

Small Mesh Gill Net Rule Modifications Information Paper

July 6, 2021

I. ISSUE

The estuarine small mesh gill net fishery in North Carolina is managed and regulated by North Carolina Fishery Management Plans (FMPs) and numerous North Carolina Marine Fisheries Commission (MFC) rules and North Carolina Division of Marine Fisheries (DMF) proclamations. Over time, the rules and proclamations that implement the small mesh gill net requirements have become overly complex and need to be streamlined. There are also concerns about biological impacts from the use of small mesh gill nets. The primary issues to be addressed concern the streamlining and simplification, where possible, of all rules that directly or indirectly regulate small mesh gill nets, reduction and increased survival of bycatch, greater flexibility with constraining harvest of quota managed fisheries, and to the greatest extent practical reducing conflict between gill net users and other stakeholders.

II. ORIGINATION

The Secretary of the Department of Environmental Quality and the DMF director.

III. BACKGROUND

North Carolina General Statutes authorize the MFC to adopt rules for the management, protection, preservation, and enhancement of the marine and estuarine resources within its jurisdiction (G.S. 113-134; G.S. 143B-289.52). The MFC has authority to adopt FMPs and the DMF is charged with preparing them (G.S. 113-182.1; G.S. 143B-289.52). Further, the MFC may delegate to the DMF director in its rules the authority to issue proclamations suspending or implementing MFC rules that may be affected by variable conditions (G.S. 113-221.1; G.S. 143B-289.52). Variable conditions include compliance with FMPs, biological impacts, bycatch issues, and user conflict, among others (15A NCAC 03H .0103). The estuarine gill net fishery in North Carolina is managed and regulated by FMPs and numerous MFC rules and DMF proclamations. Rules are periodically amended to implement changes in management goals and strategies for various fisheries and are the primary mechanism for implementing FMPs under the Fisheries Reform Act of 1997 (FRA).

In recent years, modifications to gill net management resulting from the adoption of FMPs or other circumstances have largely been implemented through the DMF director's existing proclamation authority, not through rulemaking. This is primarily due to the need to implement management changes in a timely fashion and to accommodate variable conditions. Over time, this has resulted in incongruent restrictions between rules and proclamations. Additionally, many of the rules related to small mesh gill nets were first developed prior to the FRA and have not been thoroughly considered with the addition of more recent rules developed through the FMP process.

The aforementioned circumstances have created a patchwork of small mesh gill net restrictions spanning many rules and proclamations, contributing to stakeholder confusion and administrative burden. This paper proposes options for streamlining many of the restrictions on small mesh gill nets by codifying many of the management measures found in proclamations into rule and modifying existing rules to better represent current fishing practices and management goals. The primary issues to be addressed concern the streamlining and simplification, where possible, of all rules that directly or indirectly regulate small mesh gill nets, reduction and increased survival of bycatch, greater flexibility with constraining harvest of quota managed fisheries, and to the greatest extent practical reducing conflict between gill net users and other stakeholders.

The estuarine small mesh gill net fishery is a multi-species fishery that operates year-round. The species targeted and the type of gill net used varies by season and area (NCDMF 2018). Small mesh gill nets are used to harvest many commercially valuable estuarine finfish species by using a variety of net configurations with mesh sizes specific to the intended target species. Multiple species are landed during a single trip; however, the target species usually dominates the catch (NCDMF 2008). In North Carolina, gill nets are restricted to a minimum stretched mesh size of 2.5 inches inside stretched mesh (ISM) (15A NCAC 03J .0103 (a)). The DMF categorizes gill nets with ISM from 2.5 to less than 5 inches as small mesh (Daniel 2013). Although the rule uses "mesh length" and not "mesh size", their meanings are identical for the purpose of this document; this helps to demarcate the discussion of "mesh size" from

“net length” throughout the document. Small mesh gill nets are generally classified into three categories based on how the net is deployed and fished: set gill nets, runaround gill nets, and drift gill nets (Figure 1; Table 1) (Steve et al. 2001). For the purpose of this document, “set” gill nets, or “set nets”, includes anchored, fixed, and stationary nets.

Set nets (Figure 1a) are the predominate gill net method used in North Carolina. They are kept stationary with the use of anchors or stakes attached to the bottom or attached to some other structure attached to the bottom, at both ends of the net (15A NCAC 03I .0101). Set nets can be further classified as sink or float gill nets (Steve et al. 2001). A sink gill net fishes from the bottom up into the water column a fixed distance by having a lead line (bottom line) heavy enough to sink to the bottom. Depending on the height of the net and the depth of the water, the float line (top line) may or may not be submerged below the surface of the water. A float gill net may fish the entire water column by having the top line with buoys sufficient for floating on the surface of the water, or a portion of the water column depending on the depth of the net (number of meshes deep). Set nets are deployed by dropping one end of the net and running out the rest of the length of net usually in a line. Once deployed, soak times for fishing set nets vary depending on factors such as target species, water temperature, season, waterbody, and regulations (NCDMF 2018).

A runaround gill net is an actively fished gear used to encircle schools of fish (Figure 1b). They are deployed with a weight and a buoy at one end that enables the rest of the net to be fed out, creating a closed circle around the school of fish due to the vessel’s path. Runaround gill nets tend to be deep nets capable of fishing the entire water column. Mesh sizes and net lengths vary depending on the size of the targeted species (Steve et al. 2001). Another form of runaround gill net is the strike net or drop net. Rather than deploying the net in a circle, the net is set parallel to shore, often with one end anchored to the bank. Once the net is set, the boat is driven between the net and the shore to drive fish into the net (NCDMF 2018). Soak times for all types of runaround gill nets are almost always an hour or less.

Drift gill nets are unanchored, non-stationary nets that are actively attended (i.e., remain attached to the vessel or the fishing operation remains within 100 yards of the gear) (Figure 1c) and tend to have shorter soak times than set nets. They are constructed with lighter lead lines to allow for the net to drift with the current. The small mesh drift gill nets currently employed in North Carolina estuaries are primarily used to target Spanish mackerel and bluefish in Pamlico Sound. This gear can also be used to target spot (as a sink net) and striped mullet (typically fishing the entire water column) in areas primarily from Core Sound and south (Steve et al. 2001).

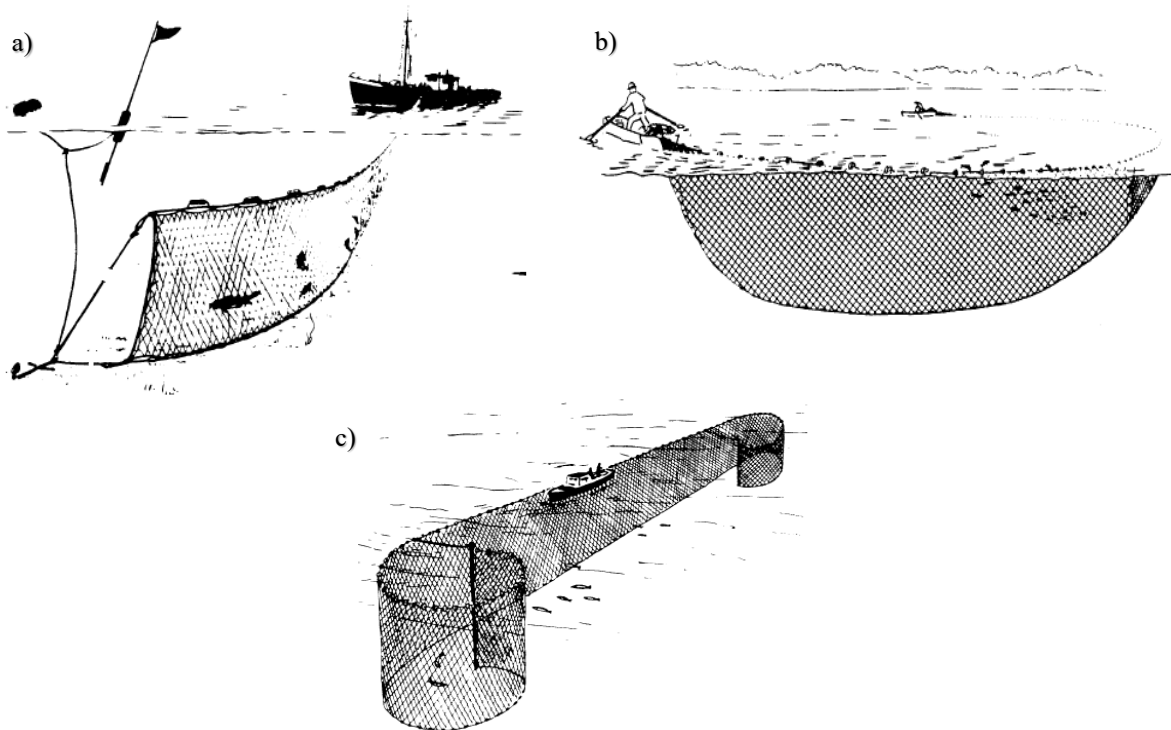
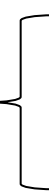
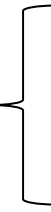


