



Sea Turtle Bycatch Monitoring of the 2012 Fall Gill-Net Fisheries in Southeastern Pamlico
Sound, North Carolina

Completion Report for Activities under Endangered Species Act
Section 10 Incidental Take Permit # 1528

Jacob Boyd

North Carolina Department of Environment and Natural Resources
North Carolina Division of Marine Fisheries
Fisheries Management Section
3441 Arendell Street
Morehead City, NC 28557

April 2013

TABLE OF CONTENTS

List of Tables	3
List of Figures	4
Background.....	5
Methods	7
Conservation Plan	7
Activity.....	7
Observer activity.....	8
Authorized Takes	9
Compliance	9
Results.....	10
Conservation plan	10
Activity.....	10
Observer Activity	10
Authorized Takes	11
Compliance	11
Sea Turtle Stranding Summary.....	11
Discussion	13
Current management.....	13
Literature Cited	17
TABLES.....	19
FIGURES.....	24
APPENDIX A. SETTLEMENT AGREEMENT.....	28

LIST OF TABLES

Table 1. Authorized live and lethal sea turtle takes under ESA ITP # 1528.....	17
Table 2. Summary of the reported large mesh gill-net activity, effort, and harvested flounder for all weeks of the Pamlico Sound Gill Net Restricted Area (PSGNRA) by each restricted area (SGNRA 1-4).	19
Table 3. Summary of reported sea turtle's (n = 4) by fishermen for all weeks of the Pamlico Sound Gill Net Restricted Area (PSGNRA) by each restricted area (SGNRA 1-4, MGNRA).....	20
Table 4. Summary of the observed large mesh gill-net activity, effort, harvested flounder, percent coverage, and sea turtle interactions (n = 6) for all weeks of the Pamlico Sound Gill Net Restricted Area (PSGNRA) by each restricted area (SGNRA 1-4, MGNRA).	20
Table 5. Summary of observed sea turtle's (n = 6) for all weeks of the Pamlico Sound Gill Net Restricted Area (PSGNRA) by each restricted area (SGNRA 1-4, MGNRA).....	21
Table 6. Summary of the estimated sea turtle interactions for all weeks of the Pamlico Sound Gill Net Restricted Area (PSGNRA) by each restricted area (MGNRA; SGNRA 1-4) using the stratified ratio method with fishing effort (yards x soak days).	21
Table 7. Summary of estimated sea turtle interactions (2012), annual totals (2010), cumulative totals (2008-2012), and authorized thresholds (2005-2012) for the Pamlico Sound Gill Net Restricted Area (PSGNRA) by restricted area (MGNRA; SGNRA 1-4) using the stratified ratio method with fishing effort (yards x soak days).	22
Table 8. Sea turtle strandings in North Carolina by species and year from 2001 through 2012 from the North Carolina Wildlife Resources Commission (NCWRC).	23

LIST OF FIGURES

- Figure 1. Map of the Pamlico Sound Gill Net Restricted Area (PSGNRA) and the National Marine Fisheries Service (NMFS) closed area for large mesh (≥ 5 in) gill nets; S1-S4=Shallow Water Gill Net Restricted Areas 1-4, MGNRA=Mainland Gill Net Restricted Area, OC=Ocracoke Corridor, OIC=Ocracoke Inlet Corridor, HC=Hatteras Inlet Corridor.24
- Figure 2. A map of the Pamlico Sound Gill Net Restricted Area (PSGNRA) divided into four areas (Shallow Gill Net Restricted Areas (SGNRA 1-4)) showing observed large mesh gill-net trips ($n = 90$) from September 15 through November 30, 2012.25
- Figure 3. A map of the Pamlico Sound Gill Net Restricted Area (PSGNRA) showing observed sea turtle interactions ($n = 6$) by disposition (alive/dead) from large mesh gill-net trips ($n = 90$) from September 15 through November 30, 2012.26
- Figure 4. Locations of observed gill-net trips from the North Carolina Division of Marine Fisheries (NCDMF) Observer Program from 2000 through 2011.....27

BACKGROUND

The Pamlico Sound Gill Net Restricted Area (PSGNRA) originated in 2000, and has been managed since under protocols established by the North Carolina Division of Marine Fisheries (NCDMF) and the National Marine Fisheries Service (NMFS). The PSGNRA is a permanent closure of Pamlico Sound to large mesh gill nets (> 4 ¼ inch stretched mesh (ISM), FR Vol. 67, No 173 56931; Figure 1), established due to increased observations of sea turtle strandings, and subsequent observed gill-net interactions in 1999 along the Outer Banks (Gearhart 2001). A limited, shallow water gill-net fishery continues to operate through Section 10 Incidental Take Permits (ESA 1973) along the mainland side and Outer Banks of Pamlico Sound.

Habitat Conservation Plans (HCPs) within Section 10 Incidental Take Permits (ITPs) allowed establishment of an extensive monitoring program in this region since 2000 (Gearhart 2001, 2002, 2003; Price 2004, 2005, 2006, 2007, 2008, 2009; 2010a; Murphey 2011; Boyd 2012). Fishery management measures within HCPs restrict areas, seasons, gear, mandate observer coverage, and require weekly reporting. These actions protect sea turtles, allow a limited shallow water gill-net fishery, and characterize catch, effort, and bycatch along the Outer Banks and mainland side of Pamlico Sound from September through December of each year.

