has two changes between Rodanthe and Gull Island and at Olivers Reef that straightened out the lines so gill net attendance is not required in those deeper waters.

Attend small mesh gill nets May through November in an area within 200 yards of shore upstream (west) of a line from Roos Point at the mouth of the Pungo River south to Point of Marsh in Neuse River (Pamlico, Pungo Bay and Neuse rivers). 3R .0112 (b) (4)

Attend small mesh gill nets from May through November within 50 yards of shore in Pamlico Sound and Core Sound and in waters south to South Carolina. EXCEPTION Core Sound south in October and November attendance not required. 3R .0112 (b) (5)

Year-round attendance of small mesh gill nets within 200 yards of shore in the Neuse River from New Bern to mouth, and in the Pamlico and Pungo rivers. Small mesh gill nets in the entire upper reaches of Pamlico, Pungo, Neuse, and Trent rivers require year-round attendance. Areas described in 3R .0112 (a)

#### Large Mesh Gill Nets

June through October - all unattended large mesh ( $\geq 5.0$  ISM) must be set a minimum of 10 feet off the shoreline. Shoreline is defined as mean high water or marsh line, whichever is most seaward. 3J .0103 (i)

Large mesh gill nets ( $\geq 5.0$  ISM) after Central Southern striped bass season is over in April through December each year.

Tie-downs (3-feet) are required west of a line from Roos Point at the mouth of the Pungo River south to Point of Marsh. In upstream areas of Neuse, Pamlico, and Pungo rivers, nets must be a minimum of 50 yards offshore. Proclamation M-9-2009.

#### Large Mesh Gill Net Attendance – Cape Fear River, NC

In 2005, in response to high abundance of sea turtles in the lower Cape Fear River and associated takes in gill net gear, the NCDMF required attendance of large mesh gill nets from June 20 to August 31. The time period for required attendance has increased since 2005. In 2009, attendance of all gill nets in this region was required from May 23 to November 11. Since 2005, seasonal attendance has proven to be an effective method of reducing interactions with turtles and managing the gill net fishery in the lower portions of the Cape Fear River. Effort has



been reduced by 66% when comparing landings data from 2007 to 2010. Discussions with NCDMF staff indicate that the attendance requirement allowed for timely detection and release of sea turtles and likely Atlantic and shortnose sturgeon from gill net gear and also resulted in reduced effort and participation due to the seasonal attendance requirement in the lower Cape Fear River flounder fishery.

## **Appendix F. Gill Net Restrictions Enacted Due to the Settlement Agreement**

In June 2009, the NMFS began an AP Observer Program in Core Sound, NC. The NMFS observers documented sea turtle interactions in gill nets >5.0 ISM in this area beginning in late June and notified the NCDMF of their concern for these unauthorized takes. The NCDMF consulted with the NMFS-SERO via conference calls and correspondence to discuss short- and long-term actions to address sea turtle takes in gill nets in Core Sound and throughout the state. In the short term, the agencies agreed for the NCDMF to implement gear restrictions (yardage limits, mesh depth reduction, and net shot reductions) and increased observer coverage in Core Sound and adjacent water bodies (NCDMF Proclamation M-14-2009; APPENDIX A). For the long term, the NCDMF continued consultations with the NMFS-SERO (July 2009 to present) concerning the preparation of an ITP application for internal coastal waters while compiling sea turtle interaction data from gill net surveys, research projects, and direct observations.

As a result of continued sea turtle interactions in the Core Sound large mesh gill net fishery throughout the summer months and anecdotal reports from fishermen of increased sea turtle sightings along the Outer Banks in Pamlico Sound, the NCDMF delayed the opening of the 2009 PSGNRA until September 5. Monitoring efforts in the PSGNRA continued through October 22 when authorized thresholds of live green sea turtles were exceeded and the NCDMF closed the PSGNRA for the remainder of the season. On October 20, 2009, the day that authorized sea turtle takes were exceeded in the 2009 PSGNRA, a 60-day Notice of Intent (NOI) to sue the NCDMF and the NCMFC was received from the Duke Environmental Law and Policy Clinic on behalf of the Beasley Center. The NOI stated that the NCDMF and the NCMFC violated Section 9 of the ESA by allowing gear that had unauthorized takes of threatened or endangered sea turtles.

The NCDMF consulted with the NMFS-SERO concerning this NOI while continuing to work toward the preparation of an application for a statewide ITP for gill net fisheries in internal coastal waters. In November 2009, the NCDMF received further correspondence from the NMFS-SERO reiterating the need to “satisfy the requirements of the ESA” relative to Core Sound sea turtle interactions. The NCDMF continued to compile sea turtle interaction data while developing an interim plan to address sea turtle interactions in gill net gear. As a result of discussions and correspondence with the NMFS-SERO, the NCDMF submitted an interim plan in January 2010 to address sea turtle interactions in gill net fisheries prosecuted in internal

coastal waters. The plan proposed to close large mesh gill net fisheries throughout the majority of the estuarine waters of North Carolina from May to December 2010.

On February 18, 2010 the NCDMF presented the interim proposal to the NCMFC and the public at an emergency NCMFC meeting in New Bern, NC. During the meeting, numerous commercial fishery representatives expressed concern with the proposed closure on the basis of the economic devastation that would result from such a closure. Representatives from the Coastal Conservation Association (CCA-NC) did not support the interim closure stating the plan was too limited in scope. After thoroughly debating the issue, the NCMFC voted to direct the NCDMF to implement alternative measures that included reductions in the number of days per week that large mesh gill nets were allowed to be fished, restricted soak times, reductions in the length of individual nets (shots), and reductions in total yardage.

On February 23, 2010, the Duke Environmental Law and Policy Clinic filed suit against the NCDMF and the NCMFC on behalf of the Beasley Center (Appendix G). Negotiations between the parties occurred between late February and March 23, 2010, when the NCMFC met again. During the meeting, the NCMFC directed the Fisheries director to issue a gill net proclamation effective May 15, 2010 restricting the number of days during the week that large mesh gill nets would be allowed, limiting soak time, establishing a maximum yardage limit, mandating maximum mesh depth, requiring net shot lengths, establishing spacing between net shots, and eliminating the use of tie-downs and floats or corks along float lines. The NCDMF director did not issue the proclamation because of ongoing negotiations with the Beasley Center and the Duke Environmental Law and Policy Clinic.

The NCMFC met May 12 through 14, 2010 and discussed the parameters of the final Settlement Agreement between the Beasley Center (plaintiff) and the NCDMF and the NCMFC (Appendix G). At that meeting, the NCMFC reached an agreement concerning restrictions that would be implemented in the 4.0 ISM to 6.5 ISM gill net fishery in NC estuarine waters. As a result of the NCMFC action, the NCDMF issued Proclamation M-8-2010 effective May 15, 2010 implementing the provisions of the Settlement Agreement (Appendix G; Table 1). Gill net restrictions implemented by the proclamation included: a stretch mesh size range of 4.0 inch to, and including, 6.5 inch for large mesh gill nets; soak times limited to an hour before sunset to an hour after sunrise, Monday evenings through Friday mornings; large mesh gill nets were restricted to a height of no more than 15 meshes, constructed with a lead core or leaded bottom

line and without corks or floats other than needed for identification; a maximum of 2,000 yards of large mesh gill nets allowed to be used per vessel; maximum individual net (shot) length of 100 yards with a 25-yard break between shots. Fishermen in the southern portion of the state were allowed to use floats on nets but were restricted to the use of a maximum of 1,000 yards of large mesh gill net per fishing operation.