Figure 1. Illustrations of (a) set, (b) runaround, and (c) drift gill nets extracted from Steve et al. (2001).

Table 1. Small mesh gill net gear categories with descriptions and capture method descriptions.

Small Mesh Gill Net Gear Categories		Sub-Categories	Gear Description	Capture Method
Anchored/Fixed/ Stationary/Set		Sink	Attached to bottom or some other structure by anchors or stakes at both ends. Sink nets are fished from the bottom up into the water column.	Passively Fished - For both sink and float set nets the gear is left in place for a period of time. Fish, if appropriately sized, swim into the net and are gilled.
		Float	Attached to bottom or some other structure by anchors or stakes at both ends. Float nets are fished from the top down into the water column. Depending on target species nets fish part of the water column or the entire water column.	
Runaround		Circle	Attached to the bottom at one end. Once the end is set, the rest of the net is then fed out of a boat creating a circle and meeting back at the original set point. Generally, these nets fish the entire water column.	Actively Fished - Used to encircle a school of fish. Primary target species for this gear is striped mullet.
		Strike; Drop	Attached to the bottom at one end. Deployed along shore with the terminal end finishing at another point along the shore. The boat is driven into the blocked section to “drive” the fish into the net and are then retrieved.	Actively Fished - Used to corral or intercept a school of fish and then immediately retrieve. Primary target species for this gear is striped mullet, and spotted seatrout to a lesser extent.
Drift			Attached to boat or free-floating with close attendance. Lighter leadlines and no anchors allow the net to drift. Depending on target species and water depth, nets fish part of the water column or the entire water column. Primarily used in Pamlico Sound to target Spanish mackerel and bluefish.	Actively Fished - Drift with the water current with continuous attendance.

The following analysis and information are presented to characterize the small mesh gill net fishery in North Carolina relative to time, area, configuration, and species composition of the harvested and discarded catch:

Methods

Information specific to North Carolina’s estuarine gill net fishery was gathered from three DMF sampling programs briefly described below:

N.C. Trip Ticket Program

The N.C. Trip Ticket Program began in 1994. This program requires licensed commercial fishermen to sell their catch to licensed DMF fish dealers, who are then required to complete a trip ticket for every transaction. Data collected on trip tickets include gear type, area fished, species harvested, and total weights of each individual species. Information recorded on trip tickets for gear type and characteristics is self-reported by the dealer. This information may be verified by DMF fish house staff after the fact, but the potential exists that some trips may be mischaracterized by dealers. In 2004, trip tickets included mesh size categories for gill nets: small mesh = <5 inch ISM, and large mesh = ≥5 inch ISM.

However, the use of this new field was not prevalent until about 2008 because dealers were still using old trip tickets they had on hand.

Commercial Fish House Sampling

Commercial fishing activity is monitored through fishery dependent (fish house) sampling. Sampling occurs dockside as fish are landed. Commercial fishermen and/or dealers are interviewed by DMF staff, and the catch is sampled. Samplers collect data on location fished, effort (soak time, net length, etc.), gear characteristics (net type, net depth, mesh size, etc.), and the size distribution of landed species.

Commercial Observer Program

On board observations of commercial estuarine gill nets, primarily set nets, occur through Program 466. Observers collect data on effort (soak time, net length, etc.), location fished, gear characteristics, and the size and fate (harvest, discard, etc.) of captured species. The Observer Program was born out of the need to estimate incidental takes of protected species such as sea turtles and Atlantic sturgeon in estuarine set nets per the DMF's Endangered Species Act Section 10 Incidental Take Permits (National Marine Fisheries Service [NMFS] 2013, 2014). As a result, observations of runaround or drift gill nets are rare.

Data from 2015 to 2019 for these three programs were used to characterize North Carolina's estuarine small mesh gill net fisheries. For trip ticket data, the species of highest abundance in landings was considered the target species for each trip. Using the presumed small mesh targeted species, the trip was then defined as either small mesh or large mesh. Species commonly targeted and landed from small mesh gear were retained for further characterization. Basing analysis on presumed targeted species allows for results that describe the gear parameters associated with each species (see NCDMF 2008 for further description of methodology). Once a target species was defined for all trips, the method of fishing (set net, runaround gill net, or drift gill net), mesh size, and net length were characterized based on available fish house sampling and observer data from 2015 through 2019 for each of the target species. Because there were no observer trips for runaround or drift gill nets, gear characteristics for those fisheries were based solely on data collected from fish house sampling. For this analysis, species targeted with large mesh gill nets (>5 inch ISM) were excluded and species targeted with small mesh gill nets (<5 inch ISM) were retained. Fishing effort and gear characteristics were also examined across management units defined in the DMF's ITP for sea turtles (Figure 2) (Byrd et al. 2020). The delineation of management units (A, B, C, D1, D2, and E) was based on three primary factors: similarity of fisheries and management; extent of known protected species interactions in commercial gill net fisheries; and unit size and corresponding ability to monitor fishing effort (Daniel 2013).