In August 2005, ITP # 1528 was issued to NCDMF to manage the PSGNRA. The ITP #1528 was authorized for six years and was set to expire December 31, 2010. NCDMF submitted an application for a statewide ITP for estuarine gill-net fisheries in August of 2010. After discussions with NMFS, the PSGNRA was allowed to open again in September 2011 and 2012 due to the statewide ITP application still being considered for approval. To date, the application for a statewide ITP from NCDMF is still in the approval process by NMFS. Management methods throughout the PSGNRA have been consistent since 2005.

Sea turtle interactions in the PSGNRA have increased relative to previous years of monitoring resulting in early season closures in the 2007 and 2009 monitoring seasons; however, in 2011 there were no observed or reported sea turtle interactions. PSGNRA participants corroborate NCDMF observations reporting a significant increase in the number of sea turtles observed in this area. In addition, sea turtle interactions have been documented outside of the PSGNRA. During 2009, a NMFS alternative observer platform program

throughout Core Sound reported increased sea turtle interactions, which prompted NMFS and NCDMF consultations and resulted in management measures (e.g., yardage and net depth restrictions) for the remainder of 2009. As a result of reports of increased sightings of sea turtles in previous years, the NCDMF considered delaying the opening of the 2010 PSGNRA until mid-September. Instead, the area was opened on September 1 for 17 days and the large mesh gill-net fishery was closely monitored for sea turtle interactions. Interactions were observed ($n = 12$) below allowable levels and the PSGNRA was subsequently opened from September 20 through November 30, 2010. Collectively, these measures allowed the fishery to operate longer and ensure continued protection of endangered and threatened sea turtles.

Due to the PSGNRA having to be closed early in previous years the start date of September 19 was elected by NCDMF for 2011 to hopefully enable continued fishing through the end of the PSGNRA season. The season ended on November 30, 2011 as planned with no sea turtle interactions observed or reported.

METHODS

The management of the PSGNRA during the 2012 fishing season was consistent with measures established in ITP # 1528 (ESA 1973) and remained identical to protocols established since 2005 (Price 2006, 2007, 2008, 2009, 2010a; Murphey 2011; Boyd 2012). Stipulations of the conservation plan included: weekly logbook reporting, mandatory observer coverage, an enforced violation system, NCDMF Marine Patrol monitoring, and immediate closure of the fishery should authorized sea turtle take levels be exceeded.

CONSERVATION PLAN

The PSGNRA began on September 15, 2012 using fishing gear restrictions under proclamation M-39-2012. Due to the PSGNRA having to be closed early in previous years the start date of September 15 was elected by NCDMF to hopefully enable continued fishing through the end of the PSGNRA season. Proclamation M-39-2012 closed all internal waters of Pamlico Sound south and west of the 35° 46.3000' N latitude line, east of the 76° 30'.0000 W longitude line, and north of the 35° 00.0000' N latitude line except for the restricted areas SGNRA 1 – SGNRA 4, and a 200-yard corridor along the mainland side of the sound (MGNRA), (Figure 1). Sea turtle interaction reporting was required. All fishermen along the Outer Banks (SGNRA 1 – SGNRA 4) using large mesh gill nets were required to obtain a PSGNRA permit from NCDMF. Provisions of the permit established mandatory logbooks, weekly reports from active fishermen, and observer coverage.

ACTIVITY

PSGNRA active permit holders operating along the Outer Banks (SGNRA 1 – SGNRA 4; Figure 1) were required to submit weekly fishing reports to NCDMF. Each fishing week began on Saturday and ended on Friday. In 2012, NCDMF required fishermen to submit weekly fishing reports by 5:00 p.m. on Friday for the previous week's catch and effort information. Active permit holders reported the following information each week: port of landing, restricted area fished, length (yards) of gill net fished, soak time (days), number and disposition (alive/dead) of sea turtles caught, and whether the fishermen had taken an observer during the week. Fishermen were required to report all sea turtle interactions to NCDMF within 24 hours.

OBSERVER ACTIVITY

Each observer was trained to identify, measure, resuscitate, and tag sea turtles by NMFS – Beaufort Lab and NCDMF. Date, time, tag numbers, location (latitude and longitude, when possible), condition (i.e., no apparent harm, injury including a description of the nature of the injury, or mortality), species, sex (if determinable), and curved carapace length (mm) and width (mm) were recorded for each turtle observed. Dead sea turtles were brought to shore when feasible. All live, debilitated sea turtles were brought to shore for examination and treatment. Observers collected data on location, gear parameters, catch, and bycatch for each haul. The landed catch was sampled throughout each trip and total flounder weights (kgs) were obtained. Data were coded on NCDMF data sheets and uploaded to NCDMF Biological Database for analysis. All observers were debriefed within 24 hours of each trip to obtain data on flounder catch, set locations, gear parameters, and sea turtle interactions to provide estimates of sea turtle bycatch.

The ITP required a minimum goal of 2% coverage of the total large mesh gill-net fishing effort between September 1 and September 15, and from November 1 to November 30. A goal of 10% coverage of the total large mesh gill-net fishing effort was established from September 16 to October 31, 2012.