Although gill nets are identified as small (<5 ISM) and large (>5 ISM) in the NCDMF Trip Ticket Program (Trip Ticket) and many of its rules, the Settlement Agreement includes gill nets from 4.0 ISM to 5.0 ISM in the large mesh category because of observed sea turtle takes in 4.0 ISM and 4.5 ISM gill nets in the NCDMF Independent Gill Net Survey. The measures were modified slightly several times during 2010, with the concurrence of the Beasley Center, to improve gear efficiency or adjust fishing area boundaries without compromising the sea turtle conservation provisions of the Settlement Agreement.

Section 5(a) of the Settlement Agreement specifies: "The restrictions as listed in Paragraph 1, 2(e) and 2(i) are minimum requirements for the 2010 statewide ITP application." Paragraph 1 specifies the restrictions on large mesh gill nets, Section 2(e) pertains to different restrictions in the southern portion of the state as described above, and Section 2(i) specifies that the restrictions apply to standard commercial fishing license holders and recreational commercial gear license holders.

However, Section 5(d) of the Settlement Agreement states "The restrictions as listed in Paragraphs 1, 2(e), and 2(i) are deemed solely interim measures and will be in effect within internal coastal waters, not otherwise exempt, until the NMFS issues the NCDMF an ITP for the affected areas. Furthermore, this Agreement shall not foreclose more lenient or more restrictive provisions in future ITP applications if warranted by biological data collected through reliable sources including but not limited to the NMFS and the NCDMF."

Section 2(b) of the Settlement Agreement makes note of the fact that the PSGNRA expired December 31, 2010 and specifies that that area will be subject to the Agreement. It is the intent of the NCDMF that management measures formerly implemented in the PSGNRA that proved to be effective for sea turtle conservation be carried forward in the sea turtle ITP application for the shallow water portions of management unit B, season 4, which were formerly designated as the PSGNRA.

## Appendix G. Settlement Agreement

### SETTLEMENT AGREEMENT

THIS SETTLEMENT AGREEMENT (hereinafter, "Agreement") is made and entered into on the last day executed below, among the Karen Beasley Sea Turtle Rescue and Rehabilitation Center ("Plaintiff") and the North Carolina Division of Marine Fisheries; Dr. Louis Daniel III, in his official capacity as Director of the North Carolina Division of Marine Fisheries; and the North Carolina Marine Fisheries Commission ("hereinafter, collectively, "Defendants").

### WITNESSETH

WHEREAS, on February 23, 2010, Plaintiff filed a complaint against the Defendants in the United States District Court for the Eastern District of North Carolina, Southern Division, file no. 7:10-CV-32-BO ("Complaint").

WHEREAS, in the Complaint, Plaintiff contends that Defendants are in violation of the Endangered Species Act ("ESA"), 16 U.S.C. §§ 1531 *et seq.* by authorizing gill nets to operate and to "take" protected sea turtles in state waters not covered by Incidental Take Permit ("ITP") No. 1528 issued to the North Carolina Division of Marine Fisheries ("DMF") by the National Marine Fisheries Service ("NMFS"), and not complying with the ITP requirements for observer coverage and enforcement.

WHEREAS, Defendants contend that the Court lacks jurisdiction over them on various grounds including sovereign immunity, lack of subject matter jurisdiction and personal jurisdiction, and further contend that they are not in violation of the ESA.

WHEREAS, the DMF is in the process of preparing an application for a statewide ITP from NMFS under Section 10 of the ESA to cover incidental takes of protected sea turtles by gill nets within the internal coastal waters of North Carolina.

WHEREAS, the Plaintiff and Defendants each acknowledge the efforts of the other to amicably resolve the controversy over the protection of sea turtles listed under the ESA while also maintaining a viable commercial gill net fishery.

NOW THEREFORE, in order to avoid further controversy and expense, without in any way waiving the Defendants' claims regarding sovereign immunity, the parties to this Agreement have agreed upon the following terms and conditions:

#### 1. Restrictions on Large Mesh Gill Nets.

(a) For the purpose of this Agreement, large mesh gill nets are defined as 4-inch stretched mesh to 6 ½-inch stretched mesh, inclusive.

(b) Until such time that a statewide ITP is issued to DMF by NMFS, the following interim restrictions on large mesh gill nets apply within the internal coastal waters of North Carolina, as defined in 15A N.C.A.C. 31.0101(1)(c):

(i) Soak times shall be limited to approximately 12 hours, from sunset to sunrise, Monday through Friday. More specifically, the start and end times

for each soak period is as follows: sunset on Monday to sunrise on Tuesday; sunset on Tuesday to sunrise on Wednesday; sunset on Wednesday to sunrise on Thursday; sunset on Thursday to sunrise on Friday. Large mesh gill nets may be set no sooner than 1 hour before sunset and must be retrieved no later than 1 hour after sunrise. Any nets deployed earlier than this specified time or nets that remain deployed after the specified time will be subject to enforcement action by the N.C. Marine Patrol in accordance with state law and marine fisheries rules and regulations.

(ii) Large mesh gill nets shall be low-profile configured as follows:

- (1) a net height of no more than 15 meshes.
- (2) a lead core or leaded bottom line.
- (3) no corks, floats or other buoys unless needed for identification requirements, except as provided in Paragraph 2(e) of this Agreement.

(iii) A maximum of 2,000 yards of large mesh gill net may be used per vessel, except as provided in Paragraph 2(e) of this Agreement.

(iv) Large mesh gill nets must be set in individual 100-yard shots with at least a 25 yard break between individual shots.

(v) Gill nets shall not choke coastal creeks in violation of 15A N.C.A.C. 3J .0101. There must be passage for sea turtles and other non-targeted species.

(vi) No gill nets over 6 1/2- inch stretched mesh will be allowed in internal coastal waters.

## **2. Applicability of Restrictions.**

(a) Upon execution of this Agreement, the Restrictions as listed in the above Paragraph 1 and below Paragraphs 2(e) and 2(i) ("restrictions") will be implemented by proclamation to go into effect beginning May 15, 2010, effective year-round as interim measures until the DMF is issued a statewide ITP from NMFS pursuant to section 10 of the ESA, except that DMF may implement more restrictive measures if required by NMFS.

(b) The Pamlico Sound Gillnet Restricted Area (PSGNRA) covered by ITP No. 1528 is not subject to this Agreement, while the permit is in effect. ITP No. 1528 will remain in effect from September 1, 2010 to December 31, 2010, after which time the PSGNRA will be subject to this Agreement.

(c) The Currituck Sound, for the purpose of this Agreement, is defined as the area north of the Currituck Sound Bridge, which is located between the following coordinates: 36° 04.828'N, 75° 47.405'W (western end) and 36° 05.577'N, 75° 44.585'W (eastern end). The Currituck Sound is not subject to the provisions of this Agreement.

(d) The Albemarle Sound, for the purpose of this Agreement, is defined as the area west of a line running from coordinates 36° 09.928' N, 75° 54.695' W (northern end) and 35° 57.559' N, 75° 56.820' W (southern end). The Albemarle Sound is not subject to the provisions in this Agreement except for the observer coverage provisions as specified in Paragraph 3(d) of this Agreement.

(e) For the area south of the NC Highway 58 bridge, which is located between coordinates 77° 4.02738 W, 34° 40.78489 N (northern end) and 77° 3.7438 W, 34° 39.86202 N (southern end), floats are allowed to be used on nets and a maximum of 1000 yards of gill net may be used per vessel. All other restrictions specified in this Agreement shall apply to this area.

