North Carolina Department of Environment and Natural Resources
Division of Marine Fisheries

Beverly Eaves Perdue
Governor

Dr. Louis B. Daniel III
Director

Dee Freeman
Secretary

December 17, 2010

Roy E. Crabtree Ph. D.
Regional Administrator
NMFS South East Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701

Dear Dr. Crabtree,

The purpose of this letter is to provide comments and information relative to the proposed rule to list Atlantic sturgeon (*Acipenser oxyrhynchus oxyrhynchus*) as endangered under the Endangered Species Act (ESA) in the Carolina and South Atlantic Distinct Population Segments (DPSs). The North Carolina Division of Marine Fisheries (NCDMF) does not support the listing of Atlantic sturgeon by National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA) under the ESA at this time. The NCDMF believes that there is sufficient evidence that management measures enacted by the state of North Carolina and the Atlantic States Marine Fisheries Commission (ASMFC) are resulting in positive population trends. The NCDMF recommends allowing the framework from the ASMFC Atlantic Sturgeon Fishery Management Plan (FMP) and Amendment 1 to continue while states monitor their populations and continue to address issues that may be impacting Atlantic sturgeon.

Atlantic sturgeon were in greater abundance in North Carolina during the turn of the century compared to present day. The state of North Carolina recognized the importance of this species to the state and coastal ecosystem and was proactive before many other Atlantic coast states by implementing a state-wide moratorium on harvest in 1991. The framework of the 1998 ASMFC FMP amendment and moratorium may already be having positive effects on the populations of Atlantic sturgeon in the Carolina DPS, based on survey data and the younger age at maturity for southern waters.

Water quality issues have been and are currently being addressed through various basin-wide plans. The NCDMF has concerns that the water quality information provided in NOAA's petition overly generalizes water quality conditions in North Carolina waters and does not accurately portray the water quality conditions utilized by Atlantic sturgeon. For example, the document states that water quality is poor for aquatic life in the Cape Fear River. While some areas are impaired for certain uses, other areas utilized by Atlantic sturgeon are fully supporting and in excellent condition. In some instances it also appears that citations are improperly used. The North Carolina Division of Water Quality (NCDWQ) extensively monitors surface waters in North Carolina and summarizes information in use support assessments and basin-wide plans. This NCDWQ data should be used to assess suitability of water quality for Atlantic sturgeon and we request that NCDWQ be contacted directly to obtain this information. Similarly, NOAA should refer to NCDWQ's annual fish kill report (NCDWQ 2008) to accurately depict changes in fish kill events over time. Data from North Carolina rivers indicate that the overall number of fish kills has declined since 2001 and remained relatively low, with the exception of 2008 when a high number of fish kills were reported. This was attributed to drought and localized weather conditions, and included fish kills in ponds (NCDWQ 2008). No sturgeon were reported in these fish kills. In addition, fish kills are generally not considered a good indicator of water quality since reporting varies by year and location due to visibility of the fish kills and the amount of staff available to investigate complaints. We recommend NOAA contact NCDWQ for more specific information regarding fish kill data and what that means for Atlantic sturgeon. Finally, the petition also states that the Carolina and South Atlantic DPSs are in a region that the Intergovernmental Panel on Climate Change predicts will experience decreases in precipitation, which could exasperate low oxygen events. However, in looking at this reference and from other literature the NCDMF has reviewed, this appears to be incorrect – with the exception of the southwest United States, precipitation is expected to increase. Due to the serious nature of this proposed listing, we would like to see a more comprehensive review of water quality conditions within areas utilized by Atlantic sturgeon, using state-collected data, as well as specific studies.

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Habitat issues have been identified and addressed through the North Carolina Coastal Habitat Protection Plan (CHPP) as well as through moratoriums on construction, dredging, and other habitat altering activities. Observer programs continue to expand to include more fisheries that have interactions with Atlantic sturgeon. Gear configurations and regulations continue to be updated to reduce bycatch of various species and limit interactions with threatened and endangered species. Grants for cooperative research have been awarded that will allow North Carolina and many other states to gain a better understanding of the migratory patterns, spawning areas, and distribution of Atlantic sturgeon throughout the east coast within the next few years. All of these items are in place without a designation of Endangered or Threatened status for Atlantic sturgeon by NMFS, NOAA. The NMFS under the 1967 ESA listing of shortnose sturgeon (*Acipencer brevirostrum*) has had the opportunity since 1978 (through the amended ESA) to designate critical habitat for shortnose sturgeon and has failed to do so, thus limiting the opportunity for improved habitat protection to Atlantic sturgeon as well (due to substantial overlap in habitat utilization among the two species). The NMFS should demonstrate its ability to meet the management objectives of the ESA for shortnose sturgeon before taking on the substantial administrative burden of a listing for Atlantic sturgeon. Proceeding with designating shortnose sturgeon critical habitat would curtail the need to list Atlantic sturgeon while providing essentially the same habitat benefits to multiple species. In addition, cooperative state and federal research could be designed to foster restoration efforts.

In the current lean economic climate, the data cost to state and federal entities of the permitting aspect (research and habitat) that would result from ESA listing should not be overlooked. Research surveys that have provided essential monitoring information on Atlantic sturgeon, as well as other ASMFC managed species, risk elimination with an ESA listing of endangered. This risk comes not only for the inordinate length of time to obtain the required permits (over a year for shortnose sturgeon) but also possible sampling constraints that would invalidate the long established survey sampling protocols. A substantial change in survey protocol is in essence the initiation of a new survey, and results in the termination of long-term indices of abundance. The states have invested millions of dollars in initiating and maintaining these multi-year surveys. This aspect of listing is counter to the stated effect of listing to promote "conservation actions by Federal and state agencies, private groups, and individuals".

The NCDMF does not believe the proposed listing is informed by the best available scientific and commercial information. The NCDMF presents the availability of new data that differ from data presented during the 1998 status review as well as the 2007 Status Review Report (SRR) for the Atlantic sturgeon Carolina DPS. A summary of data that support our position is shown below and additional detailed data are attached.

Albemarle Sound Independent Gill Net Survey

- Data are available for the survey from 1990 -2009, of which, data only through 2005 was used in the 2007 Atlantic Sturgeon Stock Status Review.
- Data collected since 2005 have shown increasing abundance through 2008.
- Overall mortality during this time series was 3%.
- Mortality is less than the 13.8% ASMFC (2007) has estimated for sink gill net fisheries.
- Catch data by mesh size cannot be compared with commercial harvest estimated from the Albemarle Sound area due to severe gear restrictions in place.

Pamlico Sound and Pamlico, Pungo, and Neuse rivers Independent Gill Net Surveys

- Data are available from the Pamlico Sound from 2001 and show a slight increase in abundance of juvenile and sub-adult fish with an overall mortality of 10%.
- Data are available for the River survey since 2004 and show a slight decrease in abundance with an overall mortality of 12%.
- Mortality is less than the 13.8% ASMFC (2007) has estimated for sink gill net fisheries.

Cape Fear River Independent Gill Net Survey

- Data are available from 2002 through 2007.
- Mortalities were high due to long soak times during summer months when water temperatures were elevated.
- Mortalities cannot be extrapolated to commercial gears since no gill net fishery exists in the river when and where these high mortality rates occurred.

Cape Fear River and near shore Atlantic Ocean Fishery Independent Assessment Program

- Data are available from 2008 and 2009. Six Atlantic sturgeon have been collected with no mortalities.
- The absence of mortality is due to very limited soak times enacted to limit sea turtle interactions.
- Mortality is less than the 13.8% ASMFC (2007) has estimated for sink gill net fisheries.

North Carolina Observer Program

- Over 3,000,000 yards of large and small mesh gill nets have been observed since 2001.
- Overall mortality was 6%, lower than the 13.8% estimated by the ASMFC (2007).
- Bycatch characterization results have been documented for over 958 tows conducted by commercial shrimp trawlers working in North Carolina with no Atlantic sturgeon reported.
- No Atlantic sturgeon have been captured in the 528 blue crab trawl tows examined since 1990.

Fishery Resource Grants (FRG) from North Carolina Sea Grant

- Data are available for four FRG's that have encountered Atlantic sturgeon in North Carolina waters.
- All FRGs combined show 1.8% mortality which is in contrast to the 13.8% estimated by ASMFC (2007).
- The White and Armstrong FRG conducted in the Albemarle Sound was used in the listing documents because of a high collection rate, however, targeting of Atlantic sturgeon may have occurred since the design of the study was to estimate survival of sturgeon captured in commercial flounder nets.
    - White and Armstrong also noted no mortality of Atlantic sturgeon collected.

Current Fishery Regulations

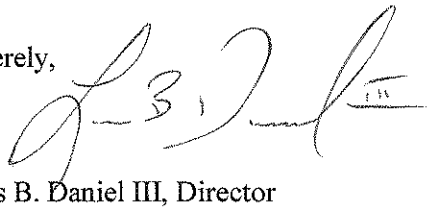
- Restrictions include mandatory attendance for small mesh gill nets from May through November.
- The American shad gill net fishery is limited to nets with a maximum of 1,000 yards of 5.25 Inch Stretched Mesh (ISM) from February through April and all nets must be float nets (Albemarle Sound Management Area (ASMA) only).
- The flounder fisheries in the ASMA allow 5.5 ISM and larger sink nets from April through November and no nets 6.0 ISM and larger from January through April.
- Other seasonal and area closures decrease interactions fishermen have with Atlantic sturgeon in the Albemarle Sound area.
- New regulations enacted after a settlement with the Karen Beasley Sea Turtle Rescue and Rehabilitation Center has reduced overall large mesh effort in the Pamlico Sound and southern North Carolina sounds and rivers by 83%.
    - It is unlawful to use large mesh gill nets (defined as 4.0 through 6.5 ISM, inclusive) unless they comply with increased provisions, not limited to: restrictions in soak times, net yardage, mesh height, lead core lines, and floats.

Genetics (Designation of Distinct Population Segments)

- Utilization of the genetics data that are available for the designation of DPSs may be uncertain due to limited sample sizes; spatial, temporal, and ontogenetic differences in collection; and review of the articles was based on techniques used rather than the samples used to derive the conclusions.

The NMFS based its determination to list the Atlantic sturgeon Carolina DPS as endangered based on "new information available indicating that threats such as bycatch and water quality issues are having a greater effect on the Atlantic sturgeon populations than previously known (November 2010 NMFS presentation to ASMFC)". Although the NMFS has no quantitative measure of total bycatch or its impact to the population as a whole, the information provided herein, at least for the Carolina DPS, clearly documents a bycatch rate lower than the 13.8% referenced, and is in line with the 2007 SRR finding that bycatch was a moderate threat. The existing ASMFC management framework can be used to further address bycatch in those fisheries (commercial and recreational) where warranted. In a similar fashion, existing North Carolina basin-wide water quality plans, along with the CHPP, are being employed to improve water quality and habitat in North Carolina waters. The NCDMF feels that the ESA listing of the Carolina DPS is not warranted at this time.