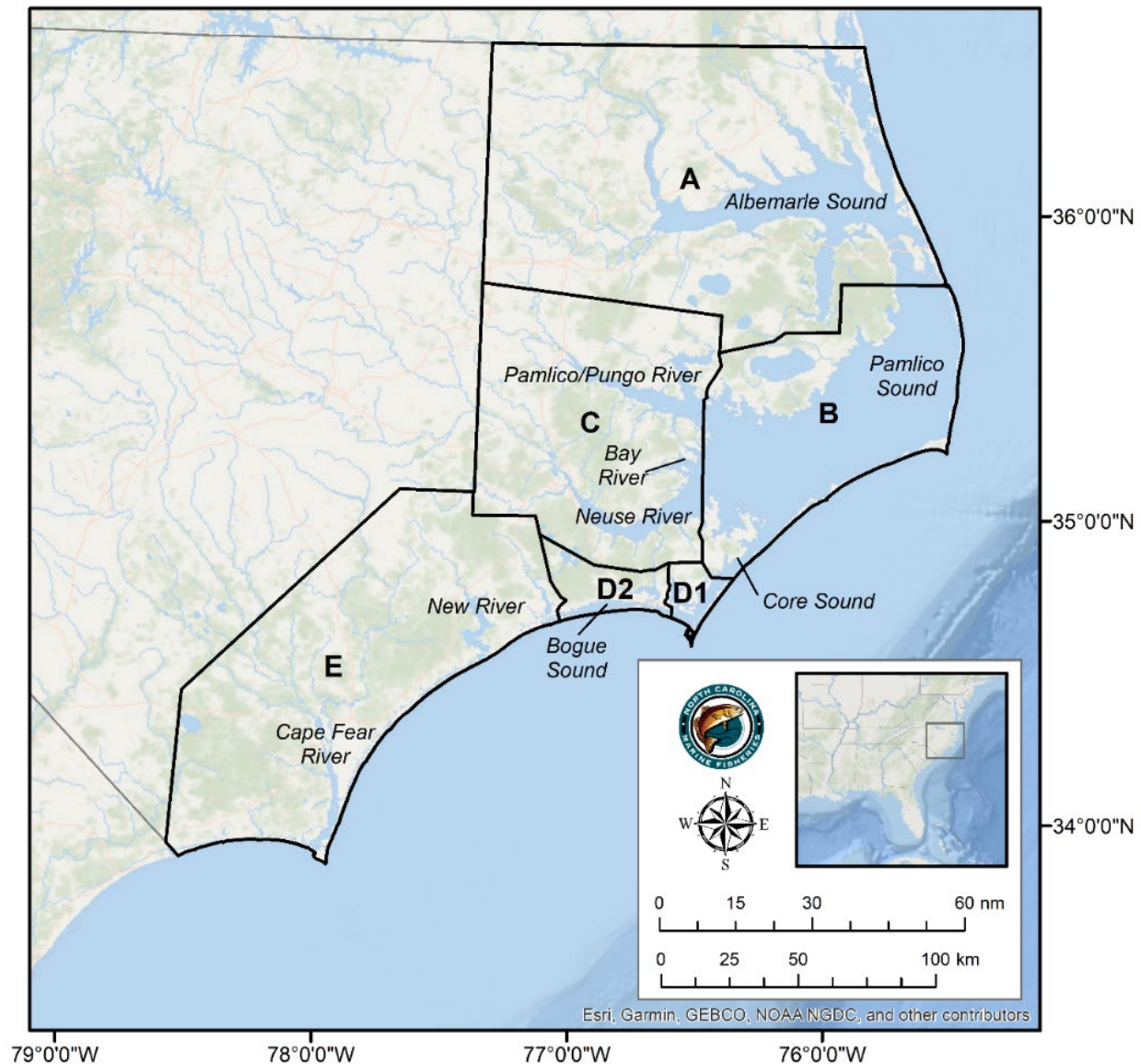


Figure 2. Locations of management units (A, B, C, D1, D2, and E) outlined in DMF's Endangered Species Act Section 10 Incidental Take Permit for sea turtles.

Results

Set Nets

Although the number of species encountered in set nets is diverse, over 99% of trips targeted at least one of 10 primary species (Table 2). These include the following, in order of magnitude: bluefish, striped mullet, spotted seatrout, Atlantic menhaden, spot, white perch, Spanish mackerel, hickory shad, weakfish, and sea mullet (kingfish spp.). The most common mesh size used for these target species was 3.25 inch ISM and mesh sizes generally ranged from 3.0 to 3.5 inch ISM. Exceptions include smaller mesh sizes (≤ 2.88 inch ISM) employed for gill nets targeting weakfish and sea mullet. The average yards of gill net fished per trip was highest for Spanish mackerel (1,643 yards) compared to less than 1,000 yards for all other target species. Maximum yards reported for a trip was typically between 2,000 and 3,000 yards for most species. Average yards fished was generally consistent across management units with some higher averages in management units B and D depending on target species (Figure 2; Table 3).

Seasonality and area fished for set nets varies by target species (Figure 3). Bluefish trips occurred commonly in Pamlico Sound and Core Sound with trips peaking in spring. Striped mullet set net trips occurred primarily in

Albemarle Sound and Pamlico Sound. Although these trips occurred year around, they peaked in the fall. Targeted spotted seatrout trips occurred in all regions with the highest number of trips in the Pamlico, Pungo and Neuse River areas. Spotted seatrout trips peaked in the fall and early winter. Set nets for Atlantic menhaden were most common in Pamlico and Albemarle Sounds peaking in March and April. Spot trips primarily occurred from Core Sound and south with a sharp seasonal peak in October. White perch occurred in northern areas led by trips in the Albemarle Sound in early spring. Spanish mackerel set net trips occurred primarily in Pamlico Sound during the summer. Hickory shad trips commonly occurred in the Pamlico Sound and Albemarle Sound. This fishery was seasonal, peaking from January to March. Weakfish trips occurred primarily in Pamlico Sound from fall through spring. Sea mullet trips occurred primarily from Pamlico Sound, Core Sound and south. The trips peaked during spring and again during fall.

Table 2. Number of small mesh (<5 inch ISM) set net trips in N.C. estuarine waters using data from the N.C. Trip Ticket Program (n=34,249) by target species with associated gear characteristics from fish house sampling and observer programs during 2015-2019. Two modal mesh sizes (the mesh sizes most often observed) are provided when differences exist between fish house sampling and observer programs. Species are listed in order of magnitude (Percent of total trips).

Species	Trips	Avg/ Yr	Per- cent	Cum. Percent	Modal Mesh	Avg Yds	Max Yds
Bluefish*	8,035	1,607	23	23	3.0 / 3.25	925	3,000
Striped mullet	5,399	1,080	16	39	3.25 / 3.5	575	1,900
Spotted seatrout	4,483	897	13	52	3.5	706	3,190
Atlantic menhaden	4,089	818	12	64	3.0 / 3.25	743	2,500
Spot	3,269	654	10	74	3.0 / 3.25	659	3,200
White perch	3,215	643	9	83	3.25 / 3.5	598	2,500
Spanish mackerel*	2,114	423	6	89	3.12	1,643	2,000
Hickory shad	1,939	388	6	95	3.25 / 3.5	783	2,100
Weakfish	1,201	240	3	98	2.88 / 3.25	937	2,500
Sea mullet	505	101	1	100	2.62 / 3.0	740	1,200

*Some trips for bluefish and Spanish mackerel may be mischaracterized as set net trips when they were actually driftnet trips, skewing the average and maximum yards reported. See *Commercial Fish House Sampling* description in the Methods section for more information.

Table 3. Average yards fished per small mesh (<5 inch ISM) set net trip by target species across gill net management unit during 2015-2019. See map in Figure 1 for locations of management units (MU).

Species	MU-A	MU-B	MU-C	MU-D	MU-E
Bluefish	876	975	350	909	356
Striped mullet	621	540	486	577	505
Spotted seatrout	725	811	667	597	955
Atlantic menhaden	528	814	767	467	.
Spot	.	.	1,150	622	501
White perch	658	701	425	.	.
Spanish mackerel	.	1,643	.	.	.
Hickory shad	849	979	543	1,675	.
Weakfish	.	820	.	1,228	500
Sea mullet	.	1,200	.	625	.