(f) The restrictions set forth in this Agreement shall apply only to set large mesh gill nets. They shall not apply to strike nets, runaround nets, drop nets or any other gear that is immediately retrieved.

(g) In recognition that low profile nets have not been tested at scale, adaptive management and monitoring measures will need to be implemented to assess their feasibility. Therefore, the restrictions in this Agreement shall not apply to scientific research or collection pursuant to N.C. Gen. Stat. § 113-200 (Fisheries Resource Grants), 15A N.C.A.C. 30.0503(g) (Scientific or Educational Collection Permits), or conducted by the DMF or its employees or agents in efforts to assess, manage and monitor the large mesh gill net fishery in North Carolina, including but not limited to testing of low profile nets and alternative harvest methods.

(h) No provision of this Agreement shall be interpreted to supersede any existing DMF proclamation that is more restrictive.

(i) The restrictions shall apply to standard commercial fishing license ("SCFL") holders and recreational commercial gear license ("RCGL") holders.

### **3. Observer Program.**

(a) The DMF shall provide observer coverage of large mesh gill net fishing beginning on May 15, 2010 on various platforms. Observers will consist of DMF staff, the N.C. Marine Patrol, and volunteer observers certified by DMF's observer training program. The observer coverage will not be static and may adapt according to season, sea turtle behavior and location, and other environmental and biological conditions.

(b) The DMF shall deploy resources sufficient to provide observer coverage with a target of 10% coverage and a minimum of 7% coverage per week of the total large mesh gill net fishing effort within internal coastal waters, except for areas exempted pursuant to this Agreement. For each fishing year, DMF will calculate observer coverage by using the previous year's effort data from the North Carolina trip ticket program.

(c) If the DMF is unable to provide minimum coverage due to financial, budget or staffing constraints, then the large mesh gill net fishery will be closed by proclamation until such time that the minimum coverage can be resumed.

(d) This subsection (d) applies only to Albemarle Sound as an interim measure until the DMF obtains a statewide ITP from NMFS. In the Albemarle Sound, as defined above in Paragraph 2(d), each N.C. Marine Patrol officer assigned to that area within the Northern District will be responsible for conducting one observed trip per week. Should reliable reports of sea turtle presence be submitted, additional observer coverage in such area will be required.

#### **4. The Sea Turtle Advisory Committee (STAC).**

(a) The Sea Turtle Advisory Committee shall be established as an advisory committee of the MFC.

(b) The STAC will consist of 12 members appointed by the MFC Chairman and the Karen Beasley Sea Turtle Rescue and Rehabilitation Center. The Karen Beasley Sea Turtle Rescue and Rehabilitation Center may appoint six of the twelve members of the STAC. The STAC may be dissolved by mutual agreement of the parties at any time.

(c) The duties of the STAC include but are not limited to the following: reviewing observer reports, devising means for fishermen to report turtle interactions, assisting with fishermen education, determining measures to reduce the incidental take of sea turtles, monitoring observer program issues, and reviewing all future ITP provisions and take calculations prior to formal application to NMFS.

#### **5. ITP Development.**

(a) The restrictions as listed in Paragraphs 1, 2(e) and 2(i) are minimum requirements for the 2010 statewide ITP application.

(b) The STAC will advise in the development of the new ITP applications and the overall take calculations.

(c) Effective for the 2012 license year (May 15, 2011), the dealer report required by the DMF will be expanded to include effort data recorded in terms of the number of 100-yard shots set by fishermen.

(d) The restrictions as listed in Paragraphs 1, 2(e) and 2(i) are deemed solely interim measures and will be in effect within internal coastal waters, not otherwise exempt, until NMFS issues the DMF an ITP for the affected areas. Furthermore, this Agreement shall not foreclose more lenient or more restrictive provisions in future ITP applications if warranted by biological data collected through reliable sources including but not limited to NMFS and the DMF.

**6. Dismissal with Prejudice.** Plaintiff shall dismiss its Complaint against Defendants with Prejudice within 10 calendar days of the execution of this Agreement by all the parties.

**7. Release of Claims.** The Plaintiff hereby releases and waives all claims and causes of action that it has against the Defendants, the State of North Carolina, and all other departments, agencies, divisions, and other components of the State of North Carolina and all past and present agents, employees, officials, and representatives of the State of North



Carolina on account of and/or in any way growing out of the actions or omissions arising from the use of gill nets in North Carolina's internal coastal waters alleged or which could have been alleged in Plaintiff's Complaint. This release and waiver of claims and causes of action continues in effect until a new Section 10 Permit under the ESA is issued by NMFS for North Carolina's internal coastal waters. Once the Section 10 Permit is issued, there will be no further need for the proclamation provided for in Paragraph 2(a) to remain in effect.

**8. Cost.** Each party shall bear its own costs, including attorney fees.

**9. No Admission of Liability.** The undersigned agree that this Agreement is a full and complete compromise settlement of disputed claims and causes of action set forth in Plaintiff's Complaint and is intended merely to terminate any and all claims or causes of action relating to the allegations therein. There is no admission of fault, wrongdoing, or liability by any party. Defendants do not waive their claim of sovereign immunity by entering into this Agreement.

**10. Full Cooperation.** The parties agree to cooperate fully, to execute any and all supplementary documents necessary to effectuate this Agreement, and to take all additional actions that may be necessary to give full force and effect to the terms of this Agreement.

**11. Enforceability.** In the event of breach of this Agreement, the parties have an action at law in any court having jurisdiction over the matter. The Agreement is not enforceable by third parties.

**12. Entire Agreement.** This Agreement contains the entire agreement between the parties and there are no understandings or agreements, verbal or otherwise, regarding this settlement except as expressly set forth herein.

**13. Reading of Agreement.** The parties hereby acknowledge that the individual executing the Agreement on his/her behalf is authorized to execute this Agreement on his/her behalf and to bind the respective entities to the terms contained herein and that he or she has read this Agreement, conferred with his or her attorney, fully understands its contents, consents to the settlement of the claims on the terms set forth herein, and does so in reliance upon his or her own judgment and advice of his or her attorney and not in reliance on any other representations or promises of Defendants or their representatives or attorneys.

IN WITNESS WHEREOF, this Agreement is executed in counterparts effective on the last date of execution indicated on the subsequent signature pages. This Agreement shall become effective upon the execution by all named parties.

[SIGNATURES APPEAR ON THE FOLLOWING PAGE]

**PLAINTIFF:**  
BY: W. Robert Bizzell for Jean Beasley dated 13 May, 2010  
Jean Beasley, Director  
Karen Beasley Sea Turtle Rescue and  
Rehabilitation Center

**DEFENDANTS:**  
BY: Dr. Louis Daniel III dated 5/13/, 2010  
Dr. Louis Daniel III, Director  
For: North Carolina Division of Marine Fisheries

BY: Dr. Louis Daniel III dated 5/13/, 2010  
Dr. Louis Daniel III, Director  
In his official capacity as Director of the  
North Carolina Division of Marine Fisheries

BY: W. Robert Bizzell dated May 13, 2010  
W. Robert Bizzell, Chairman  
For: North Carolina Marine Fisheries Commission



M-8-2010(REVISED)

North Carolina Department of Environment and Natural Resources

Division of Marine Fisheries

Beverly Eaves Perdue  
Governor

Dr. Louis B. Daniel III  
Director

Dee Freema  
Secretary

**PROCLAMATION**

**RE: LARGE MESH GILL NETS: INTERNAL COASTAL WATERS**

Dr. Louis B. Daniel III, Director, Division of Marine Fisheries, hereby announces that effective at 5:00 P.M., Sunday, June 13, 2010, the following provisions shall apply to the use of large mesh gill nets:

**I. SUSPENSION OF PORTION OF MARINE FISHERIES RULE 15A NCAC 03J .0103**

The following portion of Marine Fisheries Rules for Coastal Waters 15A NCAC 03J .0103 is **suspended**:

Section (i) (1), which reads:

- (i) For gill nets with a mesh length five inches or greater, it is unlawful:
  - (1) To use more than 3,000 yards of gill net per vessel in internal waters regardless of the number of individuals involved.