Sincerely,



Louis B. Daniel III, Director
N.C. Division of Marine Fisheries

Attachment

cc (electronic only): Governor Beverly Perdue
Secretary Dee Freeman, N.C. Department of Environment and Natural Resources
N.C. Marine Fisheries Commission
Executive Director Gordon Myers, N.C. Wildlife Resources Commission
Director Coleen Sullins, N.C. Division of Water Quality

LBD/kr/cb

North Carolina Division of Marine Fisheries Data Attachment

ALBEMARLE SOUND INDEPENDENT GILL NET SURVEY

The North Carolina Division of Marine Fisheries (NCDMF) has had a fishery independent gill net survey (IGNS) in the Albemarle Sound area since 1990 (Figure 1). Trends in abundance from this survey have been positive since 1991 (Figure 2, Table 1). While the Atlantic Sturgeon Stock Status Review Team (ASSRT 2007) suggests a decline in abundance through this survey, it contains data only through mid 2005. Juvenile and sub adult abundance data are now available through 2009 (Table 1). There was a drop in abundance in 2002 and 2003; however from 2004 through 2009 there has been much improvement, with 2008 being one of the three highest abundance years in the time series (Figure 2, Table 1). At net mortality has been recorded for 1,190 fish with only 34 (3%) mortalities, which is below the ASMFC 2007 estimate of 13.8% and the Stein et, al. 2004 estimate of 22% (Figure 2, Table 1). Mortalities were highest during the months of May and November when water temperatures were elevated (Figure 3, Table 2). Fish were collected in Albemarle Sound area using gill nets with mesh sizes that range from 2.5 ISM through 7.0 and 8.0 and 10.0 ISM (Figures 4 and 5, Table 3). The collection number by mesh size shows that 89% of the fish collected were in mesh sizes smaller than 5.5 ISM, nets sizes that are highly regulated in the Albemarle Sound area. Average lengths of sturgeon have increased for float and sink nets from 1990-2009 (Figure 6).

PAMLICO SOUND INDEPENDENT GILL NET SURVEY

An independent gill net survey has been conducted by the NCDMF in the Pamlico Sound area since 2001 (Figure 7). Data from the Pamlico Sound shows a slight increase in abundance since 2001. At net mortality has been recorded for 49 fish with only 5 (10%) mortalities, below estimates made by both ASMFC (2007) and Stein et. al. (2004; Figures 8 and 9, Tables 4 and 5). Sturgeon were collected during all fishing months (February through November) with the most collected during April (n=19)(Figure 9, Table 5). Fish were collected in mesh sizes from 3.0 ISM through 6.5 ISM in ½ inch increments, with the 5.5 ISM collecting the most (n=10) (Figure 10, Table 6).

PAMLICO, PUNGO, AND NEUSE RIVERS INDEPENDENT GILL NET SURVEY

An independent gill net survey has been conducted in Pamlico, Pungo, and Neuse rivers since 2000; however, effort has been consistent since 2004 (Figure 11). Data from Pamlico, Pungo, and Neuse rivers show a slight decrease in abundance and an overall mortality rate of 12% which is below the estimate made by ASMFC (2007) and Stein et al. (2004). Both surveys had their highest collections during 2005 (Figures 12 and 13, Tables 7 and 8). Sturgeon were collected during all fishing months (February through December) with the most occurring in October (n=9)(Figure 13, Table 8). Fish are encountered in mesh sizes from 3.0 ISM through 6.5 ISM by half inch increments, with the 3.0 ISM collecting the most (n=13) (Figure 14, Table 9).

CAPE FEAR RIVER INDEPENDENT GILL NET SURVEY

A gill net survey conducted in the Cape Fear River from 2002 through 2007 collected 228 Atlantic sturgeon, of which, 80 (35%) were at net mortalities. A high rate of mortality was expected in this survey since the gill nets were soaked for 24 hours prior to fishing and fishing

was conducted during summer months when water temperatures were elevated and dissolved oxygen levels fluctuated. Mortality from this survey cannot be extrapolated to commercial harvest in the river since gillnet fisheries do not exist in the areas where sturgeon are abundant. Additionally this survey has been discontinued and replaced with the Cape Fear River and Nearshore Ocean Fishery Independent Assessment Program.

CAPE FEAR RIVER AND NEARSHORE OCEAN FISHERY INDEPENDENT ASSESSMENT PROGRAM

An independent gill net survey was initiated in the lower portion of the Cape Fear River and southern coastal Atlantic Ocean waters (< 3 miles) to monitor finfish abundance in 2008 (Figures 15 and 16). Six Atlantic sturgeon have been collected (4 ocean, 2 Cape Fear River), all were released alive. The soak times from April through September are limited to four hours and October through March to 12 hours thus reducing mortality in several species.

TAGGING

A total of 608 Atlantic sturgeon was tagged from 1998-2009 through NCDMF surveys. T-Bar tags supplied by US Fish and Wildlife Service (USFWS) have been the primary tag type utilized by the IGNS surveys from 1998 – 2008, beginning in 2008 PIT tags have also been used.

OBSERVER PROGRAM

North Carolina implemented an at sea observer program in the Pamlico Sound area in an effort to monitor the bycatch of the large mesh flounder gill net fishery (Figure 17). When observers had time they observed small mesh gill nets as well in other areas of the state. Since 2001, 110 Atlantic sturgeon have been collected, with an overall at net mortality of 6% (7 fish) (Table 10). Mortalities ranged from 0% in 2008 to a high of 12% in 2004 (Table 10). Observers in North Carolina have observed approximately 3,031,356 yards of large and small mesh gill nets combined (Table 11). Trips were concentrated in the Pamlico Sound Gill Net Restricted Area when the flounder fishery was open; however, when observers were available trips in other waters of the state were observed. During the nine years of observer coverage there were five years where no Atlantic sturgeon were observed in commercial gill net operations. The NCDMF has also monitored 70 drift and anchored shad net trips in the Cape Fear and Brunswick rivers from 2006 through 2009. Only 1 sturgeon was observed in this fishery, it was estimated at 6 foot in length and released alive.

BYCATCH IN SHRIMP TRAWLS

Bycatch characterization results have been documented for over 958 tows conducted by commercial shrimp trawlers working in North Carolina Waters. No Atlantic sturgeon have been observed in any of the catches.

Diamond-Tissue (1999) examined 52 tows conducted over 15 trips. Sampled boats had one or two nets, and all nets contained the required Turtle Excluder Device (TED) and Bycatch Reduction Device (BRD). Ninety-two different species, including 66 species of finfish, 10 species of crabs, and 13 other invertebrates were identified. Samples from Pamlico Sound (n=16 tows) and the Cape Fear River (n=24 tows) were collected monthly from July through October 1995. Additionally, four tows were sampled in Core Sound in August 1995, and eight tows were examined in the Atlantic Ocean off Carolina Beach during July and August. No Atlantic sturgeon were observed.

Johnson (2003) quantified the catch of shrimp trawlers working in Core Sound (n=46 tows) and the Neuse River (n=8 tows) during the summers of 1999 and 2000. No Atlantic sturgeon were observed in either area.

Taylor and Donello (2000) examined shrimp trawl catches from estuarine waters in the southern portion of the state (New River to Ocean Isle Beach Bridge) from May through November (no tows in July). Catches from 54, 45-minute tows were examined. Data were only provided for species whose combined catch weight exceeded four kilograms. No data were reported for Atlantic sturgeon.

Ingraham (2003) examined Atlantic Ocean (0-3 miles) shrimp trawl catches from Topsail Inlet to the Little River Inlet. Catches from 40 tows (20 daytime, and 20 nighttime) collected during May-June and September-December were examined. No data were reported for Atlantic sturgeon.

Logothetis and McCuiston (2006), quantified shrimp trawl bycatch from the New River to the South Carolina line from April through November in 2004 and 2005. No Atlantic sturgeon were captured in 253 tows.

Brown (2009) quantified shrimp trawl bycatch from vessels working near shore waters from Carteret County to Brunswick County. Catches from 314 tows were examined from July – November 2007 and April – June 2008. No Atlantic sturgeon were captured.

Brown (2010) quantified shrimp trawl bycatch from vessels working in Pamlico Sound from July through December 2009. Catches from 191 tows were examined and no Atlantic sturgeon were captured.

BYCATCH IN CRAB TRAWLS

No Atlantic sturgeon have been captured in the 528 crab trawl tows examined (1,056 catches from individual nets) since 1990; 50 characterization (McKenna and Camp 1992), 101 TED testing (Morris 2002), and 378 tailbag testing (McKenna and Clark 1993, Lupton 1996, and Hannah and Hannah 2000).

McKenna and Camp (1992) assessed the finfish bycatch of the crab trawl fishery in the Pamlico River. During this study, 15 trips were made aboard commercial crab trawlers. The mean number of tows made during a trip was 3.3, and ranged from 1 to 5. Tow times ranged from 1 to 4 hours and averaged 2.87 hours. An average trip consisted of 9.46 hours of towing. No Atlantic sturgeon were captured in 50 tows.

McKenna and Clark (1993) tested the effects of different tailbag mesh sizes on reducing bycatch in the crab trawl fishery. This study was performed between November 1991 and November 1992. The testing was conducted in the Pamlico, Pungo, and Neuse rivers during the fall and winter and in Adam's Creek during the summer using 3.0, 4.0, and 4.5 ISM tailbags. Seventy-one tows were conducted aboard a research vessel towing two nets, the control net with the 3.0 ISM tailbag and the test net with either the 4.0 ISM tailbag (31 tows) or 4.5-ISM tailbag (40 tows). Tow times were one hour at night during the winter and spring and 30 minutes during the day in the summer. No Atlantic sturgeon were captured.

Lupton (1996) examined tailbag mesh sizes in crab trawls between June 1995 and May 1996. Two hundred twenty tows were conducted during the day in Bay River aboard a research vessel towing two 30-foot nets, the control net with the 3.0 ISM tailbag and the test net with either the 4.0 ISM tailbag (110 tows) or 4.5 ISM (110 tows) tailbag. Tow times were one hour during the winter, and spring and 30 minutes in the summer. No Atlantic sturgeon were captured.

Hannah and Hannah (2000) examined tailbag mesh sizes in crab trawls during 1998 and 1999 in eastern and western Pamlico Sound. The eastern areas of the Pamlico Sound included Stumpy Point Bay, Croatan Sound, Bluff Shoal, and the Outer Banks. The western Pamlico Sound areas were comprised of the Pamlico and Pungo rivers, Goose Creek, and Rose Bay. During each tow, two nets were fished, the control net with a 3.0 ISM tailbag and a test net with either a 4.0 ISM (39 tows) or a 4.0 ISM (41 tows) tailbag. All tows were an hour in duration, carried out between sunrise and sunset, and pulled at a vessel speed of 2.5 knots. No Atlantic sturgeon were captured.

Morris (2002) tested two type of TED's, mini-super shooter and leatherback, in Bay River to determine the effect of TED's on crab catches in crab trawls. Testing was conducted June through September, with two 30-foot nets. All tows were an hour in duration, and pulled at a vessel speed of 2.5 knots. No Atlantic sturgeon were captured.

FISHERY RESOURCE GRANTS

In addition to our observer data several North Carolina Fishery Resource Grants (FRG) have been completed that can provide information relative to bycatch. Thorpe and Beresoff (2000) completed a FRG "Determination of Gillnet Bycatch Potential of Spiny Dogfish (*Squalus acanthias L*.) In Southeastern North Carolina". Gill nets were fished in the Atlantic Ocean near Holden and Long Beach areas from November 1999 through April 2000. Nets consisted of sizes from 2.5 ISM through 5.5 ISM and were soaked from 10 to 24 hours. Nets were added to the sample size during the middle of the study period so exact yardage of nets fished is not known, however a minimum of 44,000 yards to a maximum of 66,000 yards was fished. Fourteen Atlantic sturgeon were collected and ranged from 64.5 cm to 107.0 cm total length. All sturgeon were tagged with USFWS tags and released alive. Collection by net size was not available but the authors stated the majority of sturgeon were from the 5.25 ISM shad nets (NC closed the Atlantic Ocean January 1, 2005 to American shad harvest).

Thorpe and Beresoff (2005) completed a FRG "Effects of Gillnet Tie-downs on Fish and Bycatch Rates Associated with American Shad (*Alosa sapidissima*) and Flounder (*Paralichthys* ssp.) Fisheries in Southeastern North Carolina". Flounder nets were fished in the Cape Fear River from May through September 2004 for a total of 54,800 yards. Nets had an average soak time of 15.6 hours and consisted of mesh sizes, 5.0, 5.5, and 6.0 ISM. Nets were fished with tie downs of varying depth and control nets were fished without tie downs. One Atlantic sturgeon was reported as bycatch in these flounder nets. Shad nets were also fished from January through April 2005. These nets consisted of mesh sizes 5.0, 5.5, and 7.0 ISM and were soaked an average of 23 hours. Nets totaled 64,000 yards and captured seven Atlantic sturgeon, four of which were tagged and released. The disposition of the other three is unknown.