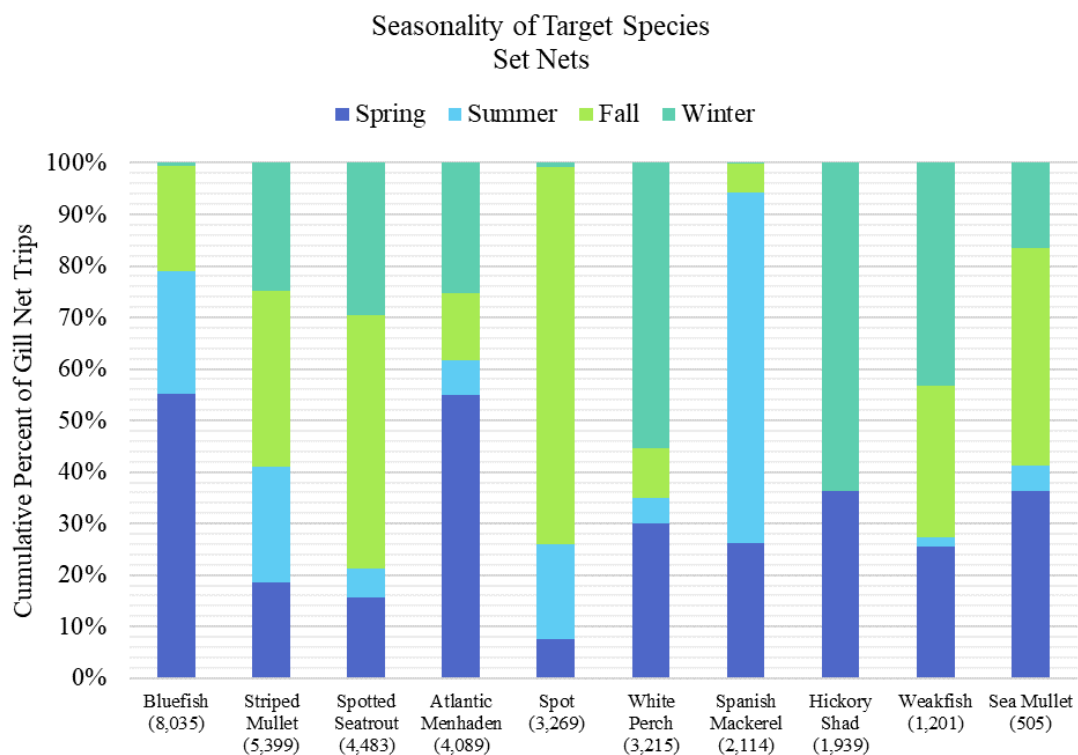
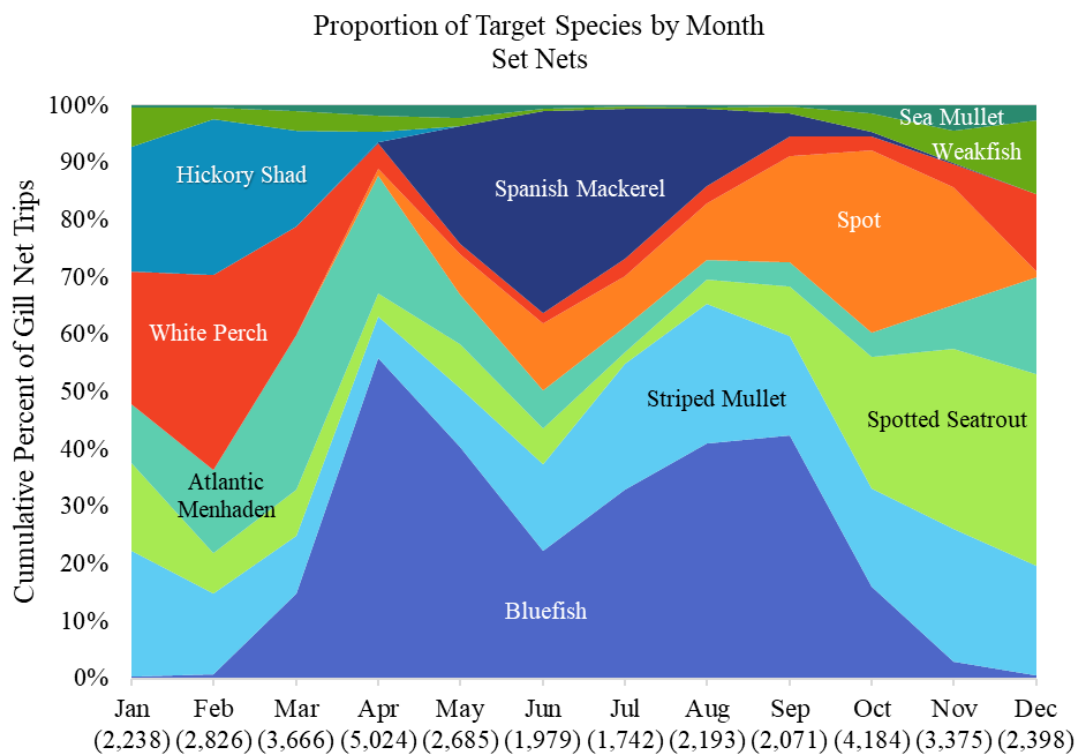


Figure 3. Percentage of set net trips for each of the 10 primary target species across months (top) and seasons (bottom) in N.C. estuarine waters during 2015-2019. Total trips per month or species are shown in parentheses under the x-axis labels.

Runaround Gill Nets

Runaround gill nets are commonly deployed throughout the year and across all coastal waters of North Carolina. The catch from runaround gill nets is more species-specific than from set nets. This gear usually targets striped mullet, spotted seatrout, and, to a lesser extent, spot and bluefish (Table 4). Generally, the nets are deployed on fish that are visually spotted (i.e., striped mullet) or in areas specific to a species (i.e., spotted seatrout). Mesh sizes differ according to the target species. During 2015-2019, three target species (striped mullet, spotted seatrout, and spot) accounted for 87% of all runaround gill net trips. The modal mesh size was 4 inch ISM for striped mullet, 3.5 inch ISM for spotted seatrout, and 2.8 inch ISM for spot. Although modal mesh size was the most commonly encountered for a species, mesh size used for a given species such as striped mullet varied based on the season and market (i.e., smaller mesh sizes for the bait mullet fishery and larger mesh sizes for the roe mullet fishery). Average net lengths generally ranged from 400 to 500 yards, but there was high variability with maximum net lengths ranging from 700 to 3,000 yards, depending on species (Table 4). There was little variability in average net length among areas.

For runaround gill net trips, seasonality and area fished varied by target species (Figure 4). Striped mullet were targeted in all areas, but primarily in Pamlico Sound and Core/Bogue sounds with fishing increasing in late summer and peaking in the fall (October and November). Spotted seatrout were most commonly targeted with runaround gill nets in the Pamlico, Pungo, Bay, and Neuse rivers. Targeted trips increased in October and peaked in November before diminishing through the winter. The runaround spot fishery was most common in the rivers, Core Sound, and southern portions of the state. Effort was high during June through October with the traditional spot fishery peaking in October. Bluefish are most commonly targeted with runaround gill nets in Pamlico and Core/Bogue sounds with peak trips occurring in April.

Table 4. Number of small mesh (<5 inch ISM) runaround gill net trips in N.C. estuarine waters using data from the N.C. Trip Ticket Program (n=17,548) by target species with associated gear characteristics from fish house sampling and observer programs during 2015-2019. Species are listed in order of magnitude (Percent of total trips).

Species	Trips	Avg/Yr	Per- cent	Cum. Percent	Modal Mesh	Avg Yds	Max Yds
Striped mullet	9,232	1,846	53	53	4.0	412	1,250
Spotted seatrout	4,611	922	26	79	3.5	493	1,150
Spot	1,434	287	8	87	2.8	380	700
Bluefish	508	102	3	90	3.3	746	3,000
Others(n=20)	1,763	353	10	100	3.3	580	1,400