**II. AREAS AND EXEMPTIONS**

A. This proclamation applies to all internal coastal waters **except for Albemarle and Currituck sounds and their tributaries described as follows**:

- 1. In **Albemarle Sound**, the restrictions **do not apply** west of a line beginning at a point 36° 57.5590'N - 75° 56.8200' W; running northerly to a point 36° 09.9280'N - 75° 54.6950'W.
- 2. In **Currituck Sound**, the restrictions **do not apply** north of the Highway 158 Wright Memorial Bridge beginning at a point on the western shore at 36° 04.8280'N - 75° 47.4050'W; running easterly along the south side of the bridge to a point on the east shore at 36° 05.5770'N - 75° 44.5850'W.

B. Run-around or strike nets and drop nets that are used to surround a school of fish and then are immediately retrieved are exempted from the restrictions in this proclamation.

C. The Pamlico Sound Gill Net Restricted Area (PSGNRA) will operate under Incidental Take Permit (ITP) No. 1528 and is exempt from the restrictions in this proclamation during the September through December 2010 period. **Restrictions in this proclamation apply to the PSGNRA outside of that time period.**

**III. GILL NET RESTRICTIONS**

**It is unlawful** to use large mesh gill nets (defined as 4 inches to 6½ inches stretched mesh, inclusive) unless they comply with the following provisions:

- A. It is unlawful to set and retrieve large mesh gill nets except during the following times:
  - 1. No sooner than one hour before sunset on Monday and no later than one hour after sunrise on Tuesday.
  - 2. No sooner than one hour before sunset on Tuesday and no later than one hour after sunrise on Wednesday.
  - 3. No sooner than one hour before sunset on Wednesday and no later than one hour after sunrise on Thursday.
  - 4. No sooner than one hour before sunset on Thursday and no later than one hour after sunrise on Friday.

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- B. It is unlawful to use large mesh gill nets of more than 15 meshes in height and without a lead core or leaded bottomline. It is unlawful to use cork, floats, or other buoys except those required for identification **except that south of the Highway 58 bridge**, beginning at a point on the north shore at 34° 40.7848'N - 77° 04.0273'W; running southerly to a point on the south shore at 34° 39.8620'N - 77° 03.7438'W, **floats are allowed.**
- C. It is unlawful to use more than 2,000 yards of large mesh gill net per vessel north of the Highway 58 bridge (coordinates above) and it is unlawful to use more than 1,000 yards of large mesh gill net per vessel south of the Highway 58 bridge.
- D. It is unlawful to set more than 100 yards of large mesh gill net without leaving a space of at least 25 yards between separate lengths of net.

#### IV. GENERAL INFORMATION

- A. This proclamation is issued under the authority of N.C.G. S. 113-134; 113-170.4; 113-170.5; 113-182; 113-221.1; 143B-289.52 and N.C. Fisheries Rules 15A NCAC 03H .0103 and 03J .0101 and .0103.
- B. It is unlawful to violate the provisions of any proclamation issued by the Fisheries Director under his delegated authority pursuant to N.C. Fisheries Rule 15A NCAC 03H .0103.
- C. The intent of this proclamation is to implement gill net restrictions while the Division applies for a statewide incidental take permit from NMFS under Section 10 of the Endangered Species Act.
- D. The restrictions in this proclamation apply to gill nets used by Recreational Commercial Gear License holders as well as Standard and Retired Commercial Fishing Licenses holders.
- E. **The small mesh gill net attendance requirements in N.C. Marine Fisheries Rule 15A NCAC 03J .0103 (h), size restrictions in 03J .0103(a)(2), the navigational passage requirements in 03J .0101, as well as all other existing gill net rules and proclamations remain in effect.**
- F. This proclamation supersedes Proclamation M-8-2010, dated May 13, 2010. It alters the previous language to allow top lines to connect the 100 yard lengths of net in accordance with N.C. Marine Fisheries Rule 15A NCAC 03J .0103 (c).

BY: 

Dr. Louis B. Daniel III, Director  
DIVISION OF MARINE FISHERIES

June 11, 2010  
1:00 P.M.  
M-8-20109(REVISED)  
/DLT/sab

## **Appendix H. NCDMF Observer Program**

The NCDMF has obtained commercial gill net fishery observations since 2000 in the Pamlico Sound Gill Net Restricted Area (PSGNRA) and outside of the PSGNRA, both spatially and temporally since 2004 (Brown and Price 2005; Price 2007b, 2009b, 2010b). The purpose of these observations was to characterize effort, catch, and bycatch by area and season. Additionally, these programs were established to monitor fisheries for protected species interactions. The NCDMF has also conducted both inshore and nearshore shrimp trawl observations (Brown 2009, 2010 in press) and obtained a limited number of pound net observations (Price 2007). In 2010, in addition to continued estuarine gill net observations, NCDMF expanded the observer program to obtain observations in the recreational hook and line fishery. Additionally, the NCDMF observer program was expanded to achieve a minimum of seven percent observer coverage of large mesh gill net trips as required by the Settlement Agreement, with the exception of exempted areas. The tasking of Marine Patrol officers with gill net observer responsibilities is now an integral part of both the NCDMF observer and enforcement programs. In 2012, the observer program was expanded to include other estuarine gill nets where sturgeon interactions are possible.

These observer programs have received funding from several sources including state appropriations, Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA), the US Fish and Wildlife Service, Atlantic Coast Cooperative Statistics Program (ACCSP), and the National Fish and Wildlife Foundation. The NCDMF will continue to seek funding for continuation and expansion of these vital fisheries monitoring programs. Information gathered from these programs is utilized when making management decisions, in stock assessments, in the development of FMPs, and for identifying bycatch (finfish, protected species) problem areas. A unique opportunity (as well as burden) is presented to the division through ESA listing decisions to expand observer programs for fisheries that have previously not been monitored through division programs. However, expansion of observer programs involves large monetary dedication from already strict and stretched budgets with little or no assistance from federal entities.

## **Atlantic Sturgeon Interaction Trends from North Carolina Observer Program**

Atlantic sturgeon interactions have been documented through the North Carolina observer program. Observations have come from the estuarine gill net fisheries primarily in the Pamlico Sound Gill Net Restricted Area (Figures 13 and 14). From 2001 through 2011, interactions have been variable with a low of 0 interactions during five of the eleven years and a maximum of 39 Atlantic sturgeon in 2006 (Tables 17, 18). Both small and large mesh gill nets have been observed in each of the management units (Tables 17–31). There have only been 12 interactions in the small mesh fisheries, while the remaining 102 interactions have been observed in the large mesh fisheries (Tables 17–31). Lengths have ranged from 330 mm FL to 1,386 mm FL and averaged 616 mm FL (Table 30).