The PSGNRA permit established mandatory observer coverage for the large mesh gill-net fishery. Permit holders were required to allow NCDMF fishery observers aboard their vessels to monitor catches. Failure to comply with this permit provision resulted in permit suspension. A list of permit holders was used to randomly assign observers to vessels by area and port. Outer Banks ports included Rodanthe, Avon, Buxton, Hatteras, Ocracoke, and Cedar Island. Mainland ports included Stumpy Point, Engelhard, Gull Rock, Swan Quarter, Rose Bay, Germantown, and Hobuken. Outer Banks observer coverage was proportionally allocated based on the 2011 PSGNRA trip distribution among ports. Mainland observer coverage was proportionally allocated based on the 2011 trip distribution of flounder gill-net trips among ports derived from trip tickets. Proportional observer coverage along the Outer Banks was updated weekly based on the relative effort from the previous week. Observer coverage along the mainland was obtained through contacts during regular fish house visits, and use of the PSGNRA database.

The total bycatch of sea turtles in the PSGNRA was estimated using the stratified ratio method (SAS 1989). The bycatch rate (sea turtles caught per unit of fishing effort), estimated from observer data, was multiplied by the total fishing effort reported by the fishermen for each fishery. Strata consisted of the restricted areas SGNRA 1, SGNRA 2, SGNRA 3, SGNRA 4, OIC, OC, and HC. Fishing effort was the product of net length (yds) and soak time (days). Total bycatch estimates were calculated weekly by adding estimates for each fishery within each restricted area. Estimates were calculated by week, area, species and disposition. Estimates were accumulated each week to implement necessary management measures if authorized take thresholds were exceeded.

$$\text{Estimated Interactions} = \frac{\# \text{ sea turtle interactions observed} / \text{total gill-net effort observed}}{\text{* total gill-net effort}}$$

AUTHORIZED TAKES

Annual take levels for the 2012 PSGNRA fishing season were the same as the 2011 season with cumulative takes from 2005-2011 (Table 1). After consulting with NMFS it was determined that NCDMF could use remaining take estimates from ITP #1528 to continue the PSGNRA in 2011-2012 while the statewide application was being processed.

COMPLIANCE

NCDMF observers and NCDMF Marine Patrol conducted weekly fish house visits, boat patrols, fisherman spot checks, gear checks, aerial surveys, and continued outreach to the industry for the purpose of ensuring industry compliance and communicating efforts throughout the PSGNRA (e.g., timely/accurate reporting, proper gear use).

RESULTS

CONSERVATION PLAN

The 2012 PSGNRA opened on September 15 under previous management measures and closed on September 26 under proclamation M-42-2012 due to sea turtle interactions (Green n = 2; Kemp's ridley n = 1). After consulting with NMFS, it was determined that NCDMF had remaining takes from the permit. The PSGNRA was re-opened on October 15 under new, more stringent restrictions contained in proclamation M-51-2012. The new regulations consisted of a five day fishing week and overnight soak times which is consistent with the other restrictions for large mesh gill nets throughout other seasons and areas for North Carolina. NCDMF implemented these restrictions to further mitigate sea turtle interactions in the fishery, which had been proven effective in other areas. The season ended on November 30 as planned.

ACTIVITY

NCDMF issued 170 PSGNRA permits for the 2012 PSGNRA, of which 100 permit holders reported fishing activity throughout the PSGNRA season with some fishermen using more than one area. There were 661 large mesh gill-net trips reported in the four areas incorporated in the Shallow Gill Net Restricted Area (SGNRA 1-4) with reported large mesh gill-net effort (n = 805,925) combining amount of net and soak time (Table 2). Sea turtle interactions and sightings were reported by fishermen (n=4) during the PSGNRA (Table 3). The number of inactive permits was greater than the total active permits during each week of the 2012 PSGNRA. This trend has continued since the inception of the PSGNRA.

OBSERVER ACTIVITY

There were 90 observed large mesh gill-net trips which accounted for 14.8% coverage of effort overall throughout the SGNRA's during the PSGNRA (Table 4; Figure 2). The majority of observed large mesh gill-net trips occurred in SGNRA 2 (n = 31) and SGNRA 3 (n = 30) with SGNRA 1 (n = 14), SGNRA 4 (n = 14), and MGNRA (n = 1) comprising the rest of the trips (Table 4). During the first week of the PSGNRA there were three observed sea turtle interactions (Green n = 2; Kemp's ridley n = 1) leading to a temporary closure on September 26, 2012 to allow water temperatures and sea turtle activity to decrease (Table 5; Figure 3). The

PSGNRA re-opened October 15, 2012 with three observed sea turtle interactions (Green n = 3) for the remaining season (Table 5; Figure 3).

AUTHORIZED TAKES

Using the stratified ratio method with fishing effort (yds x soak days) an estimated number of sea turtle interactions was calculated weekly for each species and disposition and added to the previous years (2005-2011) estimated takes (Tables 6 and 7). The majority (67%) of sea turtle interactions were with live individuals.

COMPLIANCE

The conditions of the permit require all fishermen to report weekly activities during the PSGNRA. Failure to report can lead to a revocation of the permit. It was brought the NCDMF's attention late in the season that during the 2012 PSGNRA there was non-compliance with fishermen failing to report activities for the given week. All fishing activities (e.g., pounds of flounder landed, total large mesh yards fished, soak times, dealer info, area fished, sea turtle interactions) and most trip ticket information are self reported by fishermen. After the PSGNRA, landings by large mesh gill nets from dealers in the vicinity of the PSGNRA were compared to reported activities from fishermen with PSGNRA permits landing fish at the same dealers. This comparison showed possible occurrences of non-compliance with fishermen landing fish but not reporting activities; however, to quantify an exact amount of non-compliance would not be feasible due to the fact that fishermen can land fish from other areas at the same dealers and not have to report under the guidelines of the PSGNRA permit. Also, fishermen utilizing the MGNRA can land fish at the dealers in the PSGNRA and are not required to report activities under the PSGNRA permit.