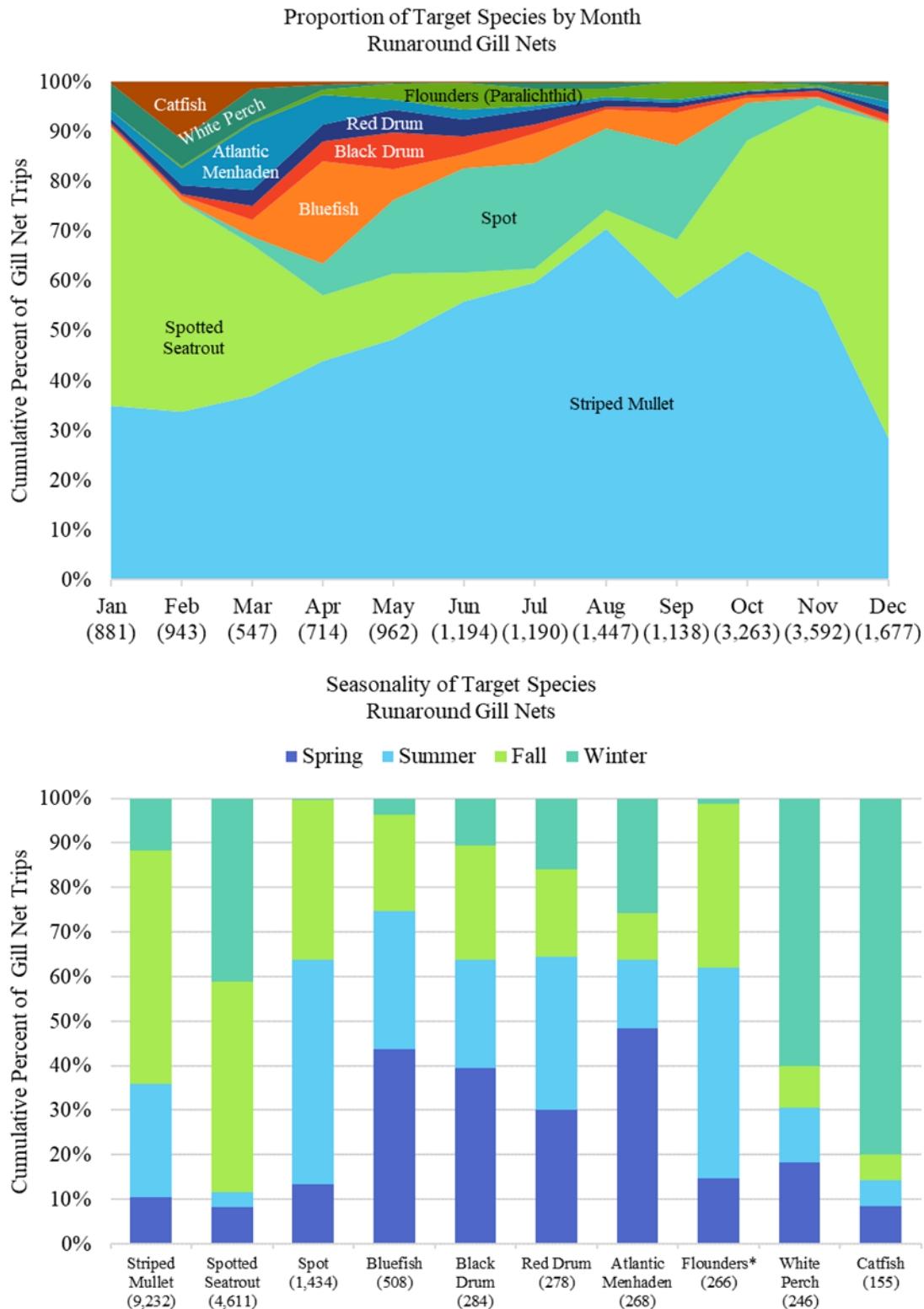


Figure 4. Percentage of runaround gill net trips for each of the ten primary target species across months (top) and seasons (bottom) in N.C. estuarine waters during 2015-2019. Total trips per month or species are shown in parentheses under the x-axis labels. An asterisk (*) indicates Paralichthid founders.

Drift Gill Nets

The small mesh drift gill net fishery occurs almost entirely in Pamlico Sound (Figure 5) and is dominated by trips targeting Spanish mackerel and to a lesser extent bluefish and spot (Table 5). Like the runaround gill net fishery, the drift gill net fishery is highly species selective due to the areas fished, season fished, and mesh sizes used. The modal mesh size used to target Spanish mackerel and bluefish was 3.5 inch ISM, while modal mesh size used to target spot was 2.9 inch ISM. Average yards fished per trip was 1,981 yards for Spanish mackerel and 1,820 yards for bluefish. Maximum yards fished for both Spanish mackerel and bluefish was 3,000 yards.

The Spanish mackerel and bluefish drift gill net fisheries occur almost entirely in Pamlico Sound with the Spanish mackerel fishery occurring from May through September and the bluefish fishery occurring throughout the summer and peaking in August (Figure 5). Although bluefish is a major species captured in this fishery, its occurrence is closely tied to trips targeting Spanish mackerel. The spot drift gill net fishery occurs almost entirely in the southern waters of the state, primarily in October and November. The drift gill net fishery for striped mullet primarily occurs in Pamlico Sound and Core/Bogue sounds south. Striped mullet are targeted in the late spring/early summer for bait, and in the fall for roe. Although the sample size is low, average mesh size in the spring from trips landing striped mullet is smaller than in the fall. Anecdotal reports from fishermen lend additional support to these observations.

Table 5. Number of small mesh (<5 inch ISM) drift gill net trips with associated gear characteristics by target species in N.C. estuarine waters during 2015-2019.

Species	Trips	Avg/Yr	Percent	Cum. Percent	Modal Mesh	Avg Yds	Max_ Yds
Spanish mackerel	644	129	52	52	3.5	1,981	3,000
Bluefish	207	41	17	68	3.5	1,820	3,000
Spot	202	40	16	84	2.86	933	1,400
Striped mullet	111	22	9	93	3	417	500
Others (n=6)	86	17	7	100	3.88	900	1,900