The current observer program divides North Carolina's estuarine waters into five units. Unit A encompasses the Albemarle, Croatan, Roanoke, and Currituck sounds and their tributaries (Figures 4, 15, and 16). There have been 277 observed trips in management subunits A1, A2, and A3 with 88 observed interactions. Of these 88 interactions, 52 (136 trips) have come from the Albemarle Sound and its tributaries (A1) with only one observed mortality (2%), 34 (107 trips) have come from the Croatan and Roanoke sounds combined (A3) with 3 mortalities (9%), and 2 (34 trips) have come from the Currituck Sound (A2) with 1 mortality (50%; Tables 32–34).

Gill net fishing trips have been observed in management subunits A1–A3 during 2001, 2004, 2005, 2006, and 2008 (Figures 15 and 16). The interactions in the Albemarle Sound are not concentrated in any one "hot spot"; the interactions in Currituck Sound are in the southern most portion of the Sound, and those in the Croatan and Roanoke sounds are concentrated in the Manns Harbor area which is in the northeast portion of Croatan Sound. Atlantic sturgeon collected in the Albemarle Sound ranged from 330 mm FL to 845 mm FL and averaged 562 mm FL (Table 32). White and Armstrong (2000) conducted a Fishery Resource Grant in the Albemarle Sound from 1998–2000 investigating the interactions of Atlantic sturgeon collected in commercial flounder gill nets. Gill net mesh sizes in this study included 5.5 ISM to 5.75 ISM and collected 131 Atlantic sturgeon that ranged from 311 mm FL to 1,105 mm FL and averaged 559 mm FL. These results are very similar to those found in the NCDMF observer program.

Atlantic sturgeon observed in the Roanoke and Croatan sounds (A3) ranged from 408 mm FL to 789 mm FL and averaged 639 mm FL (Table 33). The two Atlantic sturgeon collected in the Currituck Sound (A2) were 578 and 610 mm FL (Table 34).

The remaining interactions have come from management units B, C, and E (Tables 35, 36; Figures 17–24). Unit B encompass all estuarine waters South of 35° 46.30'N, east of 76° 30.00'W and north of 34° 48.27'N. This management unit will include all of Pamlico Sound and the northern portion of Core Sound. In this area, 2,106 trips were observed from 2001 to 2011. From these, 21 interactions with Atlantic sturgeon have occurred with one mortality (5%; Table 35). Figures 17 and 18 show these interactions are not concentrated in any one area. Interactions have occurred during 2003, 2004, 2005, 2006, and 2011; the other six years had zero interactions (Table 35). Observed Atlantic sturgeon ranged from 464 mm to 1,135 mm FL and averaged 681 mm FL. Additional information on lengths, trips, and yards can be found in Tables 17–36.

Unit C encompasses the Pamlico, Pungo, Bay, and Neuse river drainages west of 76 °30.00'W (Table 36; Figures 19 and 20). There have been only three interactions (1 mortality) in this management unit from 472 observed trips during 2002–2005, 2007, 2009, and 2010 (2 Neuse River, 1 Pamlico River). The two interactions in the Neuse River were 687 and 603 mm FL and the interaction in the Pamlico River was 633 mm FL. These interactions occurred during 2005 and 2006. Figures 19 and 20 show the locations of the interactions. Information on lengths, weights, trips, and yards, can be found in Tables 17–36.

Unit D had zero interactions with Atlantic sturgeon over a total of 109 trips, 2002–2011, while unit E had a single interaction during 2011 from 139 trips observed during 2005–2011 (Tables 18, 19; Figures 21–24). Unit D encompass all estuarine waters south of 34° 48.27'N and west of a line running from 34° 40.70'N – 76° 22.50'W to 34° 42.48'N – 76° 36.70'W to the Hwy 58 bridge. Management unit D includes southern Core Sound, Back and Bogue sounds, and North, and Newport rivers. Unit E includes the Atlantic Intracoastal Waterway (ICW) and adjacent sounds and the New, Cape Fear, Lockwood Folly, Shallotte, and White Oak rivers. Information on total trips and yards can be found in Tables 17–31.

## **Appendix I. Albemarle Sound Independent Gill Net Survey**

The stratified-random multiple-mesh Albemarle Sound Independent Gill Net Survey (IGNS) began in 1990 to monitor the striped bass resident and overwintering fall/winter population in the Albemarle and Croatan sounds and the Albemarle/Roanoke (A/R) striped bass spring spawning population.

Sampling gear is monofilament gill nets 9 ft or 10 ft deep, hung in 40-yard sections, with a hanging ratio 2:1. Mesh sizes range from 2.5 ISM to 7.0 ISM at 0.5 inch intervals, 8.0, and 10.0 ISM, for a total of 12 mesh sizes. Twine sizes vary as follows: 2.5 to 4.5 ISM had a twine size of 0.33 mm (#104), 5.0 to 7.0 ISM has a twine size of 0.40 mm (#139), and 8.0 and 10.0 ISM has a twine size of 0.57 mm (#277). Heavier twine size in the larger mesh nets is intended to improve retention of larger fish. Gill nets are hung as one of two types: floating or sinking. Float nets are hung using 0.5 inch float line and 20 lb lead line so as to fish from the surface of the water column down to the depth of the net, while the sink nets are hung using 3/8 inch float line and 40 lb lead line so as to fish from the bottom of the water column to the height of the net. Six nets are tied together to form a “gang”. Gangs of nets are one of four types: 1) large mesh floating net; 2) large mesh sinking net; 3) small mesh floating net; or 4) small mesh sinking net. Gangs are tied together in such a way as to minimize mesh size selectivity (i.e. small mesh net order = 2.5, 3.5, 4.5, 3.0, 4.0, 5.0, and large mesh net order = 6.5, 5.5, 7.0, 6.0, 8.0, 10.0). Float nets are set with a navigational fairway between the third and fourth net in each line. Each crew fishes one “set” of nets, which was made up of four “gangs”: One gang each of small mesh float nets, small mesh sink nets, large mesh float nets, and large mesh sink nets. Therefore, there are 24, 40-yard gill net sections equaling 960 yards of gill net fished by each crew per sampling day.

Six sample zones in the Albemarle and Croatan sounds are divided into one-mile square quadrants with an average of 22 quadrants per zone (Figure 25). Areas unsuitable for gill net sampling, such as marked navigational channels and areas with excessive submerged obstructions, are excluded. Quadrants within each zone are randomly selected. Alternate quadrants within each zone are randomly selected in case the primary quadrant cannot be sampled due to adverse weather conditions or space limitations. In Zones II–VI, gangs of nets are set perpendicular to the shore. In Zone VII, gangs are set parallel to the shore due to the substantial current associated with local tides. Some quadrants may contain only shallow



water, while others may contain only deep water. In quadrants that contained both shallow and deep water areas, float and sink nets are set in both shallow and deep areas to assure a more complete assessment of how striped bass use different habitats and portions of the water column by season. Nets fished in the shallow areas (less than 10 ft deep) are termed as "FIN" (float inshore) and sample the majority of the water column. Nets fished in water deeper than 10 ft are identified as: 1) "FO" (float net offshore) with the net fishing from the surface of the water column to the depth of the net, or, 2) "SO" (sink net offshore) with the net fishing from bottom of the water column to the height of the net. Gangs of nets are separated to the greatest extent possible within each quadrant to eliminate interference caused by one gang fishing too close to another, as well as to sample various habitat types and depths that may exist in the same quadrant.

The fishing year is divided into two segments: 1) Fall/Winter (F/W) segment, November to February and 2) spring segment, March through May. The sampling methods remain the same during each sampling segment. However, areas fished, sampling frequency, and sampling effort are altered seasonally.