Thomas Rose Jr. (2000, 2001, and 2002) completed a FRG "Estimating Migratory Bird Bycatch in Submerged vs. Floating Shad Nets". This study was conducted in the eastern Albemarle Sound near the mouth of Pasquotank and North rivers. A total of 128,000 floating and 128,000 submerged yards of 5.5 ISM shad nets were fished from January through April 2000, 2001, and 2002. Each set consisted of 500 yards of floating net and 500 yards of sinking net. Atlantic

sturgeon were collected in each year, totaling 69 fish, with only 1 mortality (April 2002). Floating shad nets accounted for 29 fish and the one mortality while the submerged shad nets accounted for 40 fish.

White and Armstrong (2000) completed a FRG "Survival of Atlantic Sturgeon Captured by Flounder Gillnets in Albemarle Sound". Flounder gill nets were fished in eastern Albemarle Sound from September 1 through December 31, 1998, June 1 through December 31, 1999, and June 1 through August 31, 2000 to estimate survival of Atlantic sturgeon captured in flounder gill nets. A total of 131 Atlantic sturgeon was collected during this study period, 122 unique individuals were tagged and released and nine were recaptures. All Atlantic sturgeon were released alive and only four individuals had "minor injuries". They determined that "this investigation did not generate evidence that further restriction of southern flounder gillnet fishery will benefit the recovery of Atlantic sturgeon in Albemarle Sound".

Bycatch estimates for NC waters from Independent Gill Net Surveys, observer programs, and FRGs show lower mortality than estimated by Stein et al. 2004 (22%) and ASMFC 2007 (13.8%). Data show that mortality estimates may not be underestimated as previously thought by the ASMFC Technical Committee. The ASMFC believed that underreporting of data was occurring and no data exist for the federal waters from North Carolina through Florida. However data do exist for coastal and inshore waters where sturgeon are encountered in small and large mesh gill nets.

CURRENT REGULATIONS

Data from North Carolina independent surveys cannot be directly applied to commercial harvest because of gear restrictions that are enforced in various locations throughout the state. Small mesh nets are allowed in the Albemarle Sound area for targeting white perch (*Morone americana*) and striped mullet (*Mugil cephalus*) but are limited to 3.0 ISM and 3.25 ISM and cannot exceed 800 yards. In the Albemarle Sound area, when water temperatures increase to 18° C (65° F) (May 12 – 14) attendance is required on small mesh gill nets, limiting soak times, overall effort, mesh sizes from 3.0 ISM to 4.0 ISM, and net lengths not longer than 800 yards. This attendance requirement remains in effect until late November. Gill nets with a mesh length of 5.5 ISM and larger are utilized in the flounder (*Paralichthys ssp*.) fisheries from April 15 through November and cannot exceed 3,000 yards. American shad gill net fishery allows 5.25 ISM floating nets from February through April with lengths not to exceed 1,000 yards. No gill nets larger the 6.0 ISM are allowed from January 1 through April 15. However, these yardage limits, seasonal restrictions, closed areas, and gear configuration requirements vary by location throughout the state. New regulations enacted after a settlement with the Karen Beasley Sea Turtle Rescue and Rehabilitation Center has reduced overall large mesh effort in the Pamlico Sound and southern North Carolina sounds and rivers by 83%.

It is unlawful to use large mesh gill nets (defined as 4.0 - 6.5 ISM, 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.

B. It is unlawful to use large mesh gill nets of more than 15 meshes in height and without a lead core or leaded bottom line. 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 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.

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. These time limits and yardage limits do affect the amount of gear in the water that could potentially impact sturgeon.

EVIDENCE OF ADULTS IN ROANOKE RIVER

North Carolina Wildlife Resources Commission (NCWRC) in cooperation with NCDMF, US Fish and Wildlife Service, and Dr. Joe Hightower (USGS) collected three adult Atlantic sturgeon (2 males, 1 unknown) in the Roanoke River during September 2010, a historical spawning area, and tagged each with a Vemco sonic tag. Several adult size sturgeon were seen the same day of sampling, as well as a previous sampling day, but were not collected. An array of Vemco receivers was deployed in the river and tracked the fish out of the river several weeks later. These collections of adult spawning condition males suggest a fall spawning run of Atlantic sturgeon in the Roanoke River, as well as, proving a population of sturgeon exists in the river that can survive the daily peaking of water release from the Roanoke Rapids Dam.

HABITAT

The NCDMF regularly provides input to federal and state regulatory agencies of the location of habitats used by Atlantic sturgeon. The NCDMF reviews environmental impact statements and permit applications for projects or facilities, which may impact sturgeon spawning or nursery areas and provides appropriate recommendations to minimize impacts or to preserve habitats. The NCDMF and the NCWRC have designated Anadromous Fish Spawning Areas (AFSA) through rules for their respective jurisdictions. Also, the North Carolina Coastal Habitat Protection Plan (CHPP) was adopted in 2005 to reach 4 goals: 1. Improve effectiveness of existing rules and programs protecting coastal fish habitats, 2. Identify, designate, and protect strategic habitat areas, 3. Enhance habitat and protect it from physical impacts and, 4. Enhance and protect water quality, all of which will directly impact habitats utilized by Atlantic sturgeon (Street 2005).

The North Carolina Marine Fisheries Commission (NCMFC) approved Strategic Habitat Areas (SHA) for Region 1 in North Carolina in January 2009, and is currently evaluating SHA's for other regions in North Carolina. "Strategic Habitat Areas represent priority habitat areas for protection due to their exceptional condition or imminent threat to their ecological functions supporting estuarine and coastal fish and shellfish species" (NCDMF 2009). The SHA areas will be incorporated into conservation and restoration efforts. SHA #3: Bellows Bay to Knotts Island Bay (28,462 acres) was identified partially due to the near shore ocean areas that are important

for Atlantic sturgeon and striped bass (Figure 18). SHA #8: Chowan and Roanoke rivers and western Albemarle Sound (401,233 acres) was identified and may include one of few Atlantic sturgeon spawning habitats in NC (Figure 18).

WATER QUALITY

Additional water quality monitoring and improvement goals have been identified through NC Division of Water Quality basin wide water quality plans that have been completed for several rivers utilized by Atlantic sturgeon, including the Pasquotank, Roanoke, Neuse, Tar-Pamlico, and Cape Fear rivers. The goals of these plans are 1. Identify water quality problems and restore full use to impaired waters, 2. Identify and protect high value resource waters, and 3. Protect unimpaired waters while allowing for reasonable economic growth. Overall water quality in NC has improved over the years as indicated in the North Carolina Division of Water Quality basin wide plans. The Southeast National Estuary Program Coastal Condition Report rates the water quality index as good for the Albemarle and Pamlico sounds (USEPA 2006).

CONSTRUCTION IMPACTS

The NCDMF routinely works with the U.S. Army Corps of Engineers (USACE) and the NC Department of Transportation on in water construction moratoriums in some systems during critical times of year that may adversely affect Atlantic sturgeon. The USACE is in the process of filling the scour hole below Lock and Dam # 1 in the Cape Fear River with the intent of creating a rubble ramp up to the dam that will allow passage of fish. The eventual bypass of Lock and Dam #1 in the Cape Fear River will open up an addition 32 miles or 17% of potential Cape Fear River spawning grounds by 2012.

GENETICS (DESIGNATION OF DISTINCT POPULATION SEGMENTS)

Genetics have been used to describe different population segments using both mtDNA (ASSRT 2007, Grunwald et al. 2008) and nuclear microsatellites (King et al. 2001, ASSRT 2007). Although the peer reviewed studies have described a high degree of separation with good classification success and provided methods for scientific research, there are problems when the papers are reviewed and considered for management. The sample design should ensure that each time period is balanced in number of samples and number of years sampled. Sample sizes have been small overall in the studies of Atlantic sturgeon genetics. Sample size of 100 specimens per sample is the recommended sample size for detecting differences in stocks (Ward 2000, Magoulas 2005). This sample size target has only been reached in two river systems but the samples were pooled among juvenile and adults or temporally. Evidence of differentiation was found between age 0/1 sturgeon and adults collected in 2005 in the Altamaha River. This was a narrow time frame for genetic differentiation to develop and should be a strong consideration for the entire data set. The sample size was 50 individuals for both juvenile and adult fish. No significant differences were observed between adult sturgeon collected in 2004 (n=31) and 2005 in the Altamaha River. The only other river tested for differentiation among years was the Hudson River. The test was conducted on sturgeon collected in the Hudson River collected from 1990 to 1994 (multiple years) and compared with sturgeon collected in 2006. The lumping of years from 1990 to 1994 samples could result in artificially increased heterozygosis during that time period thus violating a statistical assumption.

The genetic evidence has been used to describe a clinal recolonization of the northern areas by sturgeon from southern areas (Grunwald et al. 2008). Atlantic sturgeon were restricted during the Pleistocene and then expanded their range as their thermal refuge expanded (Waldman et al. 2002). Vagrancy from southern rivers was required to recolonize the northern rivers. Vagrancy among rivers has been observed in Atlantic sturgeon based on tagging studies although the natal rivers for the tagged sturgeon remain unknown. More data are needed to truly address "significance". Genetic samples for adult sturgeon will be collected in upcoming years through federally funded projects along the Atlantic Coast. These adult sturgeon are going to be tracked to determine if an individual is making a spawning run. If the fish makes a spawning run, then spawning adults for each river system can be determined and spawning areas can be delineated. Finally these fish are going to be tracked for multiple years in multiple river systems which can be used to address vagrancy of Atlantic sturgeon.

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Table 1. Albemarle Sound Independent Gill Net Survey catch per unit effort (CPUE) and percent mortality of Atlantic sturgeon by year, NC, 1990-2009.

Year	Effort	# of Atl. Sturgeon	CPUE	# of Mortalities	% Mortality
1990	693	56	0.081	0	0
1991	5,155	60	0.012	0	0
1992	5,914	27	0.005	0	0
1993	5,237	31	0.006	0	0
1994	4,305	43	0.010	0	0
1995	4,264	21	0.005	0	0
1996	4,230	27	0.006	0	0
1997	4,256	61	0.014	0	0
1998	4,187	92	0.022	0	0
1999	4,332	55	0.013	1	2
2000	4,297	139	0.032	0	0
2001	4,151	132	0.032	0	0
2002	4,176	29	0.007	2	7
2003	4,464	21	0.005	4	19
2004	4,172	30	0.007	2	7
2005	4,094	48	0.012	2	4
2006	4,081	63	0.015	2	3
2007	4,143	71	0.017	3	4
2008	4,088	128	0.031	13	10
2009	3,817	56	0.015	5	9
Total	84,056	1,190	0.015	34	3

- 1 unit of effort is a 40 yard net fished for 24 hours
- Nets consist of 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 8.0, 10.0 ISM
- Fishing during June through October only occurred from 1991-1993
- Effort increases to 7 days a week March – May
- Effort for 1990 was only October - December

Table 2. Albemarle Sound Independent Gill Net Survey catch per unit effort (CPUE) and percent mortality of Atlantic sturgeon by month, NC, 1991-2009.

Month	Effort	CPUE	# of Atl. Sturgeon	# of Mortalities	% Mortality
1	10,560	0.014	151	3	2
2	10,990	0.011	119	0	0
3	12,886	0.007	91	1	1
4	12,839	0.006	79	2	3
5	11,494	0.014	161	11	7
6	1,260	0.004	5	0	0
7	432	0.032	14	0	0
8	437	0.037	16	0	0
9	432	0.028	12	0	0
10	430	0.033	14	0	0
11	10,795	0.029	308	14	5
12	10,808	0.015	164	3	2
Total	83,363	0.014	1,134	34	3

- 1 unit of effort is a 40 yard net fished for 24 hours
- Nets consist of 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 8.0, 10.0 ISM
- Fishing during June through October only occurred from 1991-1993
- Effort increases to 7 days a week March – May
- 1990 data not included; incomplete data set

Table 3. Albemarle Sound Independent Gill Net Survey collection number and percent mortality of Atlantic sturgeon by mesh size, NC, 1991-2009.