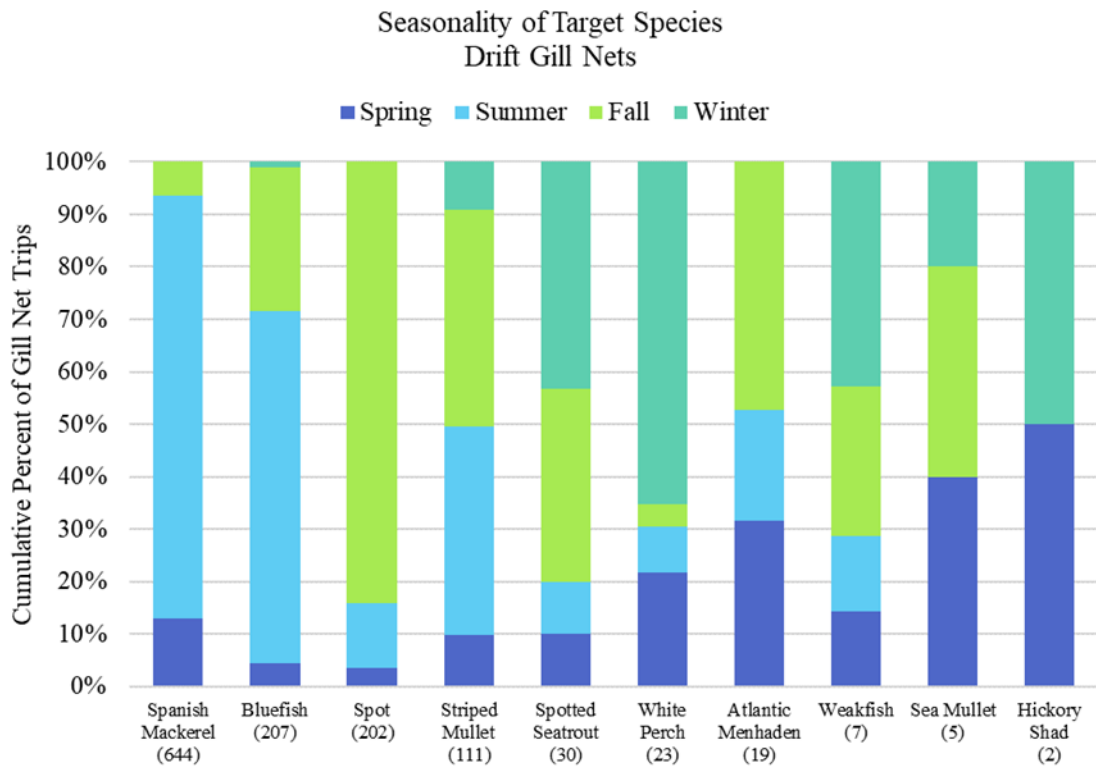
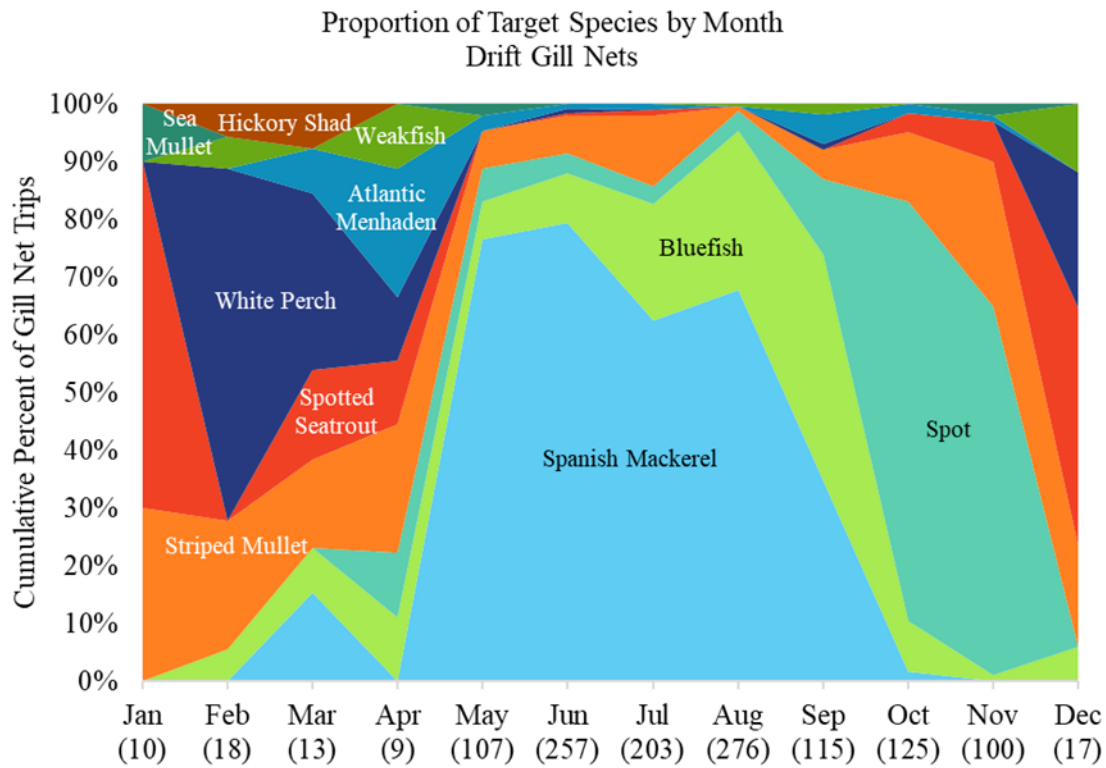


Figure 5. Percentage of drift gill net trips for each of the 10 primary target species across months (top) and seasons (bottom) in N.C. estuarine waters during 2015-2019. Total trips per month or species are shown in parentheses under the x-axis labels.

Measures used to address bycatch

Numerous gill net restrictions have been implemented over the years, either through proclamation or rule, following state FMPs that have identified bycatch as a source of mortality impeding stock growth and productivity. These restrictions have included minimum setbacks from shore for set nets, tie downs to limit the amount of the water column fished by the gear, and either seasonal or area specific required attendance and closures. Recommendations for reducing bycatch of state managed species were developed through the FMP process and in general, addressed species specific concerns to reduce mortality at critical life history stages and/or sub-legal sizes. These measures were informed by studies that enumerated the frequency that target and non-target species were caught and discarded from the nets, their subsequent survival, and gear parameters and set characteristics of the nets typically fished.

As part of the original FRA, G.S. 143B-289.52 charged the MFC to establish guidance criteria as to the contents of FMPs. The MFC adopted the “Guidelines for North Carolina Fishery Management Plans”, which set a standard for FMPs to design management measures that minimize waste of fishery resources, including both target and bycatch species. The Red Drum FMP (NCDMF 2001) and subsequent amendment (NCDMF 2008) identified non-harvest loss of red drum as a key factor contributing to the uncertainty of stock status of the species. While non-harvest losses of red drum likely occur to some extent from various commercial gears, it has been well accepted that the primary non-harvest loss is likely due to the bycatch of red drum in the estuarine gill net fishery. As a result, the 2001 N.C. Red Drum FMP took measures to reduce red drum bycatch in the estuarine gill net fishery by requiring the seasonal attendance of small mesh gill nets (<5” inch ISM). The rationale for employing attendance requirements to reduce non-harvest loss is that fishermen can actively fish their gear and release red drum and other sub-legal fish quickly, reducing the chance of harm to the fish from the gear. Gill nets of this mesh size select for red drum less than 18” total length and are a significant source of the bycatch mortality, particularly in months when water temperatures are high.

Following the original FMP, North Carolina regulations required the attendance of small mesh gill nets from May 1 through October 31 in areas known to be critical for juvenile red drum. The areas where attendance is required include all primary and secondary nursery areas, areas within 200 yards of any shoreline, and the extensive area of shallow grass flats located behind the Outer Banks. An exemption to this rule lifts the attendance requirement for the region from Core Sound to the South Carolina border in October to allow for the fall spot fishery. A study conducted in Core Sound during 1999 indicated that catches of red drum during the October fall spot fishery were relatively low. All observed trips conducted during the study occurred while gill netters were fishing nets set approximately 100 yards from shore. This practice of setting nets well off the shoreline appeared to be effective at reducing the incidence of juvenile red drum bycatch in this fishery. During the same study, DMF gill nets set less than 100 yards from shore had substantially more red drum bycatch than did sets made at ≥ 100 yards from shore.

Amendment 1 to the Red Drum FMP further refined the gill net attendance rules based on additional data collection by the DMF to focus regulations on areas and times when mortality and interactions were highest. Major modifications included extending the attendance requirement to November 30 and reducing the distance from shore attendance requirement to 50 yards in Pamlico Sound and in the area from Core Sound and south.

IV. AUTHORITY

- § 14-4.1. Legislative review of regulatory crimes.
- § 113-134. Rules.
- § 113-182. Regulations of fishing and fisheries.
- § 113-182.1. Fishery Management Plans.
- § 113-221.1. Proclamations; emergency review.
- § 143B-289.52. Marine Fisheries Commission – powers and duties.

15A NCAC 03H .0103 PROCLAMATIONS, GENERAL
15A NCAC 03I .0102 TEMPORARY SUSPENSION OF RULES

V. DISCUSSION

To address the issues identified by the Secretary of the Department of Environmental Quality and the DMF director, four categories of options for discussion and consideration are presented below (yardage limits, attendance requirements, set time and area restrictions, and mesh size limits). These various categories of potential rule

modifications, in combination, attempt to streamline and simplify small mesh gill net rules, address bycatch in small mesh gill nets, provide for greater flexibility with constraining harvest of quota managed species, and to the greatest extent practical reduce conflicts between gill net users and other stakeholders. Each section will discuss the aforementioned categories relative to the proposed management options.