During the F/W segment, two survey crews each fish one set of nets each sampling day. Each crew samples each of the six zones once monthly, providing 24 fishing days per month (12 per crew) and a total of 96 fishing days for the F/W season. A fishing day is defined as one crew, fishing the full set of nets, after a 24-hour soak time. Total gear soak time for each quadrant is 48 hours. Each 40-yard net, fished for 24 hours, is one unit of effort. Monthly effort for all mesh sizes is equal, except when nets are damaged or hampered by debris or rough weather. Therefore, the maximum amount of units of effort for the F/W segment is 2,304.

During the Spring segment, gill net effort is concentrated in western Albemarle Sound (Zone II), near the mouth of the Roanoke River. The shift to Zone II is designed to increase the chance of intercepting A/R striped bass moving through this area during their migration to the Roanoke River spawning grounds. Effort is concentrated in Zone II to determine differences in the size, age, and sex composition of the spring spawning migration relative to the F/W resident and overwintering population. Zone II is further sub-divided into southern and northern areas. The southern area, adjacent to the Roanoke River, receives effort at a 2:1 ratio south to north, based on the historical seasonal abundance of mature striped bass (Harriss et al. 1985). Quadrants sampled are randomly selected as previously noted. In order to effectively sample the entire

spring segment, minimize lapses in effort, and eliminate simultaneous sampling, fishing effort is conducted continuously, seven days a week, with two fishing days per quadrant, from March 1 until the end of May. Only one set of nets is fished instead of two, for a maximum daily effort of 24 and a maximum effort for the entire Spring segment of 2,208 units.

### **Atlantic Sturgeon Interaction Trends in the Albemarle Sound Independent Gill Net Survey**

Program 135 (Albemarle Sound Independent Gill Net Survey—ASIGNS) is the main source for Atlantic sturgeon data in the Albemarle Sound area. Atlantic sturgeon are found in all six zones currently sampled with collection numbers larger in the south west portion of the sound. Program 135 has collected 1,271 sturgeon from November 1990 through December 2011 with only 39 mortalities (3%; Table 37). Yearly collections have ranged from a low of 21 fish in 1995 and 2003 to a high of 139 in 2000 (Table 37). Mortality has ranged from 0% to 18%, the highest mortality occurred in May (7%) and in the 6.5 ISM net (7%; Table 38). Eighty-eight percent of fish collected are from mesh sizes less than 5.5 ISM (3% mortality), while 12% are from mesh sizes 5.5 ISM and larger (3% mortality; Table 39). Fork lengths range from 153 mm to 1,498 mm with an average of 498 mm (Table 40). The average length of Atlantic sturgeon collected in this survey is smaller than the other North Carolina independent gill net surveys. This smaller mean size suggests that there is a reproducing population of Atlantic sturgeon using the Albemarle Sound and its tributaries.

Atlantic sturgeon have been collected in nearly every grid of the 140 available (Figure 25). The 4.0 ISM webbing had the highest catch rate in the IGNS; however, it is only allowed to be fished during the summer when attendance is required (Tables 38, 39). The area in the southwest portion of Albemarle Sound, where collections numbers are the highest in the ASIGNS, is closed to commercial gill netting from February through mid-November. November is the month with the highest interactions ( $n = 372$ ) and April is the month with the least ( $n = 81$ ); June through October were only fished during the first few years of the survey (Table 38). Figure 25 shows the locations where collections have been made. Figures 26–28 show the catch per unit effort of the ASIGNS and compares the CPUE of the three IGNS in North Carolina. It should be noted that there are multiple regulations in the Albemarle area that restrict the mesh sizes fishermen can use throughout various times of the year as well as area restrictions where gill nets cannot be fished.

## **Appendix J. Pamlico Sound Independent Gill Net Survey**

This study employs a stratified-random sampling design based on area and water depth. Samples for each year are obtained from February 15–December 15. The period of December 16 through February 14 was dropped due primarily to low catch rates, but also due to the safety concerns associated with fewer daylight hours and cold water and air temperatures occurring during that period.

Sampling is divided into two regions: Region 1 includes areas of eastern Pamlico Sound adjacent to the Outer Banks from southern Roanoke Island to the northern end of Portsmouth Island; Region 2 includes Hyde County bays from Stumpy Point Bay to Abel's Bay and adjacent areas of western Pamlico Sound (Figure 29). Each region is overlaid with a one-minute by one-minute grid system (equivalent to one square nautical mile) and delineated into shallow ( $\leq 6$  feet) and deep ( $> 6$  feet) strata using bathymetric data from NOAA navigational charts and field observations. NCDMF staff also considers such factors as obstructions to fishing, safety, and accessibility when evaluating each grid for inclusion in the sampling. After grid delineation, each region is further segregated into four similar sized areas to ensure that samples are evenly distributed throughout each region.

Each of the four areas within each region is sampled twice a month. The SAS procedure PLAN is used to randomly select sampling grids within each area (SAS Institute 1985). For each grid selected, both the shallow and deep strata are sampled with a separate array of nets. An array of nets consists of 30-yard segments of 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, and 6.5 ISM webbing (240 yards of gill net). Catches from this array of gill nets comprise a single sample, while two samples (one shallow, one deep), totaling 480 yards of gill nets fished, are completed in a sampling trip. Within a month, 32 core samples are completed (8 areas x twice a month x 2 samples). If adverse weather conditions or other factors prevent the primary grid in an area from being sampled, alternative grids for that area are randomly selected to increase flexibility and ensure completion of sampling requirements each month. Gear is typically deployed within an hour of sunset and fished the following morning with all soak times within 12 hours. The 12-hour soak time allows for uniform effort and keeps the study in compliance with the terms and conditions mandated by the Section 7 permit issued by the U.S. Fish and Wildlife Service. This action is taken to minimize interactions with endangered and threatened sea turtles. Twine size varies between the regions and is based on the twine size most frequently used by local

commercial fishermen (Region 1: #208 twine or 0.52 mm; Region 2: #177 or 0.47 mm). All gill nets are constructed with a hanging ratio of 2:1. Nets constructed for shallow strata have a vertical height between six and seven feet. Prior to 2005, nets constructed for deep and shallow strata were made with the same configurations. Beginning in 2005, all deep water nets were constructed with a vertical height of approximately 10 feet. With this configuration, all gill nets are floating and fished the entire water column.

### **Atlantic Sturgeon Interaction Trends in the Pamlico Sound Independent Gill Net Survey**

Program 915 has collected 53 Atlantic sturgeon in Pamlico Sound since 2001 with an overall mortality of 9% (Table 41). Atlantic sturgeon are collected during all fishing months (February through December) with the most collected during April ( $n = 20$ ; Table 42). Fish were collected from all mesh sizes used with the 5.5 ISM having the highest catches (Table 43). Atlantic sturgeon ranged in fork length from 460 mm–1,495 mm with an average of 679 mm (Table 44). Atlantic sturgeon in this survey average 185 mm larger than those collected in the ASIGNS and 166 mm larger than those collected in the Pamlico, Pungo, and Neuse rivers IGNS, evidence that this survey encounters older fish as they begin to move out of the estuary and exhibit migratory behavior.

## **Appendix K. Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey**

This study employs a stratified-random sampling design based on area and water depth. Samples for each year are obtained from February 15–December 15. The period of December 16 through February 14 was dropped due primarily to low catch rates but also due to the safety concerns associated with fewer daylight hours and cold water and air temperatures occurring during that period.