MESH (ISM)	Effort	CPUE	# ATL. Collected	# Mortalities	% Mortality
2.5	7,393	0.022	165	3	2
3	7,392	0.024	174	5	3
3.5	7,413	0.028	204	5	2
4	7,352	0.028	203	9	4
4.5	7,472	0.025	187	5	3
5	7,423	0.016	122	3	2
5.5	6,907	0.007	51	1	2
6	6,962	0.005	34	0	0
6.5	6,897	0.003	22	2	9
7	6,933	0.003	20	0	0
8	7,571	0.001	7	0	0
10	6,856	0.000	1	1	100
Total	86,571	0.014	1,190	34	3

- 1 unit of effort is a 40 yard net fished for 24 hours
- Nets consist of 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 8.0, 10.0 ISM
- Fishing during June through October only occurred from 1991-1993
- Effort increases to 7 days a week March - May

Table 4. Pamlico Sound Independent Gill Net Survey catch per unit effort (CPUE) and percent mortality of Atlantic sturgeon by year, NC, 2001-2009.

Year	# of Sets	# of Atl. Sturgeon	CPUE	# of Mortalities	% Mortality
2001	238	0	0.000	0	
2002	320	1	0.003	0	0
2003	320	1	0.003	0	0
2004	320	6	0.019	1	17
2005	304	20	0.066	3	15
2006	320	13	0.041	0	0
2007	320	5	0.016	0	0
2008	320	2	0.006	0	0
2009	320	1	0.003	1	100
TOTAL	2,782	49	0.018	5	10

- 1 unit of effort is 240 yards of gill net (30 yards each; 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5 ISM) fished for 12 hours

Table 5. Pamlico Sound Independent Gill Net Survey catch per unit effort (CPUE) and percent mortality of Atlantic sturgeon by month, NC, 2001-2009.

Month	# of Sets	# of Atl. Sturgeon	CPUE	# of Mortalities	% Mortality
2	144	1	0.007	0	0
3	256	1	0.004	0	0
4	256	19	0.074	1	5
5	288	9	0.031	1	11
6	288	4	0.014	1	25
7	288	1	0.003	0	0
8	289	6	0.021	1	17
9	272	0	0.000		
10	285	2	0.007	0	0
11	288	6	0.021	1	17
12	128	0	0.000		
TOTAL	2,782	49	0.018	5	10

- 1 unit of effort is 240 yards of gill net (30 yards each; 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5 ISM) fished for 12 hours

Table 6. Pamlico Sound Independent Gill Net Survey collection number and percent mortality of Atlantic sturgeon by mesh size (ISM), NC, 2001-2009.

Mesh Size (ISM)	# Atl. Alive	# Atl. Dead	Total # Atl. Collected	% Mortality
3	3	1	4	25
3.5	4	1	5	20
4	7	1	8	13
4.5	7	0	7	0
5	7	0	7	0
5.5	9	1	10	10
6	3	0	3	0
6.5	4	1	5	20
Totals	44	5	49	10

Table 7. Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey catch per unit effort (CPUE) and percent mortality of Atlantic sturgeon by year, NC, 2000 and 2003-2009.

Year	# of Sets	# of Atl. Sturgeon	CPUE	# of Atl. Mortalities	% Mortality
2000	239	1	0.004	0	0
2003	156	0	0.000	0	
2004	320	8	0.025	0	0
2005	304	29	0.095	4	14
2006	320	4	0.013	2	50
2007	320	3	0.009	0	0
2008	320	1	0.003	0	0
2009	320	5	0.016	0	0
Total	2,299	51	0.022	6	12

- 1 unit of effort is 240 yards of gill net (30 yards each; 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5 ISM) fished for 12 hours

Table 8. Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey catch per unit effort (CPUE) and percent mortality of Atlantic sturgeon by month, NC, 2000 and 2003-2009.

Month	# of Sets	# of Atl. Sturgeon	CPUE	# of Atl. Mortalities	% Mortality
2	97	1	0.010	0	0
3	213	3	0.014	0	0
4	212	2	0.009	0	0
5	224	5	0.022	1	20
6	216	6	0.028	0	0
7	228	5	0.022	1	20
8	259	4	0.015	0	0
9	222	6	0.027	4	67
10	234	9	0.038	0	0
11	242	6	0.025	0	0
12	152	4	0.026	0	0
Total	2,299	51	0.022	6	12

- 1 unit of effort is 240 yards of gill net (30 yards each; 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5 ISM) fished for 12 hours

Table 9. Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey collection number and percent mortality of Atlantic sturgeon by mesh size (ISM), NC, 2000 and 2003-2009.

Mesh Size (ISM)	# Atl. Alive	# Atl. Dead	Total # Atl. Collected	% Mortality
3	11	2	13	15
3.5	12	0	12	0
4	6	2	8	25
4.5	6	1	7	14
5	3	0	3	0
5.5	2	1	3	33
6	3	0	3	0
6.5	2	0	2	0
TOTAL	45	6	51	12

Table 10. Total collection number, number of mortalities, and percent mortality of Atlantic sturgeon observed in gill net trips, NC, 2001-2009.

Year	Total Yards	# of Atl. Collected	# of Atl. Mortalities	% Mortality
2001	206,678	0	0	
2002	231,405	0	0	
2003	131,235	0	0	
2004	607,313	25	3	12
2005	520,304	28	2	7
2006	549,765	39	2	5
2007	176,839	0	0	
2008	346,842	18	0	0
2009	260,984	0	0	
Totals	3,031,365	110	7	6

Table 11. Total collection number, number of mortalities, and percent mortality of Atlantic sturgeon observed in the large and small mesh gill net trips, NC, 2001 – 2009.

	Large Mesh				Small Mesh			
Year	Yards	# of Atl. Collected	# of Atl. Mortalities	% Mortality	Yards	# of Atl. Collected	# of Atl. Mortalities	% Mortality
2001	150,259	0	0		56,419	0	0	
2002	208,475	0	0		22,930	0	0	
2003	116,065	0	0		15,170	0	0	
2004	559,320	24	2	8	47,993	1	1	100
2005	439,765	21	1	5	80,539	7	1	14
2006	479,225	37	2	5	70,540	2	0	0
2007	171,814	0	0		5,025	0	0	
2008	331,006	16	0	0	15,836	2	0	0
2009	259,484	0	0		1,500	0	0	
Totals	2,715,413	98	5	5	315,952	12	2	17

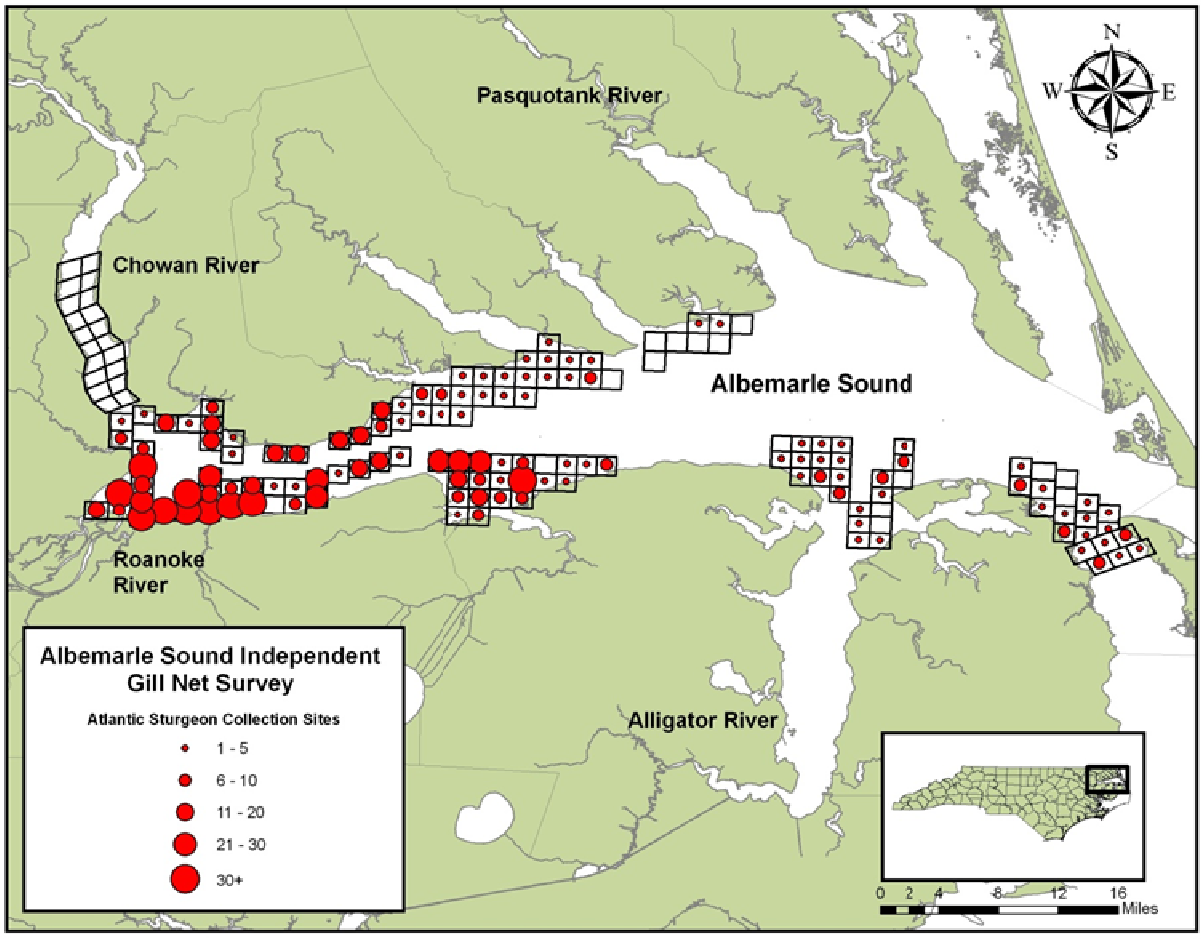

Figure 1. Albemarle Sound Independent Gill Net Survey sampling locations and collections of Atlantic sturgeon, NC, 1990-2009.

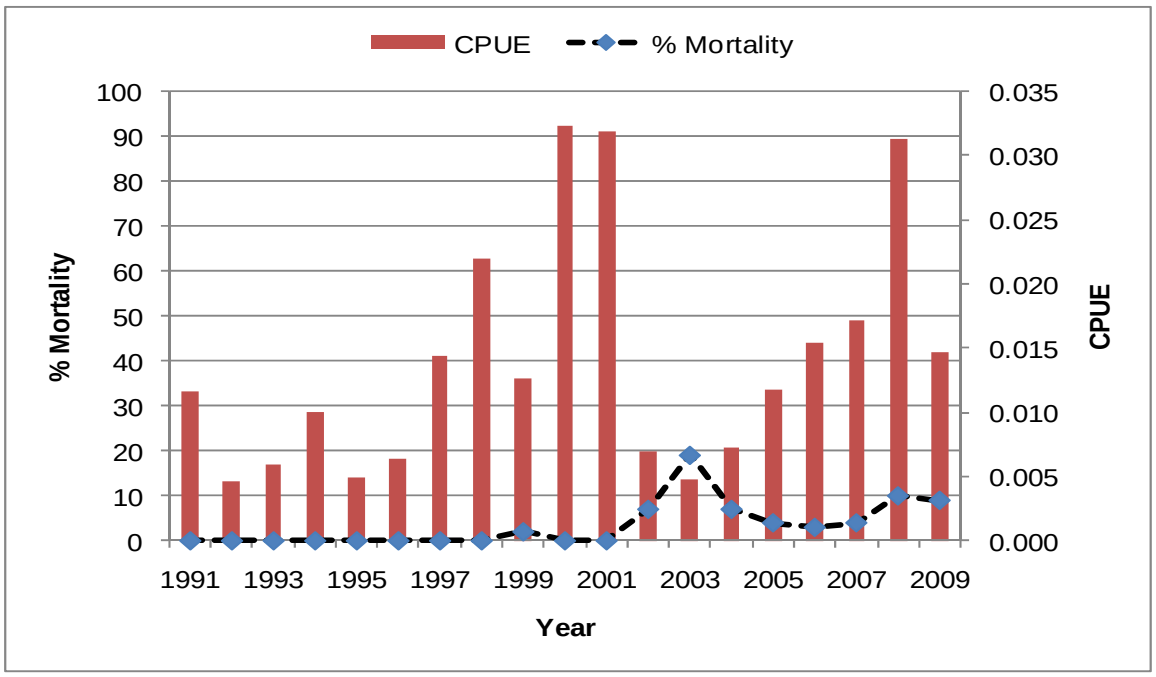

Figure 2. Albemarle Sound Independent Gill Net Survey percent mortality and catch per unit effort (CPUE) of Atlantic sturgeon by year, NC, 1991-2009.