SEA TURTLE STRANDING SUMMARY

Reported sea turtle strandings in North Carolina increased from 1995 to 2000. Prior to 1995, annual stranding totals averaged < 200. Strandings increased considerably in 2000 with 831 reported statewide. North Carolina strandings from 2001 through 2012 averaged 475 per year with 2010 (n = 848) being the highest year for the time period (Table 8; North Carolina Wildlife Resources Commission Sea Turtle Stranding Network Database Sea Turtle Stranding

and Salvage Network - NCSSTN). From 2001 to 2012, strandings were made up of 48.3% loggerhead, 31.6% green sea turtles, and 15.3% Kemp's ridley (Table 8).

DISCUSSION

Between 2000 and 2012, a number of changes were made in the PSGNRA such as: adjustments to allowable fishing areas, restrictions modified (e.g., state closure, net length restriction), and allowable take levels reduced (Gearhart 2003; Price 2010a; Murphey 2011; Boyd 2012). These adaptations were made feasible as a result of the extensive monitoring program conducted by the NCDMF in the PSGNRA. The NCDMF has monitored gill-net fisheries throughout Pamlico Sound since 2000 and has conducted numerous observations outside of this area since 2004 (Figure 4). The information gathered from these direct observations allows NCDMF to generate requested estimated take numbers for observed fisheries and build a functional Conservation Plan. It is important to recognize that the Conservation Plan maintains flexibility in design and management adaptations necessary to address potential changing finfish and sea turtle populations and distributions, varying fishing practices, and data collections while providing for a better understanding of fishery bycatch issues and to more efficiently direct human resources.

CURRENT MANAGEMENT

In June 2009, the NMFS began an Alternative Platform Observer Program in Core Sound, NC. The NMFS observers documented sea turtle interactions in large mesh gill nets 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-16-2009). For the long-term, the NCDMF continued consultations with the NMFS-SERO 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.

The NCDMF delayed the opening of the 2009 PSGNRA until September 5 as a result of continued sea turtle interactions in Core Sound throughout the summer months and anecdotal reports from fishermen of increased sea turtle sightings along the Outer Banks in Pamlico Sound. Monitoring efforts in the PSGNRA continued through October 22 when authorized

levels of live green sea turtles were reached and the NCDMF closed the PSGNRA for the remainder of the season. On October 20, 2009, the day that authorized sea turtle takes were reached 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 Karen Beasley Sea Turtle Rescue and Rehabilitation Center Foundation (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 collect 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. 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, as detailed below, ongoing negotiations with the Beasley Center and the Duke Environmental Law and Policy Clinic produced a settlement agreement which preempted this particular action.

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 A). At that meeting, the NCMFC reached an agreement concerning restrictions that would be implemented in the large mesh 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.

Gill-net restrictions implemented by the proclamation included: a stretch mesh size range of 4 ISM to, and including, 6 ½ 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.

Although gill nets are identified as small (<5 ISM) and large (≥5 ISM) in the NTTP, the Settlement Agreement includes gill nets from 4 ISM to 5 ISM in the large mesh category because of observed sea turtle takes in 4 ISM and 4 ½ 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.

Collectively, NCDMF will continue to gather the data necessary for managers to protect, conserve and sustain resources, protect threatened and endangered species, and allow access

to the resource for all user groups. In the short term, NCDMF is building the infrastructure necessary for this management. In the long-term, continued monitoring, estimates, establishments of take thresholds, and the development of bycatch reducing gears will remain integral to fishery and habitat management in North Carolina.

Since 2000, the PSGNRA has provided a compact framework for how a Section 10 ITP can function, evolve and adapt effectively managing a limited fishery in conjunction with the conservation of sea turtles. However, there are practical limitations (e.g., resources, increasing sea turtle populations) that exist in the PSGNRA and elsewhere that will all play a major role in fishery management and the implementation and evolution of future ITPs that are broader in both size and scope. It will remain critical for managers to adapt to these changes and develop and maintain the ability to offer creative ways to manage and design better gears for user groups (Gilman et al., 2010).

The measures outlined in the Conservation Plan in the current statewide ITP application, once approved, will apply to the PSGNRA from September 1 through November 30 annually.

LITERATURE CITED

- ESA 1973. Endangered Species Act, 1973.
- Boyd, J. 2012. Sea turtle bycatch monitoring of the 2011 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion report for ITP 1528. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries.
- Gearhart J. 2001. Sea turtle bycatch monitoring of the 2000 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion Report for ITP 1259. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries. 26pp
- Gearhart J. 2002. Sea turtle bycatch monitoring of the 2001 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion Report for ITP 1348. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries. 44pp.
- Gearhart J. 2003. Sea turtle bycatch monitoring of the 2002 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion Report for ITP 1398. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries. 39pp.
- Gilman et al. 2010. Eric Gilman¹, Jeff Gearhart², Blake Price³, Scott Eckert⁴, Henry Milliken⁵, John Wang⁶, Yonat Swimmer⁷, Daisuke Shiode⁸, Osamu Abe⁹, S. Hoyt Peckham¹⁰, Milani Chaloupka¹¹, Martin Hall¹², Jeff Mangel¹³, Joanna Alfaro-Shigueto¹³, Paul Dalzell¹⁴ & Asuka Ishizaki¹⁴. Mitigating sea turtle by-catch in coastal passive net fisheries. *Fish and Fisheries* 2010, 11: 57 – 88.
- Murphey, T. 2011. Sea turtle bycatch monitoring of the 2010 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion report for ITP 1528. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries.
- Price B. 2004. Sea turtle bycatch monitoring of the 2003 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion Report for ITP 1398. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries. 26pp.
- Price B. 2005. Sea turtle bycatch monitoring of the 2004 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion report for ITP 1398. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries. 33 pp.
- Price B. 2006. Sea turtle bycatch monitoring of the 2005 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion report for ITP 1528. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries. 31 pp.