Sampling is divided into two regions: Pamlico/Pungo includes areas of Pamlico River from Washington, North Carolina to the mouth of the Pamlico Sound (south of Wade Point) and the upper portion of the Pungo River from (Haystack Point and west to Belhaven) and south to Jordan Creek; Neuse includes the Neuse River from New Bern to Oriental, North Carolina (from Old House Point south to Sandy Point; Figure 30). Each region is overlaid with a one-minute by one-minute grid system (equivalent to one square nautical mile) and delineated into shallow ( $\leq 6$  feet) and deep ( $> 6$  feet) strata using bathymetric data from NOAA navigational charts and field observations. NCDMF staff also considers such factors as obstructions to fishing, safety, and accessibility when evaluating each grid for inclusion in the sampling. After grid delineation, each of the two regions is further segregated into four similar sized areas to ensure that samples are evenly distributed throughout each region.

Each of the four areas within each region is sampled twice a month. The SAS procedure PLAN is used to randomly select sampling grids within each area (SAS Institute 1985). For each grid selected, both the shallow and deep strata are sampled with a separate array of nets. An array of nets consists of 30-yard segments of 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, and 6.5 ISM webbing (240 yards of gill net). Catches from this array of gill nets comprises a single sample, while two samples (one shallow, one deep), totaling 480 yards of gill nets fished, are completed on a sampling trip. Within a month, 32 core samples are completed (8 areas x twice a month x 2 samples). If adverse weather conditions or other factors prevent the primary grid in an area from being sampled, alternative grids for that area are randomly selected to increase flexibility and ensure completion of sampling requirements each month. Nets are deployed as sink gill nets parallel or perpendicular to the shore based on the strata and common fishing techniques for each area. Gear is typically deployed within an hour of sunset and fished the following morning with effort made to keep all soak times within 12 hours. The 12-hour soak time allows for uniform effort and keeps the study in compliance with the terms and conditions mandated by

the Section 7 permit issued by the U.S. Fish and Wildlife Service. This action is taken to minimize interactions with endangered and threatened sea turtles. Twine size for both regions are #177 or 0.47 mm and are based on the twine size most frequently used by local commercial fishermen in these rivers. All gill nets are constructed with a hanging ratio of 2:1. Nets constructed for shallow strata have a vertical height between six and seven feet. Prior to 2005, nets constructed for deep and shallow strata were made with the same configurations. Beginning in 2005, all deep water nets have been constructed with a vertical height of approximately 10 feet. With this configuration, all gill nets are floating and fished the entire water column.

### **Atlantic Sturgeon Interaction Trends in the Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey**

Program 915 has collected 47 Atlantic sturgeon in these rivers since 2003 when effort was standardized (13% mortality; Table 45). Atlantic sturgeon were collected during all fishing months (February through December) with the most occurring in October (n = 9; Table 46). Fish are encountered in mesh sizes from 3.0 ISM through 6.5 ISM by half inch increments, and most are collected in the 3.0 ISM (n = 13; Table 47). Lengths ranged from 358 mm to 2,300 mm with an average of 513 mm (Table 44). These small fish likely represent offspring from a reproducing population within one or more of these river systems.

## **Appendix L. Southeast Area Independent Gill Net Surveys**

The Assessment of Fish Populations in the Lower Cape Fear River project employs sinking gill nets to sample large species that are less likely to be captured in trawls or by electroshock. Gill nets are 50 meters long and constructed of 13.9 cm (5.5 ISM) stretch monofilament mesh. Gill nets are set perpendicular to shore and soaked for approximately 24 hours. The fishing methods and gear/mesh size are similar to gear used by commercial fishermen to target American shad (*Alosa sapidissima*) and striped bass (*Morone saxatilis*). The sampling design is based on two sets per month at each site. However, sampling efforts varied in the beginning of the study. Some stations were skipped due to issues with boat traffic and water level, other stations had only one net set, and some stations had more than two nets set due to issues with the set.

The Fisheries Independent Assessment Program (FIA) employs a stratified-random sampling design based on area and water depth for the New and Cape Fear rivers and the Atlantic Ocean (Figures 31 and 32). The New River includes an upper portion from Wilson Bay to Hines Point (line extending eastward to French's Creek) and a lower portion from Hines Point to the intersection of New River and the Intracoastal Waterway (Figure 32). The Cape Fear River is considered as one area from the northern end of US Army Corps of Engineer's Island 13 south to the mouth of the river.

The Atlantic Ocean is separated into three areas including the Topsail Area which is designated from a line extending southwest off New River Inlet south to a line extending southwest off Rich's Inlet; Masonboro Area extended from Rich's Inlet to Frying Pan Shoals; and Brunswick Area extended from Frying Pan Shoals to the North Carolina/South Carolina border (Figure 31).

For the New and Cape Fear rivers sampling, the SAS procedure PLAN is used to randomly select sampling grids within each area (SAS Institute 1985). Sampling gear consists of an array of nets consisting of 30-yard segments of 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, and 6.5 ISM webbing (240 yards of gill net per sample). Catches from the array of gill nets combined together comprise a single sample. Gear is typically deployed within an hour of sunset and fished the following morning to keep all soak times at a standard 12 hours.

For the Atlantic Ocean sampling, the SAS procedure PLAN is used to randomly select sampling grids within each area (SAS Institute 1985). Sampling gear consists of an array of nets consisting of 30-yard segments of 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, and 6.5 ISM webbing (270 yards of gill net per sample). Catches from the array of gill nets combined together comprise a single sample. Gear is typically deployed within an hour of sunset and fished the following morning to keep all soak times at a standard 12 hours during from October through March and two hours from April through September (sampling was modified in July 2008).

### **Atlantic Sturgeon Interaction Trends in the Cape Fear River**

A total of 251 sub-adult Atlantic sturgeon was collected in gill nets throughout the year. However, catches were considerably lower in the winter months (December–February). The highest annual interactions occurred in 2004 ( $n = 89$ ) and the lowest in 2002 ( $n = 20$ ), 2003 ( $n = 25$ ), and 2007 ( $n = 17$ , only 6 months). Gill net CPUEs varied over time with no yearly trend in abundance but a seasonal pattern was observed. The catch of Atlantic sturgeon was usually low from December to March or April. As the waters began to warm, the catch increased. The highest catches occurred during May and November in the Brunswick River and accounted for 48% of the total catch. These peaks during the spring and fall likely represent a seasonal migration pattern in the Cape Fear River.

The length frequency of sturgeon captured in 2004 was smaller than other years with fish between 500 and 599 mm FL being the most common. This size class corresponds to two- or three-year-old fish (Stevenson and Secor 1999; Secor et al. 2000). This could be an indication of a high recruitment year in 2001 or 2002. The predicted growth for the cohort in the following year would average 600 to 699 mm TL (Stevenson and Secor 1999). Mortality during this survey averaged 35% and reached as high as 60% in 2002.

The Cape Fear/New River Independent Gill Net Survey has collected 11 Atlantic sturgeon (2 mortalities) from 2008 through 2011 (Table 48). These fish were collected in the Cape Fear River and Long Bay (Atlantic Ocean); no Atlantic sturgeon were collected in the New River or Onslow Bay (Atlantic Ocean; Tables 48–51). Fish collected in the Cape Fear River ranged from 569–873 mm FL and averaged 727 mm FL (Table 52). Fish collected in Long Bay ranged from 412–960 mm FL and averaged 684 mm FL (Table 52).