Yardage limits

As a management tool, yardage limits can be utilized to constrain effort within a fishery to moderate removals over time. This is a common management practice for quota managed species to ensure quota is available throughout the fishing season or as long as reasonably possible. When coupled with requirements for attendance, the measure can potentially contribute to higher rates of survival of discarded fish by promoting more frequent fishing of the gear. Additionally, yardage limits have the potential to address concerns of user conflict. Simply put, less gear in the water can translate to potentially lower incidence of interaction with other fisheries. There are no yardage limits that currently exist in rule for nets < 4 inch ISM. Nets > 4 inch ISM are limited to a maximum of 2,000 yards in rule (15A NCAC 03J .0103 (b)(3)(B)) but are currently restricted to 1,500 yards by proclamation. The DMF director has authority to limit the amount of yardage through proclamation for either small or large mesh gill nets and has restricted the amount of allowable yardage for small mesh gill nets recently to 800 yards with an exception for drift gill nets in Pamlico Sound of 1,500 yards from May 1 – October 31. The exception allows for the Spanish mackerel and bluefish fisheries that primarily operate in Pamlico Sound to use more net to maintain efficiency and profitability of trips (further explained below).

Option 1 would maintain the current yardage limits for small mesh gill nets and proclamation authority for the DMF director to modify as needed. With the current yardage limits in place, issues related to dead discards and management of quota managed fisheries may have been adequately addressed. However, these yardage limits have not been in place for a full fishing year so the effect on the aforementioned issues is not yet known.

Options 2 through 9 provide for the establishment of yardage limits for small mesh gill nets statewide. The proposed yardage limits were informed by the previously summarized characterization of the small mesh gill net fishery and reasonable alternatives are proposed that mirror either the maximum or average yardages observed currently in the fishery. Additionally, options are proposed that allow for exemptions for drift gill net fisheries, to provide: greater flexibility for fisheries that may need more gear to remain viable, typically do not have a high incidence of bycatch, and/or occur in areas away from shore and other fisheries that may contribute to conflict.

Option 2 would establish a 2,000-yard limit for small mesh gill nets statewide in Internal Coastal Waters, which are all Coastal Fishing Waters except the Atlantic Ocean. This would be consistent with the large mesh limit currently in rule and provide clarity for stakeholders on the allowable yardage of net in state waters. In general, most net fisheries in the state, excluding some drift gill net fisheries, average considerably less yardage than 2,000 yards. This action is not expected to reduce the amount of total net yardage fished in the state, but will provide a “top end” for yardage where one currently does not exist in rule. It would also allow for the drift gill net fishery to continue as-is, relatively unaffected given that the average yardage of drift gill nets is less than 2,000 yards. This may constrain some trips, but there would not be a need to consider special exemptions for the fishery.

Option 3 would establish a 1,500-yard limit for all small mesh gill net fisheries in Internal Coastal Waters. This yardage limit is closer to the current statewide average for all combined small mesh gill net trips. This may affect the drift gill net fishery more than Option 2, but is still equivalent to the average amount of yardage fished and may help constrain effort and landings for the Spanish mackerel and bluefish quota managed fisheries by limiting the potential for large catches. However, this option does not reduce the amount of yardage fished in other small mesh gill net fisheries statewide, so there would be little benefit realized for the issues of reducing bycatch and user conflict.

Option 4 would establish an 800-yard small mesh gill net limit statewide in Internal Coastal Waters. This would make the state consistent with yardage restrictions currently in place through proclamation for Albemarle Sound and its tributaries, simplifying statewide regulations for the gear. However, based on stakeholder feedback the drift gill net fishery may be greatly affected by this yardage limit to the point that the viability of the fishery may be in question. Excluding the drift gill net fishery, 800 yards approximates the statewide average of net yardage fished in the small mesh gill net fishery. This would offer some benefits towards addressing issues with bycatch and user conflict, but in areas of the state south of Highway 58, the average yardage of net fished is much less.

Option 5 would establish two yardage limits based on area, with an 800-yard small mesh gill net limit statewide North of Highway 58 in Internal Coastal Waters and a 500-yard small mesh gill net limit South of Highway 58 in Internal Coastal Waters. A 500-yard limit south of Highway 58 would more closely match the average yardage currently fished in those areas of the state, imparting the same benefits and concerns for areas north highlighted under Option 4. Also, the same concerns for the drift gill net fishery exist for this option.

The drift gill net fishery operates in large, open bodies of water generally away from areas frequented by other fisheries. This fishery does not typically interact with other net fisheries or recreational fisheries, translating into lower reports of conflict relative to set and strike net fisheries. Nets are attended when fished and non-marketable bycatch can be low. The primary targeted species of the drift gill net fishery are Spanish mackerel and bluefish; both quota managed fisheries. In general, due to the larger vessels needed to safely fish open bodies of water, higher yardages of net are typically fished to maximize profitability of the trips. Given this, Options 6 through 9 provide for exemptions for this fishery relative to statewide yardage limits described above. Options 6 and 7 allow for 1,500 yards of small mesh drift gill net from May 1 – October 31, primarily allowing for the Spanish mackerel drift gill net fishery to occur, but with yardage limits approximately equal to the average amount of yardage observed in the fishery. A 1,500-yard allowance for the Spanish mackerel drift gill net fishery still allows for the traditional fishery but may limit the amount of gear fished and potentially increase the frequency that fishermen fish their nets, leading to decreased discard mortality. However, the time period may not allow for other fisheries like bluefish or bait fisheries to seasonally operate when their targeted species are available. Options 8 and 9 allow for flexibility in providing a drift gill net yardage exception by allowing the DMF director to increase the yardage limit for drift gill nets up to 1,500 yards by proclamation and specify the area and time for this exception. Similar to options 8 and 9, option 10 would allow for an exemption of up to 2,000 yards by proclamation from December through April for all small mesh nets. This would allow fisheries for bluefish and bait to operate with yardage amounts in excess of the current 800 yard limit which may increase the efficiency and profitability of those trips. However, if the Director allows for this exemption, then there is the potential that bycatch of some fisheries may increase.

Attendance requirements

Bycatch, and minimizing waste of target and non-target species in N.C. gill net fisheries has been addressed in many FMPs. As part of FMPs for red drum (NCDMF 2001; 2008) and striped bass (NCDMF 2004; 2013), small mesh gill net (<5.0 inch ISM) attendance requirements have been implemented as a strategy to decrease dead discards of these species. “Attended” is defined in Rule 15A NCAC 03I .0101 as being in a vessel, in the water, or on the shore, and immediately available to work the gear and be within 100 yards of any gear in use by that person at all times. Attendance does not include being in a building or structure. The intent of the attendance requirement is to indirectly limit the amount of gear that can be fished and directly reduce mortality of discards and protected species. All options and discussion of attendance requirements in this section are only applicable to areas south of Albemarle Sound. Attendance requirements in Albemarle Sound are applicable to ranges of mesh sizes and do not have distance from shore qualifiers as the rest of the state does.

Small mesh gill net attendance was first implemented in Pamlico and Neuse rivers by proclamation in 1995. Expanded attendance requirements are now in rule from the Red Drum FMP for the state (15A NCAC 03J .0103) (Appendix, Figure A1). Rule 15A NCAC 03J .0103(g) and (h) state:

- (g) It is unlawful to use unattended gill nets with a mesh length less than five inches in a commercial fishing operation in the gill net attended areas designated in 15A NCAC 03R .0112(a).
- (h) It is unlawful to use unattended gill nets with a mesh length less than five inches in a commercial fishing operation from May 1 through November 30 in the Internal Coastal Waters and Joint Fishing Waters of the state designated in 15A NCAC 03R .0112(b).

Year-round small mesh gill net attendance is required in the upper portions of the rivers (Pamlico and Neuse) and within 200 yards of shore in the lower rivers (Figure 6). From May 1 through November 30 small mesh gill nets must be attended in all primary and permanent secondary nursery areas, no trawl areas, within 50 yards of shore in Pamlico and Core sounds, and all coastal waters south to the North Carolina/South Carolina state line. An exemption to this rule lifts the attendance requirement for the region from Core Sound to the South Carolina border in October to allow for the fall spot fishery. Overall, the amount of small mesh gill net effort has been reduced in areas where attendance requirements are required.