Price B. 2007. Sea turtle bycatch monitoring of the 2006 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion report for ITP 1528. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries. 21 pp.

Price B. 2008. Sea turtle bycatch monitoring of the 2007 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion report for ITP 1528. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries. 25 pp.

Price B. 2009. Sea turtle bycatch monitoring of the 2008 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion report for ITP 1528. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries. 22 pp.

Price, B. 2010a. Sea turtle bycatch monitoring of the 2009 fall flounder gill-net fishery of southeastern Pamlico Sound, North Carolina. Completion report for ITP 1528. North Carolina Dep. of Environment and Natural Resources, Division of Marine Fisheries.

SAS 1989. Institute, 2005. SAS version 9.1 Cary, NC.

TABLES

Table 1. Authorized live and lethal sea turtle takes under ESA ITP # 1528.

Species	Maximum Authorized Estimated Lethal Takes	Maximum Authorized Estimated Live Takes	Total Authorized Take
Kemp's Ridley ¹	14	27	41
Green	48	120	168
Loggerhead ¹	3	38	41
Species Aggregate	65	185	250

Species	Total Observed Take
Hawksbill	2 lethal or live, observed, all areas 2
Leatherback	2 lethal or live, observed, all areas 2
Kemp's ridley, green, loggerhead	6 lethal or live, any combination of species, observed, on the western shore of Pamlico Sound only 6
Total Observed Take	10
Total Estimated and Observed Take	260

¹ Kemp's ridley and Loggerhead estimated take will be based on a 3-year period (i.e, Kemp's ridley = 81 live, 42 lethal for 2005 - 2007 and 81 live, 42 lethal for 2008 - 2010; Loggerhead = 114 live, 9 lethal for 2005-2007 and 114 live, 9 lethal for 2008-2010) for purposes of exceeding the threshold. Estimated take of Kemp's ridleys and loggerheads varies greatly by year, thus combining years will account for some of the variability across years.

Table 2. Summary of the reported large mesh gill-net activity, effort, and harvested flounder for all weeks of the Pamlico Sound Gill Net Restricted Area (PSGNRA) by each restricted area (SGNRA 1-4).

Area	Trips	Effort (yd x soak days)	Flounder (lbs)
SGNRA 1	71	116,700	7,063
SGNRA 2	137	179,200	12,578
SGNRA 3	327	345,150	23,139
SGNRA 4	126	164,875	12,954
Total	661	805,925	55,734

*SGNRA - Shallow Gill Net Restricted Area

Table 3. Summary of reported sea turtle's (n = 4) by fishermen for all weeks of the Pamlico Sound Gill Net Restricted Area (PSGNRA) by each restricted area (SGNRA 1-4, MGNRA).

Date	Waterbody	Gear	Latitude	Longitude	Species	Condition
9/20/2012	MGNRA	Large mesh gill net	n/a	na/	Unknown	Alive
9/20/2012	MGNRA	n/a	n/a	n/a	Unknown	Alive
9/20/2012	MGNRA	Large mesh gill net	35 26.007	76 03.419	Kemp's Ridley	Alive
9/27/2012	MGNRA	n/a	35 28.278	76 00.297	Green	Dead

*SGNRA - Shallow Gill Net Restricted Area

**MGNRA - Mainland Gill Net Restricted Area

Table 4. Summary of the observed large mesh gill-net activity, effort, harvested flounder, percent coverage, and sea turtle interactions (n = 6) for all weeks of the Pamlico Sound Gill Net Restricted Area (PSGNRA) by each restricted area (SGNRA 1-4, MGNRA).

Area	Observed				Kemp's ridley		Green		Loggerhead	
	Trips	Effort	Flounder (lbs)	Coverage (%)	Alive	Dead	Alive	Dead	Alive	Dead
MGNRA	1	2,000	0	n/a	0	1	0	0	0	0
SGNRA 1	14	20,150	1,426	17.27	0	0	0	0	0	0
SGNRA 2	31	42,500	3,021	23.72	0	0	0	0	0	0
SGNRA 3	30	36,900	1,582	10.69	0	0	2	0	0	0
SGNRA 4	14	17,750	1,095	10.77	0	0	2	1	0	0
Total	90	119,300	7,124	14.80	0	1	4	1	0	0

*SGNRA - Shallow Gill Net Restricted Area

*MGNRA - Mainland Gill Net Restricted Area

Table 5. Summary of observed sea turtle's (n = 6) for all weeks of the Pamlico Sound Gill Net Restricted Area (PSGNRA) by each restricted area (SGNRA 1-4, MGNRA).