- 1 unit of effort is a 40 yard net fished for 24 hours
- Nets consist of 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 8.0, 10.0 ISM
- Fishing during June through October only occurred from 1991-1993
- Effort increases to 7 days a week March – May
- Effort for 1990 was only October - December

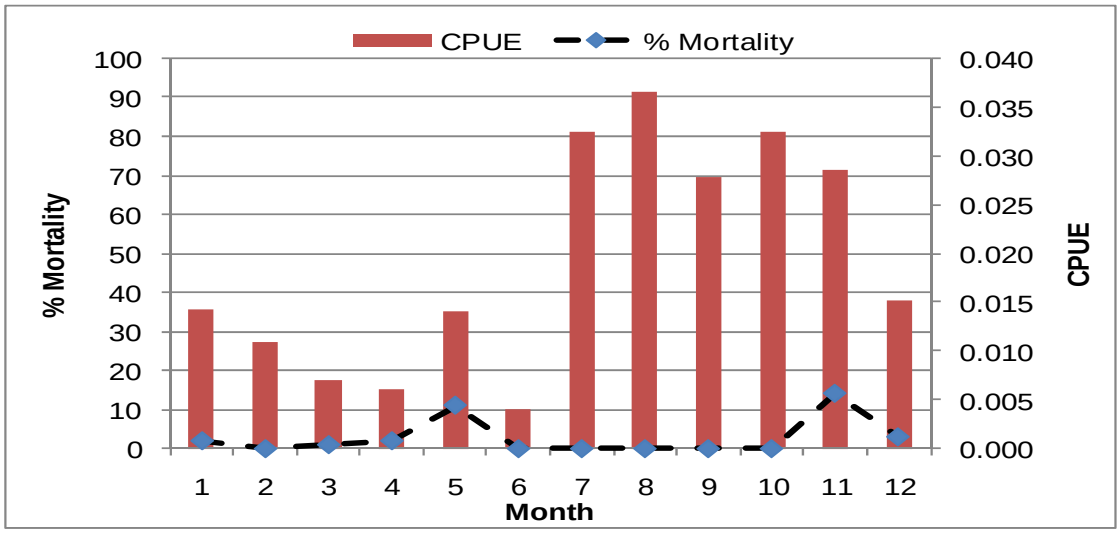

Figure 3. Albemarle Sound Independent Gill Net Survey percent mortality and catch per unit effort (CPUE) of Atlantic sturgeon by month, NC, 1991-2009.

- 1 unit of effort is a 40 yard net fished for 24 hours
- Nets consist of 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 8.0, 10.0 ISM
- Fishing during June through October only occurred from 1991-1993
- Effort increases to 7 days a week March – May
- Effort for 1990 was only October – December
- Data does not include 1990; incomplete data set

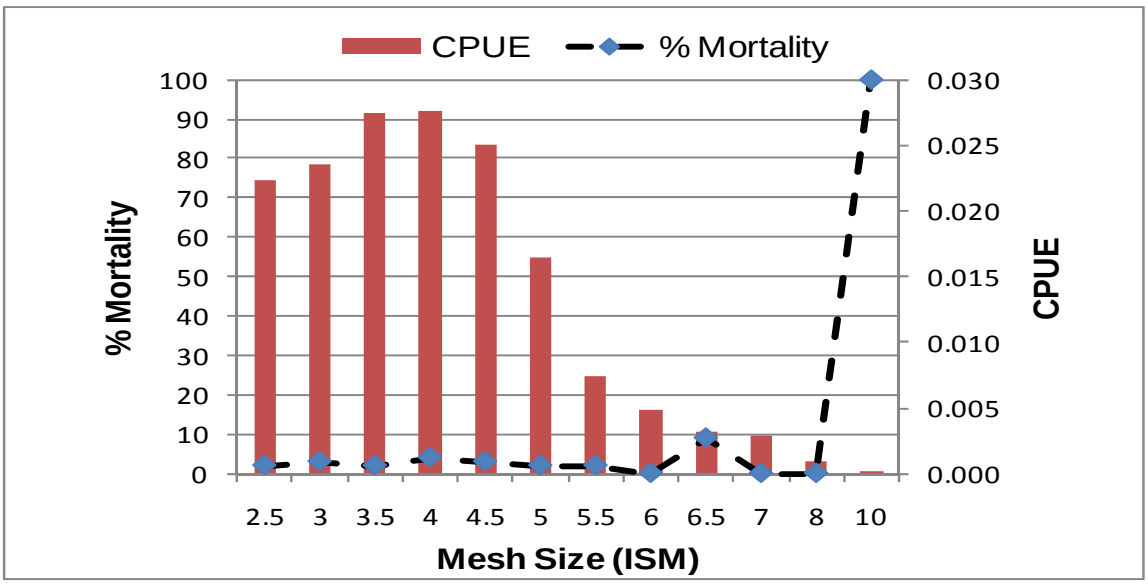

Figure 4. Albemarle Sound Independent Gill Net Survey percent mortality and catch per unit effort (CPUE) of Atlantic sturgeon by mesh size (ISM), NC, 1990-2009.

- 1 unit of effort is a 40 yard net fished for 24 hours
- Nets consist of 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 8.0, 10.0 ISM
- Fishing during June through October only occurred from 1991-1993
- Effort increases to 7 days a week March – M
- Effort for 1990 was only October – December

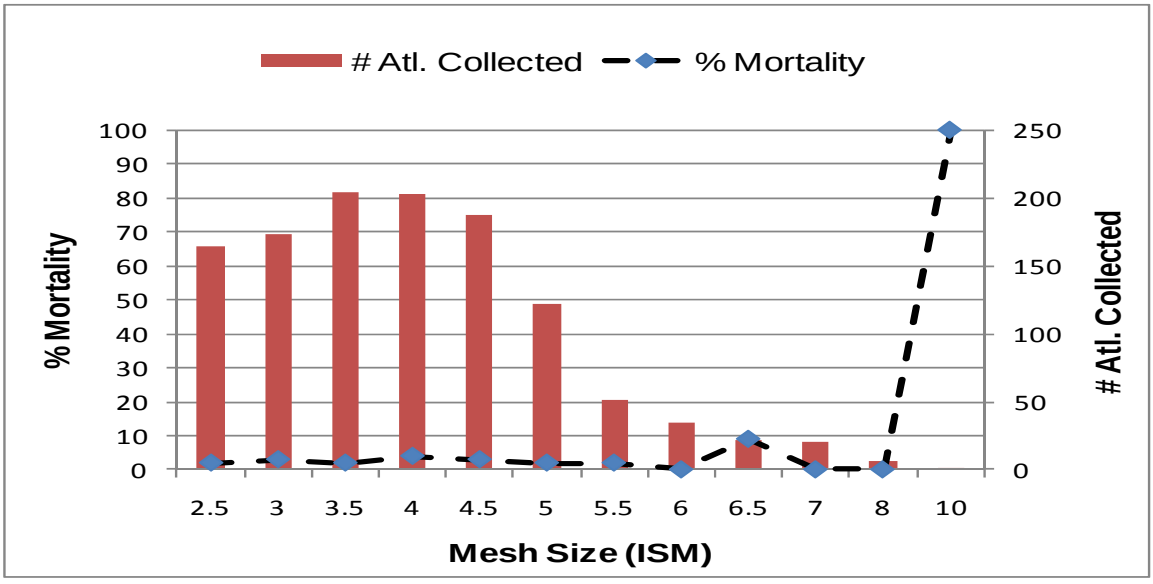

Figure 5. Albemarle Sound Independent Gill Net Survey percent mortality and collection number of Atlantic sturgeon by mesh size, NC, 1990-2009.

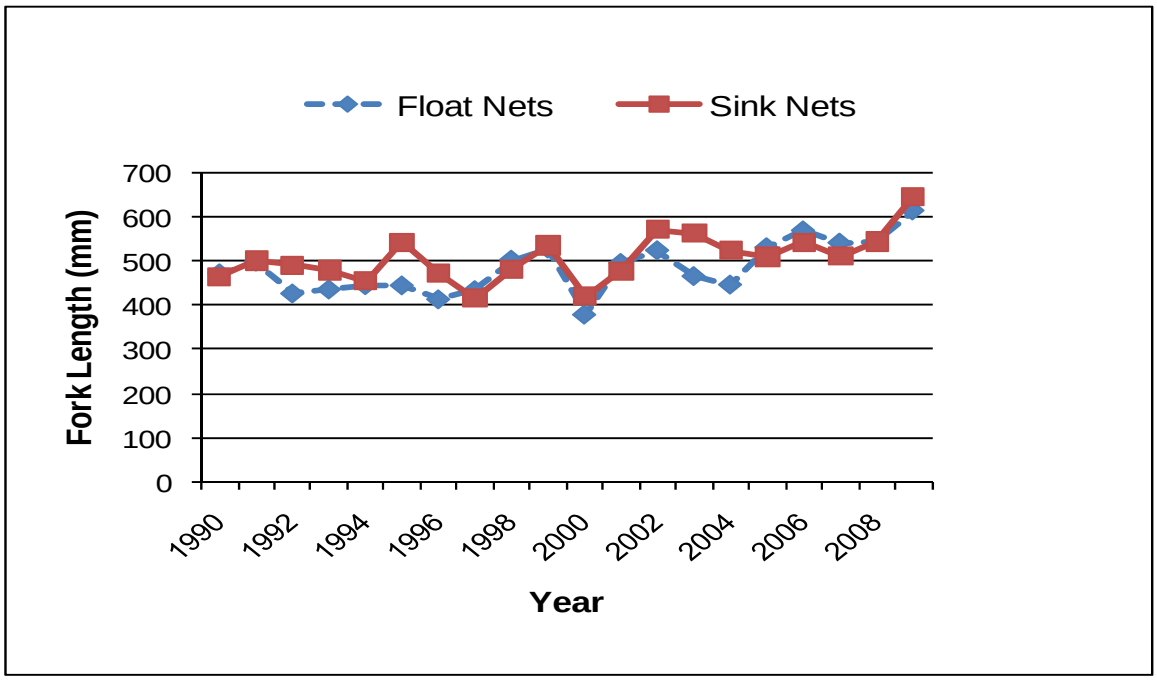

Figure 6. Albemarle Sound Independent Gill Net Survey average fork length of Atlantic sturgeon from float and sink nets, NC, 1990-2009.