Moser and Ross (1993) collected 100 Atlantic sturgeon from the Cape Fear river area during 1990–1992 (24% mortality). Mortality was highest from June through September when water temperatures were above 28°C even when soak times were reduced to 4 hours. Williams and Moser (2000) completed a study in the Cape Fear area collecting two large males and one gravid female during sampling from 1999–2000.

## Appendix M. Atlantic Sturgeon Incidental Capture Report Form

### STURGEON

#### INCIDENTAL CAPTURE REPORT

OBSERVER'S NAME \_\_\_\_\_ DATE \_\_\_\_\_

year      month      day

AFFILIATION/ADDRESS: \_\_\_\_\_

AREA CODE/PHONE NUMBER: \_\_\_\_\_

GEAR: \_\_\_\_\_ SOAK/TOW TIME: \_\_\_\_\_

GEAR PARAMETERS INCLUDING MESH SIZE: \_\_\_\_\_

LOCATION (Include county, body of water, mgmt area, nearby nautical landmarks such as channel markers, inlets, etc.): \_\_\_\_\_

LATITUDE: \_\_\_\_\_ LONGITUDE: \_\_\_\_\_

COMMENTS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

STURGEON #	SPECIES (use codes)	CONDITION (use codes)	TAG # (if tag present)	Disposition (use codes)	TOTAL LENGTH (mm)	FORK LENGTH (mm)	WEIGHT (kg)

If more sturgeon are caught than boxes provided, use extra sheets as needed.

TOTAL NUMBER OF STURGEON CAUGHT AT THIS INTERACTION LOCATION: \_\_\_\_\_

Table definitions and codes

Sturgeon # - number assigned to each sturgeon at this interaction location in the order they were encountered (1, 2, 3...)

Species:	Condition (condition of sturgeon)	Disposition (final disposition of sturgeon)
AS - Atlantic sturgeon	0 - Alive	1 - Alive, released
SNS - Shortnose sturgeon	1 - Fresh/Dead	2 - Dead, released
	2 - Moderately Decomposed	3 - Dead, collected for study
	3 - Severely Decomposed	
	4 - Drier Carcass	
	5 - Skeletal, bones only	

Total Length - Tip of the snout to the tip of the longest lobe of the caudal fin in millimeters

Fork Length - Tip of the snout to the fork of the tail in millimeters

Weight - If fish can be safely weighed use either basket or sling. If fish cannot be safely weighed please provide estimated weight in kilograms

## **Appendix N. Updated Information and Communication Between NMFS and NCDMF**

### **Notes on call between NCDMF and NMFS for the Sturgeon ITP application February 4, 2013**

On April 5, 2012, NCDMF submitted an application for an ITP to address Atlantic sturgeon interactions with set gill nets in NC internal coastal waters. Feedback on the ITP application was received from NMFS on May 29, 2012 via a teleconference with NCDMF and NMFS staff. After further review, on July 20, 2012 NMFS requested the NCDMF to submit a revised permit application and conservation plan that addressed issues that were provided. In response to requested changes from NMFS, NCDMF made extensive revisions to its application and resubmitted December 20, 2012. Upon further review NMFS provided NCDMF with a list of questions they had regarding the application. On February 4, 2013 NMFS and NCDMF went over questions regarding the ITP application and Conservation Plan for the incidental take of Atlantic sturgeon in NC fisheries. NMFS had listed questions and NCDMF had provided answers before the call. Both parties agreed that notes would memorialize the phone conversation and both parties would review the notes, action items, and suggestions and agree (or disagree) to the accuracy of the notes. The questions, answers, concerns, and end result are listed below:

#3) **NMFS** - It appears you're predicting the same amount of sturgeon bycatch each year for 10 years with no allowance for decrease in takes due to the implementation of your adaptive management driven Conservation Plan (CP). We understand you can't start implementing a CP with immediate reduction in bycatch especially with an adaptive management type plan, but after the first few years, assuming the CP is to work, you should see sturgeon bycatch go down. There are concerns with getting your application and take request as is through the Endangered Species Act section 7 consultation process as is. The section 7 analysis must consider what is anticipated to be the impact based on what is reasonably expected to occur.

- Is there a way you can incorporate the decreases in take you'll likely see and revise your take request?

**NCDMF** - We cannot estimate what the number or percent reduction in bycatch would be in future years due to an observer program and adaptive management that has not occurred yet. We also note that should the population begin to recover, interactions may increase and offset a decrease in interactions due to mitigation measures.

**Result** - Both parties agreed that we will need to explore several options to estimate a reduction in bycatch over the 10 years, especially since data used for future adaptive management will accumulate in an ongoing process. Some ideas were – (a) establish multi-year averages to account for inter annual variability; (b) establish a take % reduction target goal within the first 5 years and if that goal is not reached, address with new management measures (steps possibly

to be outlined in an implementing agreement, see #7); and (c) use an implementing agreement to revisit take numbers in after a certain number of years; others?

**NMFS Action** - NMFS offered to come up with suggestions and submit them to NC in the near future.

**End Result** - The Implementing Agreement states that after three years NCDMF will analyze Observer Program data to determine if a reduction is appropriate and convene with NMFS.

#5) **NMFS** - Areas where sturgeon bycatch is expected to be high (i.e., 'hotspots') is still not clearly defined.

**NCDMF** - We cannot define this exactly since we don't have the data yet. It will be obtained during the monitoring and adaptive management phase.

**NCDMF Action** - NC will define 'hotspots' to the best of their ability at this time. To make the definition more specific in the absence of data. NC will list the series of steps it will take when a hotspot is discovered/defined in order to close the area or whatever other adaptive management strategy they have planned. This will allow the public and NMFS to visualize what will happen when a hotspot is identified. These steps could be placed in the implementing agreement (see #7), should NC choose to go this route.

**End Result** - NCDMF revised hotspot language in Conservation Plan of ITP application

#7) **NMFS** - Suggested an implementing agreement for specifying the steps to be taken in terms of adaptive management measures such as hotspot recognition and closures, addressing future take, fishery closures, or adaptive management measures that are less than a fishery closure.

**NCDMF Action** - Will discuss internally and consider whether they want to enter into an implementing agreement.

**End Result** - NMFS provided NCDMF with a draft Implementing Agreement which NCDMF revised. Negotiations are still underway but an Implementing Agreement will be utilized by NCDMF and NMFS to carry out the Conservation Plan.

#9) **NMFS** - PIT tags and genetic samples need to be done and paid for by NC. However, not ALL 3,000 fish per year would need to be genetic-sampled – just enough to be statistically significant. This is something that could be worked out at a later date or outlined in the implementing agreement.

**NCDMF** - Was not aware of this requirement and, at this time, cannot pay to tag and sample every single sturgeon. NC suggested sending genetic samples to University researchers who may be able to process some samples.

**Action NMFS and NCDMF** - Jason Kahn has agreed to look into funding for tags. NC will explore sending the samples to University researchers.

**End Result** - NCDMF agreed to tag and collect genetic samples from Atlantic sturgeon. NMFS is going to make the effort to provide the tags and analysis of genetic samples. If not, both NMFS and NCDMF agreed to find a third party (i.e., researchers) to provide funding for such. Implementing Agreement goes into more detail.

#12) **NMFS** - Would NC be open to average take numbers over a multiple-year period?

**NCDMF** - Possibly for Management Unit A, but not for the other units where low or zero interactions have occurred. (This could possibly have been in the reverse. Please let us know.)

**NMFS Action** - Will come up with suggestions for and submit them to NC in the near future.

**End Result** - According to the Implementing Agreement after three years analysis will be done to determine if action is appropriate.