Date	Waterbody	Gear	Latitude	Longitude	Species	Condition	Curved Carapace (mm)	
							Length	Width
9/20/2012	MGNRA	Large mesh gill net	35 22.563	76 04.004	Kemp's ridley	Dead	318	318
9/21/2012	SGNRA 4	Large mesh gill net	35 35.976	75 28.662	Green	Alive	432	381
9/21/2012	SGNRA 4	Large mesh gill net	35 35.976	75 28.662	Green	Alive	330	267
10/18/2012	SGNRA 4	Large mesh gill net	35 34.977	75 30.468	Green	Dead	324	276
10/24/2012	SGNRA 3	Large mesh gill net	35 18.523	75 33.305	Green	Alive	290	270
10/24/2012	SGNRA 3	Large mesh gill net	35 18.523	75 33.305	Green	Alive	280	250

*SGNRA - Shallow Gill Net Restricted Area

**MGNRA - Mainland Gill Net Restricted Area

Table 6. Summary of the estimated sea turtle interactions for all weeks of the Pamlico Sound Gill Net Restricted Area (PSGNRA) by each restricted area (MGNRA, SGNRA 1-4) using the stratified ratio method with fishing effort (yards x soak days).

Area	Kemp's ridley		Green		Loggerhead	
	Alive	Dead	Alive	Dead	Alive	Dead
MGNRA	0	10	0	0	0	0
SGNRA1	0	0	0	0	0	0
SGNRA2	0	0	0	0	0	0
SGNRA3	0	0	19	0	0	0
SGNRA4	0	0	19	9	0	0
Total	0	10	38	9	0	0

*SGNRA - Shallow Gill Net Restricted Area

**MGNRA - Mainland Gill Net Restricted Area

Table 7. Summary of estimated sea turtle interactions (2012), annual totals (2010), cumulative totals (2008-2012), and authorized thresholds (2005-2012) for the Pamlico Sound Gill Net Restricted Area (PSGNRA) by restricted area (MGNRA, SGNRA 1-4) using the stratified ratio method with fishing effort (yards x soak days).

Area	Kemp's ridley		Green		Loggerhead	
	Alive	Dead	Alive	Dead	Alive	Dead
MGNRA	0	10	0	0	0	0
SGNRA1	0	0	0	0	0	0
SGNRA2	0	0	0	0	0	0
SGNRA3	0	0	19	0	0	0
SGNRA4	0	0	19	9	0	0
Total	0	10	38	9	0	0
Annual Totals (2010)	0	0	72	0	0	0
*Cumulative Totals (2008-2011)	9	18	72	0	20	0
Cumulative Totals including 2012	9	28	110	9	20	0
**Authorized Threshold	81	42	120	48	114	9
Authorized Takes Available	72	14	10	41	94	9

*Cumulative Totals—Reflect the three-year cumulative totals from 2008-2010 and also 2011

**Authorized threshold—Take estimates for Kemp's ridley and Loggerhead sea turtles are on three-year cycles

Table 8. Sea turtle strandings in North Carolina by species and year from 2001 through 2012 from the North Carolina Wildlife Resources Commission (NCWRC).

	Sea Turtle						Total	
	Loggerhead	Green	Leatherback	Hawksbill	Kemp's ridley	Unknown	Number	Year (%)
2001	216	53	12	1	58	19	359	6.3
2002	286	94	28	0	43	18	469	8.2
2003	364	43	15	2	45	7	476	8.4
2004	266	88	12	0	59	24	449	7.9
2005	249	66	9	4	30	20	378	6.6
2006	202	49	7	1	41	21	321	5.6
2007	156	140	4	0	29	11	340	6.0
2008	176	299	3	0	58	11	547	9.6
2009	213	299	3	1	113	9	638	11.2
2010	295	377	0	0	171	5	848	14.9
2011	171	132	6	0	126	5	440	7.7
2012	159	160	6	0	100	10	435	7.6
Total (Species)	2,753	1,800	105	9	873	160	5,700	
Total (Species %)	48.3	31.6	1.8	0.2	15.3	2.8		