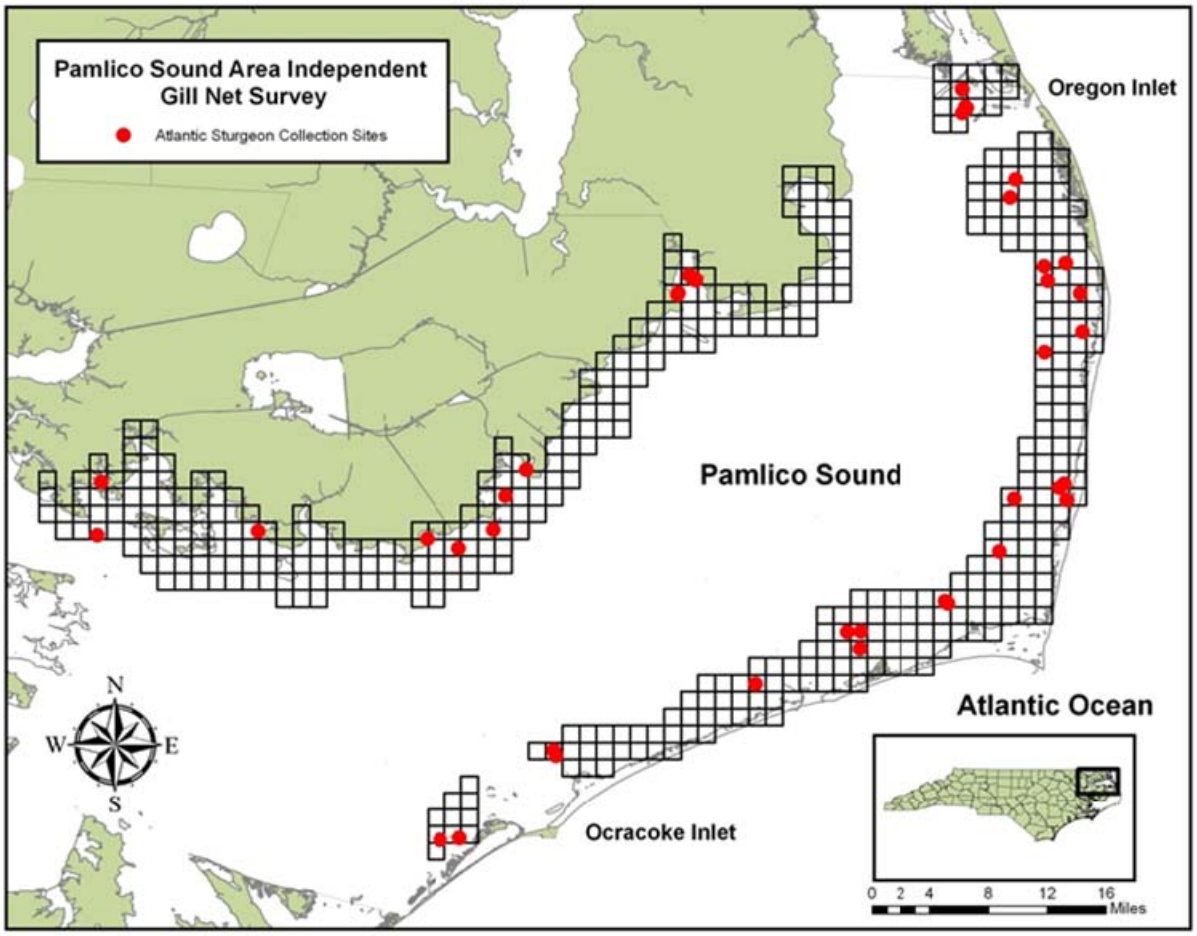

Figure 7. Pamlico Sound Independent Gill Net Survey sampling locations and collections of Atlantic sturgeon, NC, 2001-2009.

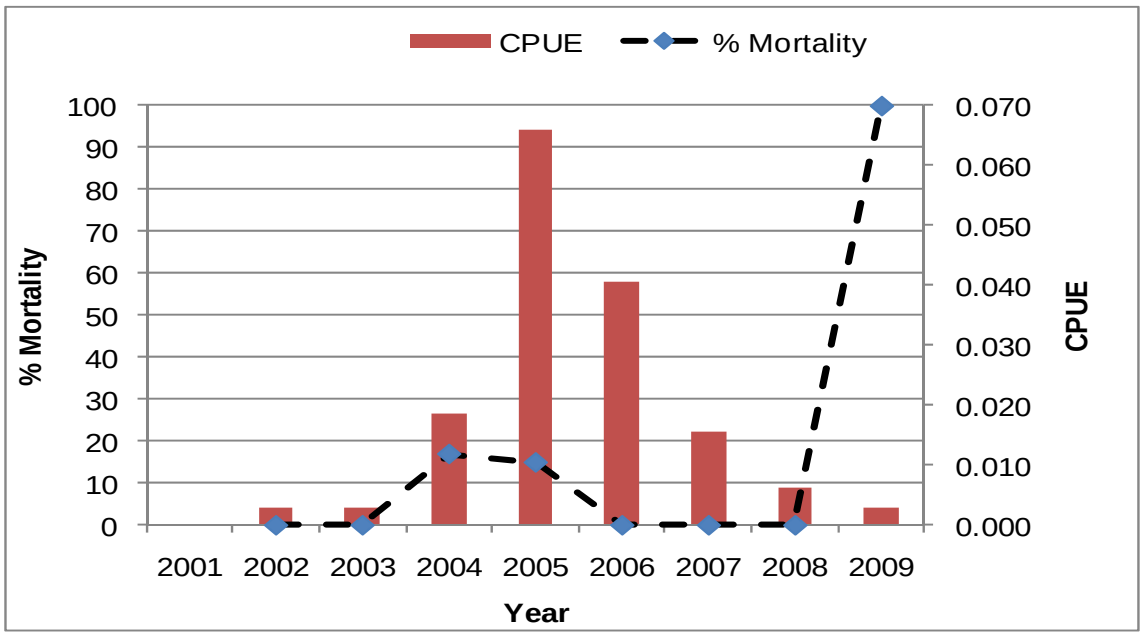

Figure 8. Pamlico Sound Independent Gill Net Survey percent mortality and catch per unit effort (CPUE) of Atlantic sturgeon by year, NC, 2001-2009.

- 1 unit of effort is 240 yards of gill net (30 yards each; 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5 ISM) fished for 12 hours

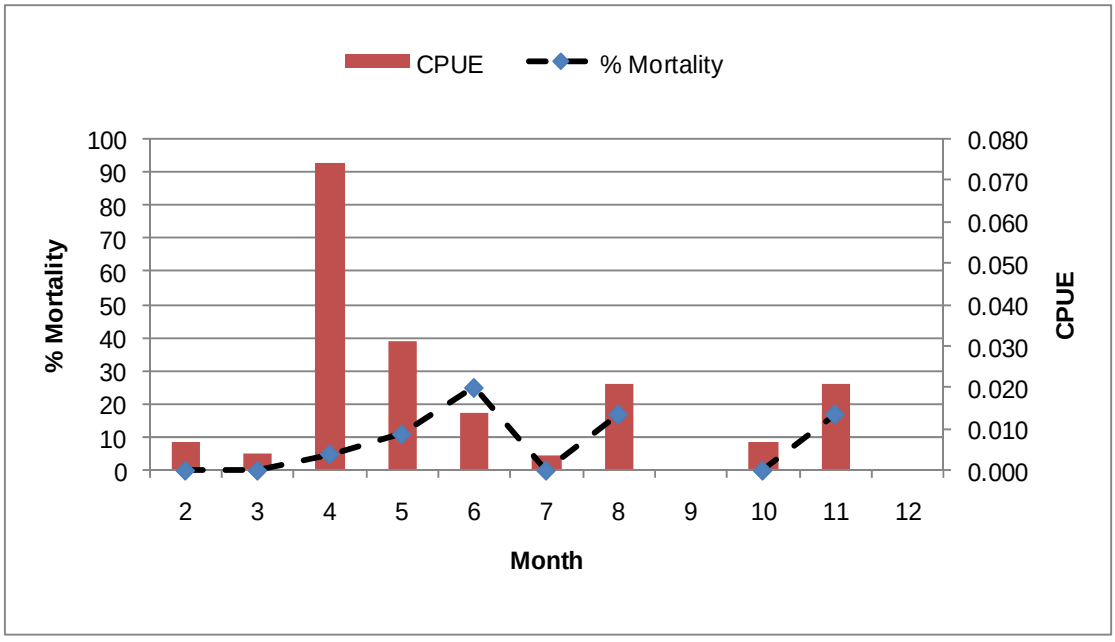

Figure 9. Pamlico Sound Independent Gill Net Survey percent mortality and catch per unit effort (CPUE) of Atlantic sturgeon by month, NC, 2001-2009.

- 1 unit of effort is 240 yards of gill net (30 yards each; 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5 ISM) fished for 12 hours

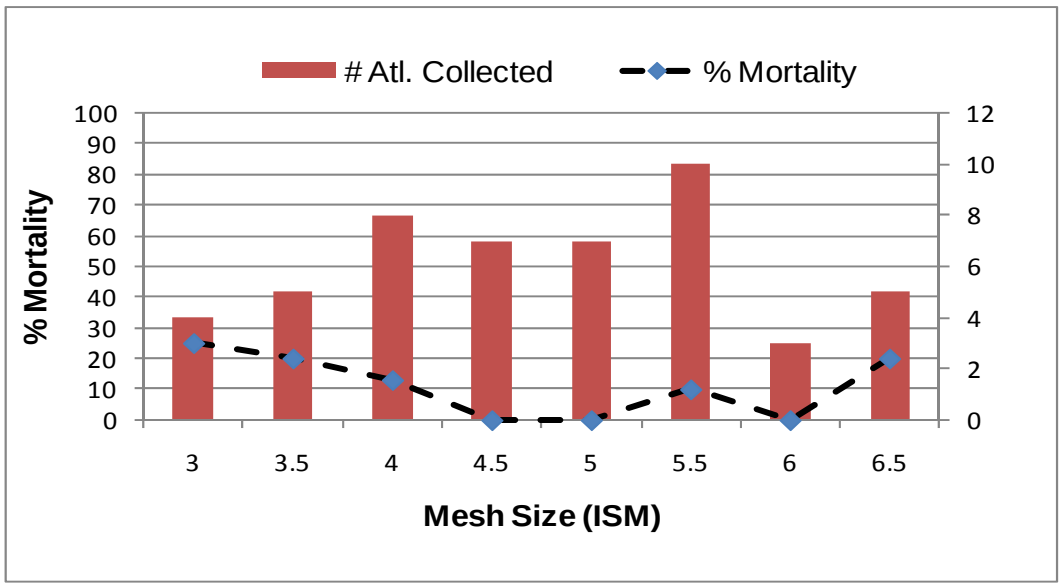

Figure 10. Pamlico Sound Independent Gill Net Survey percent mortality and collection number of Atlantic sturgeon by mesh size (ISM), NC, 2001-2009.