FIGURES

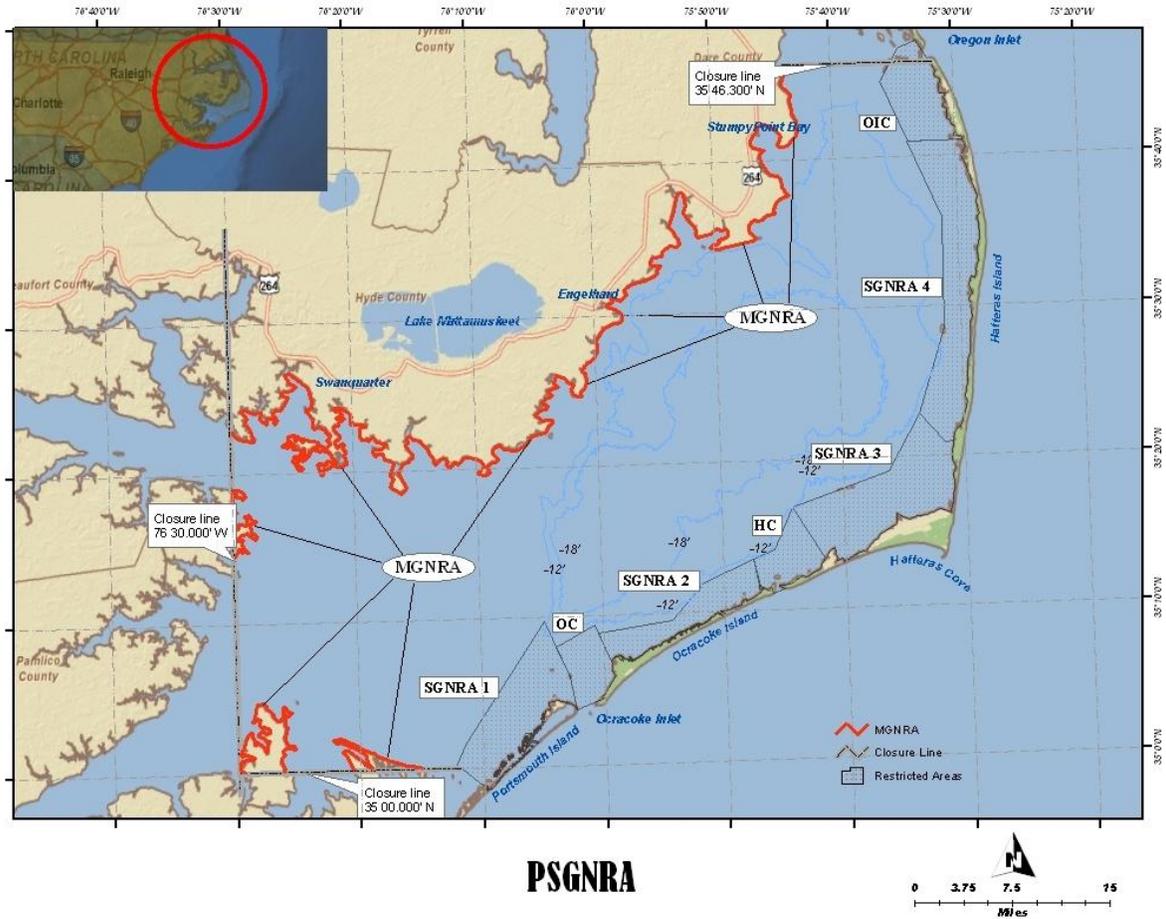


Figure 1. Map of the Pamlico Sound Gill Net Restricted Area (PSGNRA) and the National Marine Fisheries Service (NMFS) closed area for large mesh (≥ 5 in) gill nets; S1-S4=Shallow Water Gill Net Restricted Areas 1-4, MGNRA=Mainland Gill Net Restricted Area, OC=Ocracoke Corridor, OIC=Ocracoke Inlet Corridor, HC=Hatteras Inlet Corridor.