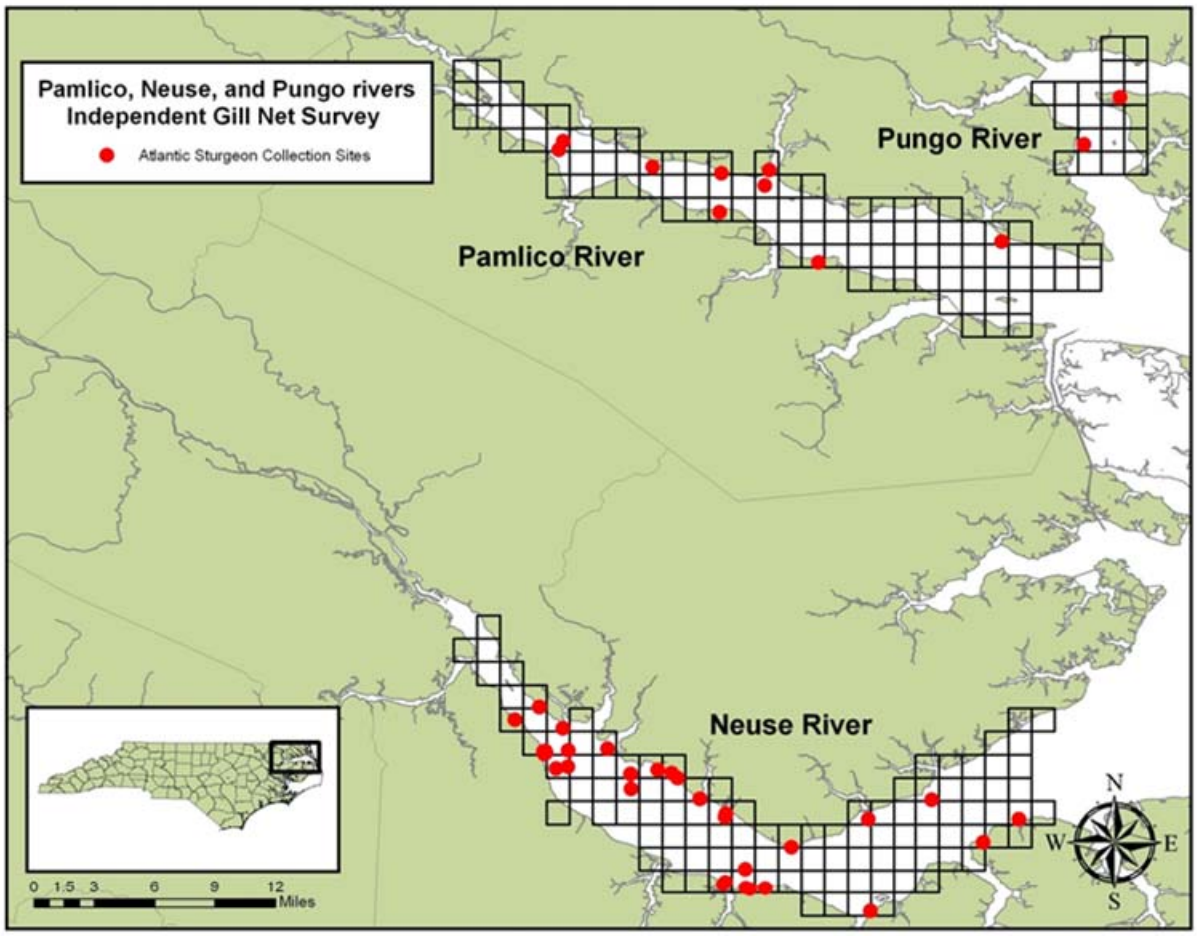

Figure 11. Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey sampling locations and collections of Atlantic sturgeon, NC, 2000 and 2003-2009.

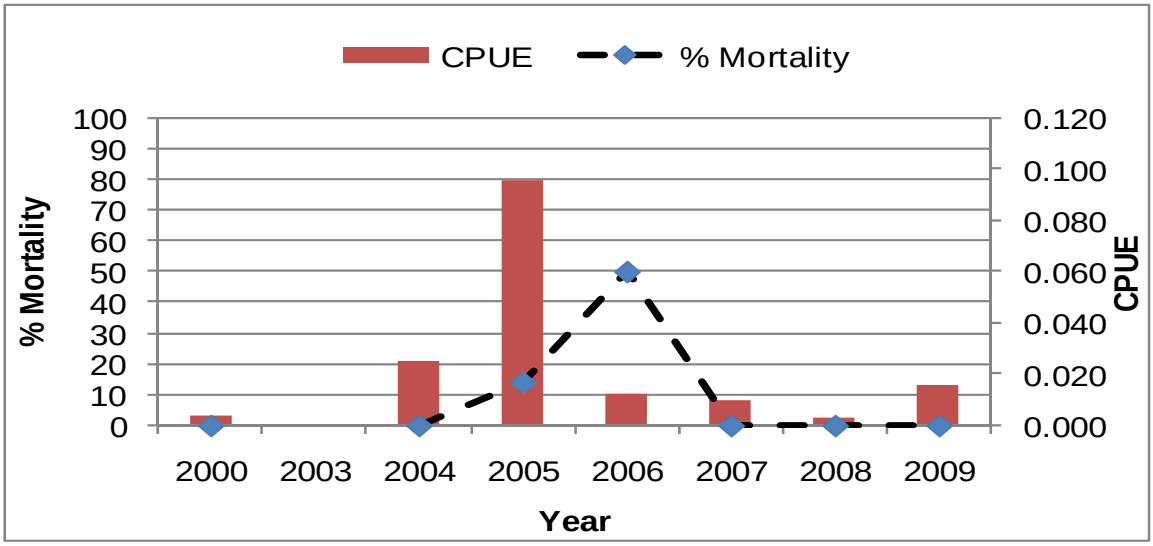

Figure 12. Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey percent mortality and catch per unit effort (CPUE) of Atlantic sturgeon by year, NC, 2000 and 2003-2009.

- 1 unit of effort is 240 yards of gill net (30 yards each; 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5 ISM) fished for 12 hours

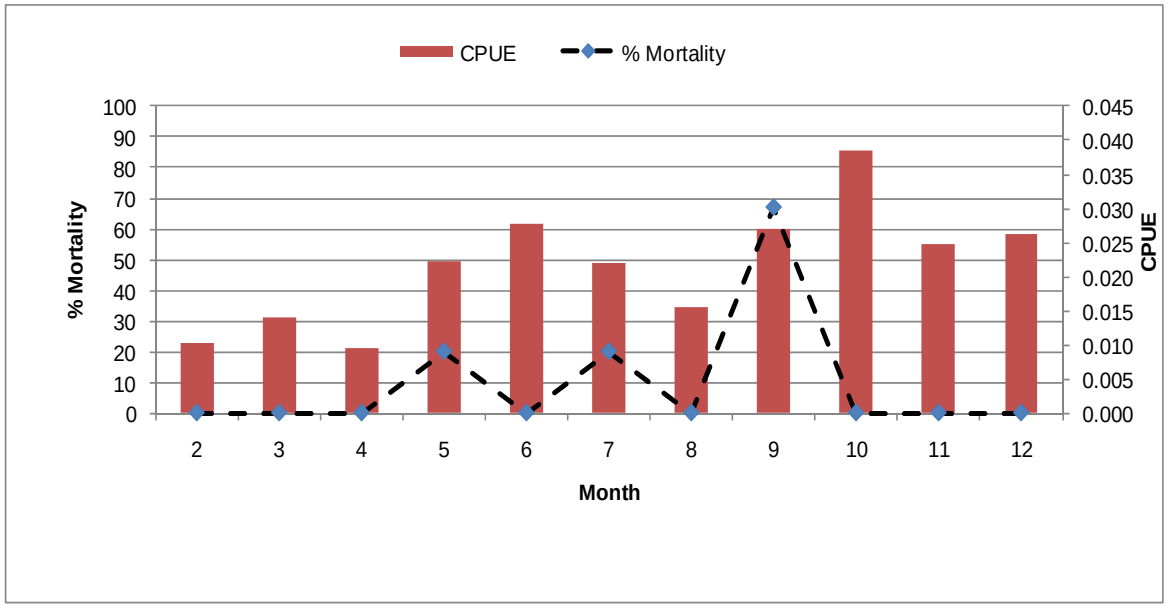

Figure 13. Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey percent mortality and catch per unit effort (CPUE) of Atlantic sturgeon by month, NC, 2000 and 2003-2009.

- 1 unit of effort is 240 yards of gill net (30 yards each; 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5 ISM) fished for 12 hours

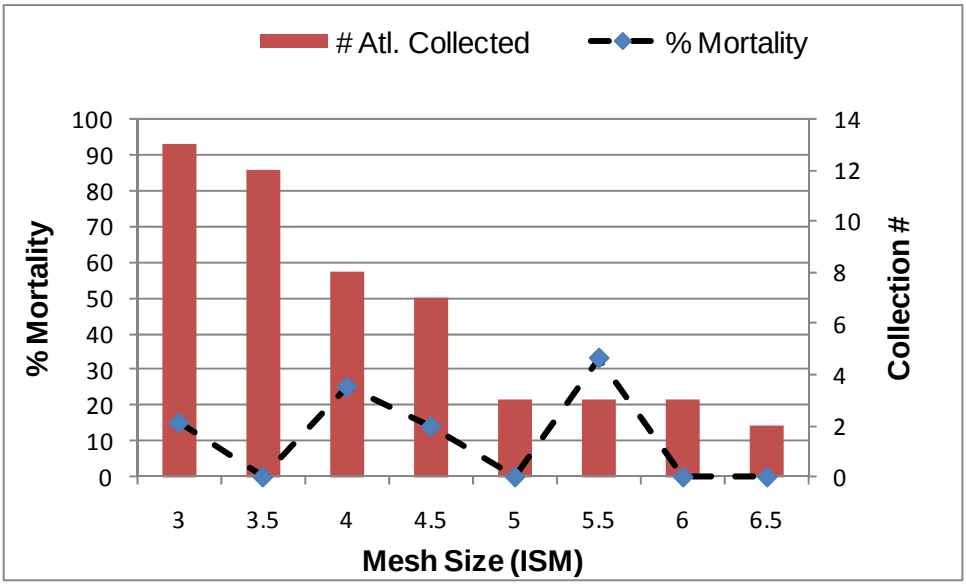

Figure 14. Pamlico, Pungo, and Neuse rivers Independent Gill Net Survey percent mortality and collection number of Atlantic sturgeon by mesh size (ISM), NC, 2000 and 2003-2009.

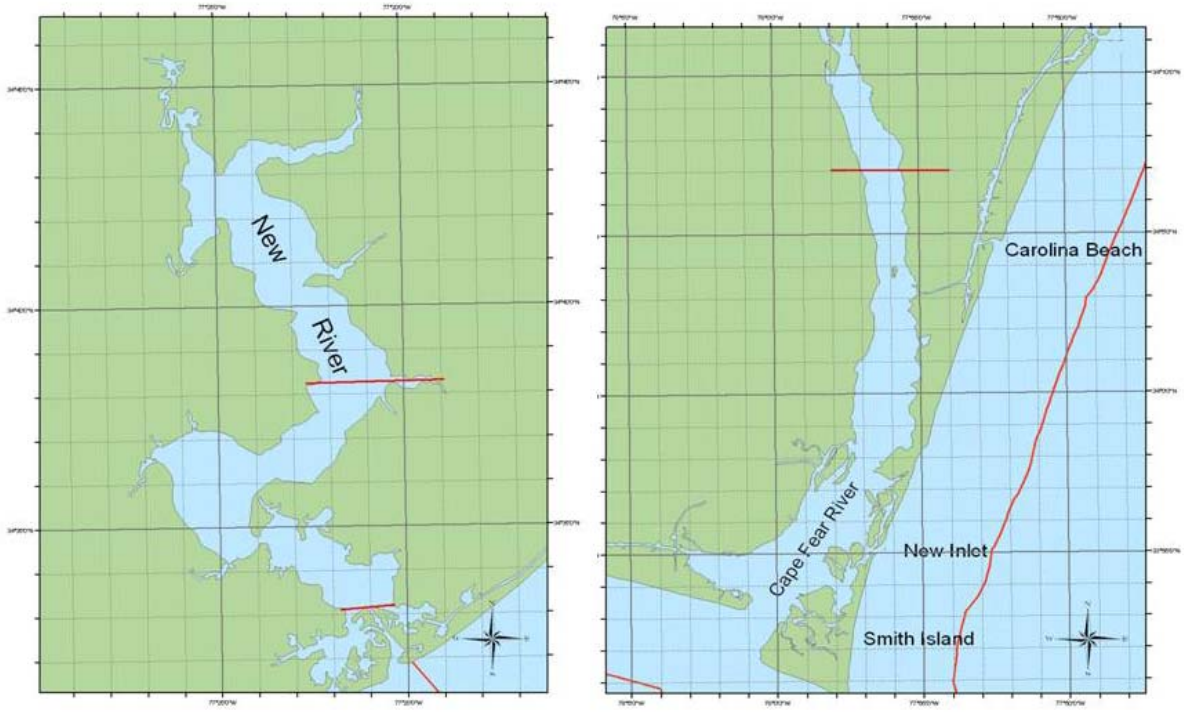

Figure 15. The sample regions and grid system for the Fisheries Independent Assessment Program (New and Cape Fear rivers) of North Carolina during 2009.

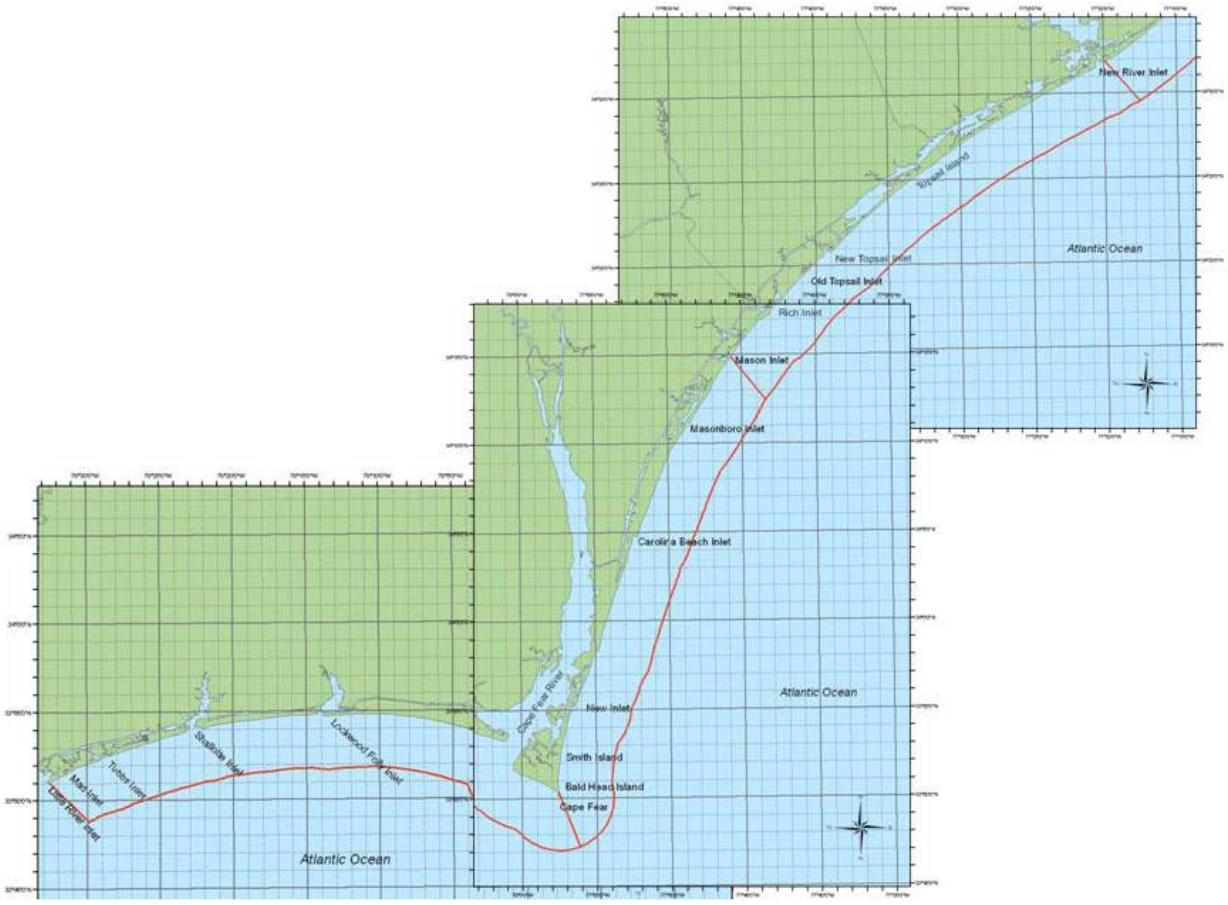

Figure 16. The sample regions and grid system for the Fisheries Independent Assessment Program (Atlantic Ocean) of North Carolina during 2009 including the Topsail, Masonboro, and Brunswick areas

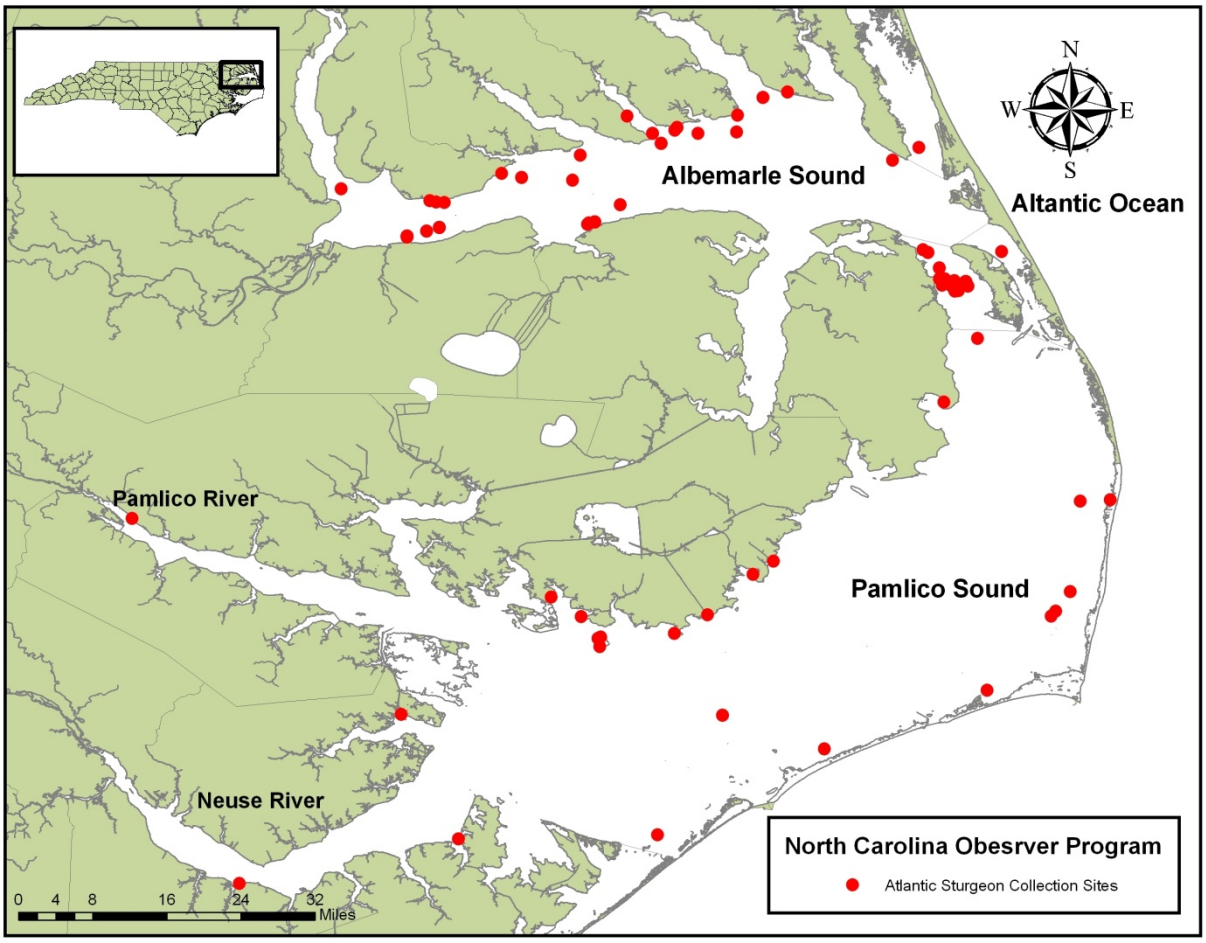

Figure 17. Locations of observed Atlantic sturgeon catches from the North Carolina Observer Program, 2001-2009.

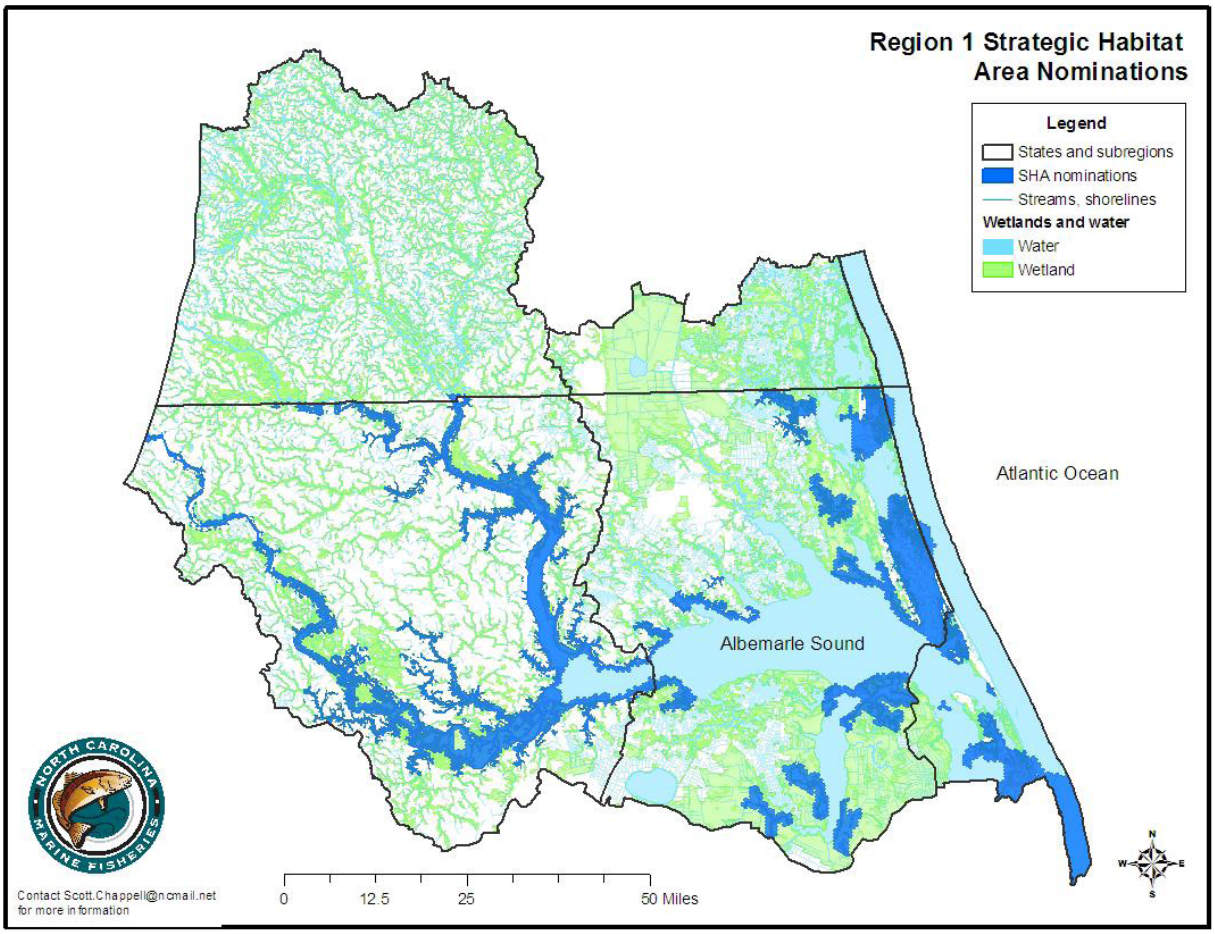

Figure 18. Strategic Habitat Areas for Region 1 that include important Atlantic sturgeon Habitat, NC 2009.