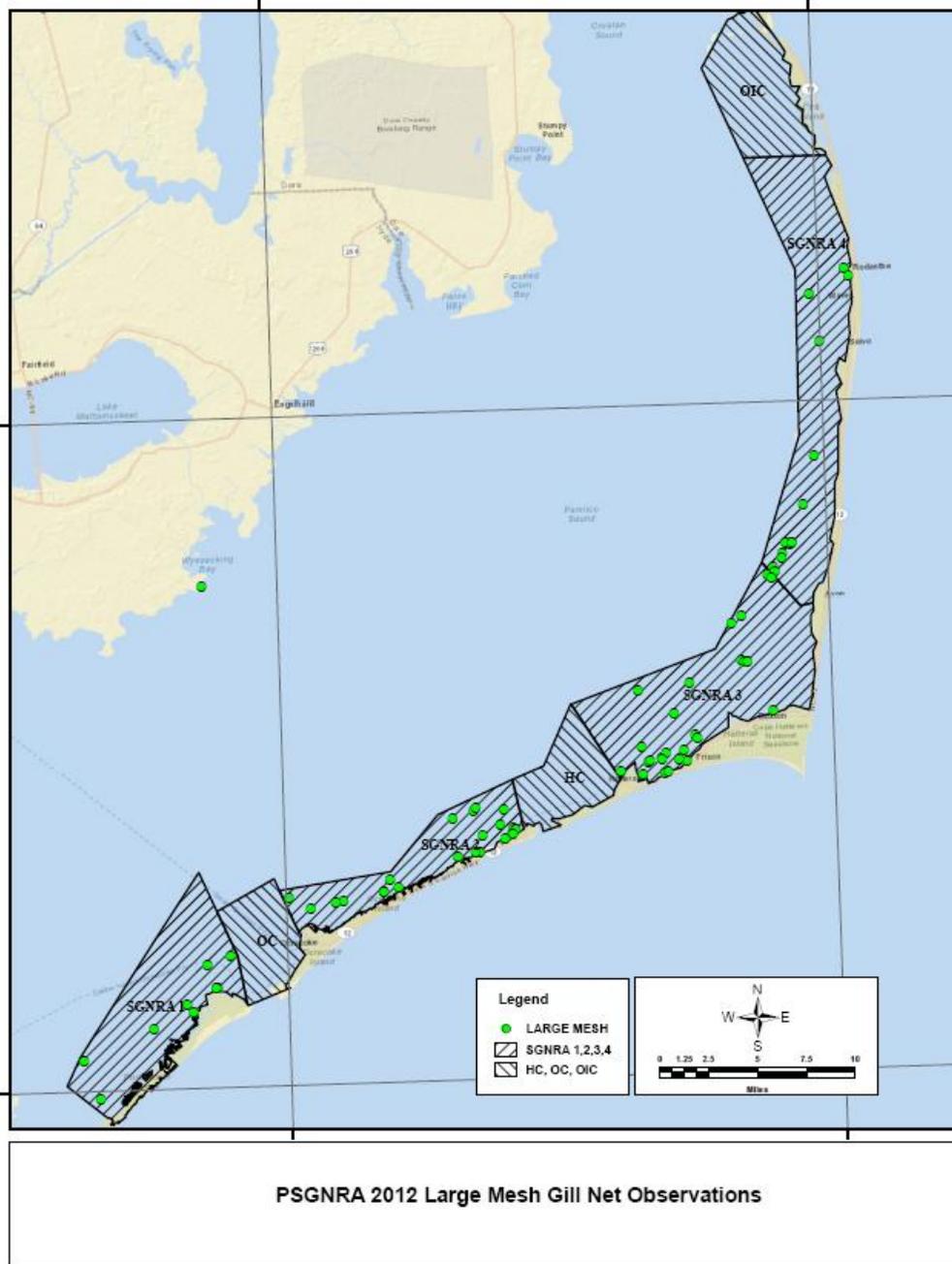


Figure 2. A map of the Pamlico Sound Gill Net Restricted Area (PSGNRA) divided into four areas (Shallow Gill Net Restricted Areas (SGNRA 1-4)) showing observed large mesh gill-net trips (n = 90) from September 15 through November 30, 2012.

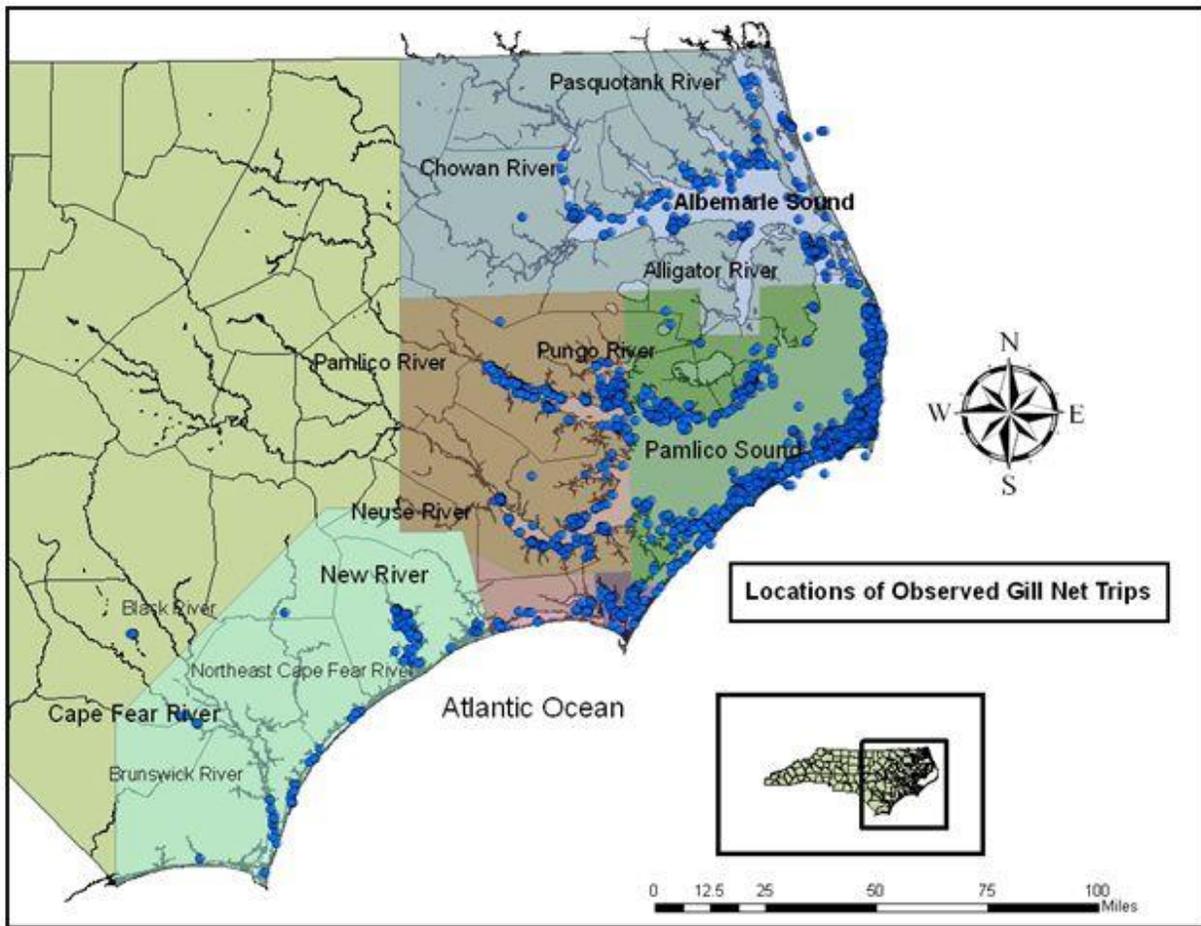


Figure 4. Locations of observed gill-net trips from the North Carolina Division of Marine Fisheries (NCDMF) Observer Program from 2000 through 2011.

APPENDIX A. 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: *M. Beasley for Jean Beasley* dated 13 May, 2010
Jean Beasley, Director
Karen Beasley Sea Turtle Rescue and
Rehabilitation Center

DEFENDANTS:
BY: *L. Daniel III* dated 5/13/10, 2010
Dr. Louis Daniel III, Director
For: North Carolina Division of Marine Fisheries

BY: *L. Daniel III* dated 5/13/10, 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