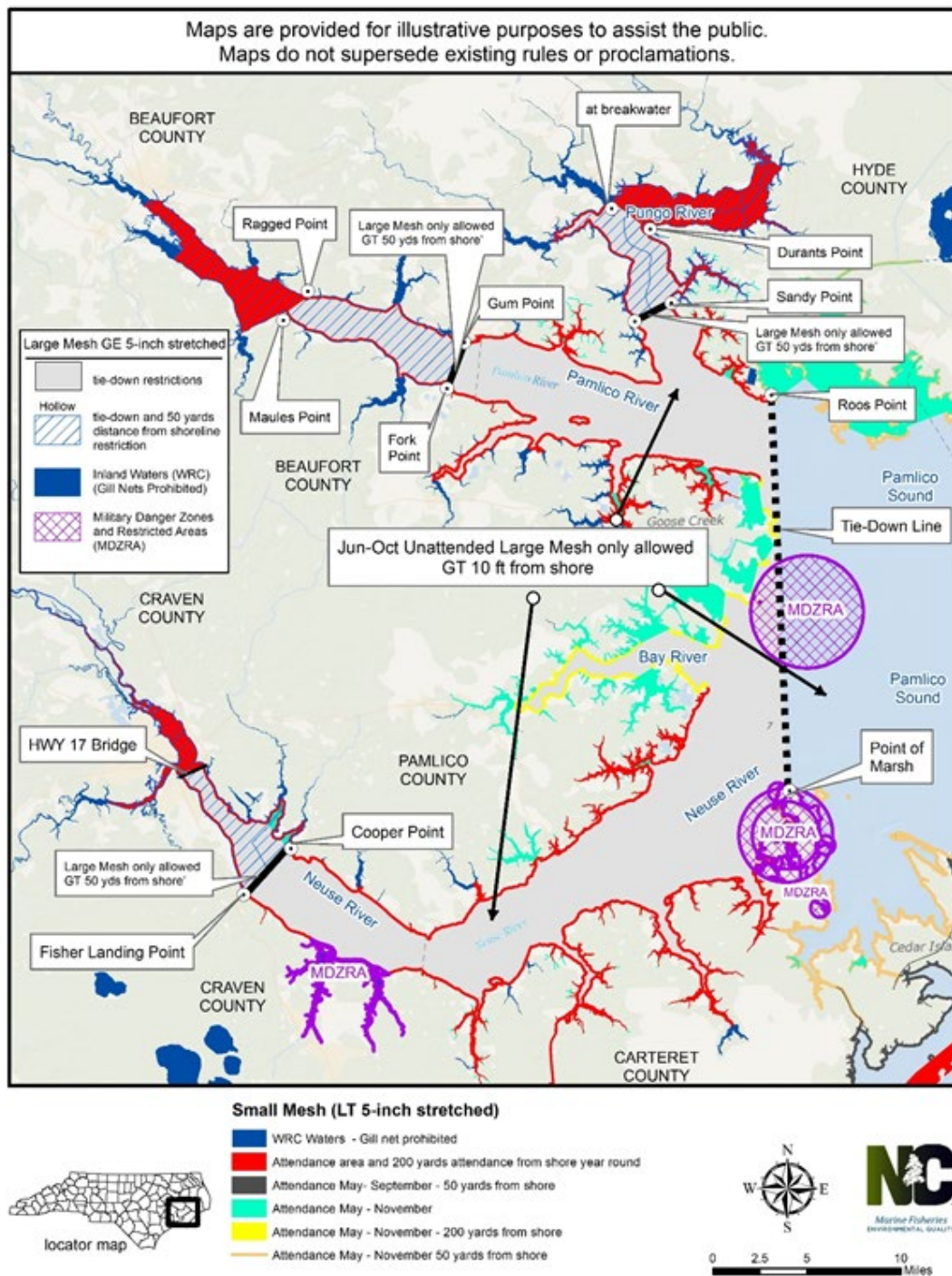


Figure 6. Gill net regulations for small and large mesh gill nets in the Pamlico, Pungo, Bay, and Neuse rivers.

Implementation of areas and seasons where small mesh gill net attendance is required was informed by analysis of best available data from onboard commercial fishery observers and fishery-independent (DMF) gill net sampling. For example, a study conducted in Core Sound during 1999 indicated catches of red drum during the October fall spot fishery were relatively low (NCDFM 2001). All observed trips conducted during the study occurred while gill netters

were fishing nets set approximately 100 yards from shore, which appeared to be effective at reducing the incidence of juvenile red drum bycatch in the fishery. Fishery-independent gill nets set concurrently by the DMF caught substantially more red drum within 100 yards from shore than those set greater than 100 yards from shore. This information was used as the basis for exempting the October spot fishery in Core Sound from attendance requirements.

Fishery-independent gill net data was also used to inform decisions regarding extending attendance for small mesh gill nets within 200 yards of shore to include the area of the lower Neuse out to the mouth of the river and to modify the seasonal attendance requirement to include the period of May 1 through November 30 in all primary and permanent secondary nursery areas, no trawl areas, within 50 yards of shore in Pamlico and Core sounds, and all coastal waters south to the North Carolina/South Carolina state line (NCDMF 2008). These decisions were based on acute mortality of sub-legal red drum for each month during fishery-independent gill net sampling. Because of the rigorous process used in identifying the need for attendance requirements and reductions in effort associated with implementation of attendance requirements, regulations have largely been effective in reducing dead discards of red drum and striped bass from small mesh gill nets. Conversely, removing attendance requirements statewide, even for a portion of the year, could potentially increase the likelihood of dead discards and undermine the conservation benefits of current fishery management plans.

However, because of the patchwork nature of areas requiring small mesh gill net attendance and differences in seasonality of attendance requirements, the simplification of existing rules may alleviate confusion and aid in enforceability. Other attended areas are implemented via proclamation (see Option 1 below), which creates flexibility in how they are implemented but may lead to confusion. Codifying these requirements in rule would maintain consistency with how most attendance requirements are implemented and reduce potential for confusion by the fishing public.

While existing small mesh gill net requirements are likely adequate for reducing discard mortality, expansion of attendance areas, or attendance seasons, would likely lead to greater survival of discards over a broader area and time range. Requiring year-round attendance of small mesh gill nets set within 200 yards from shore statewide would create consistency in rules and possibly reduce dead discards. This measure would mostly impact areas outside of the Pamlico and Neuse rivers (year-round attendance required within 200 yards from shore in rivers; Figure 1). Year-round attendance could also be considered for areas designated in Rule 15A NCAC 03R .0112(b) (i.e., primary nursery areas, permanent secondary nursery areas, no trawl areas). This would create consistency in the timing of attendance requirements.

Increasing the area or time when attendance is required would cause some concerns about safety because of the need to remain on the water attending nets. This is of particular concern in the northern part of the state where waterbodies are larger with fewer sheltered areas. In addition, attendance requirements have been shown to reduce effort, so any additional requirements would likely further limit the small mesh gill net fishery, and potentially cause shifts to the runaround and drift gill net fisheries. The opportunity cost of trips for fishermen may increase with additional attendance requirements translating to increase effort for the same amount of fish.

Consideration could also be given to modifying the definition of attended. Currently, the requirement for attendance is being within 100 yards of the gear. Some stakeholders have pointed out that a modification in the attendance definition to allow for a greater distance from gear could impart some benefits relative to efficiency of the fishing operation. The distance requirement could be increased to increase efficiency of the fishing operation, but this is counterproductive for the overall effort examined in this document as it could allow for more gear to be fished. That said, a greater distance could provide the flexibility to fish multiple smaller shots of gill net that could be fished more quickly, offsetting the increased attendance requirements and reducing opportunity costs for fishermen overall. This type of modification may be useful in smaller waterbodies in the southern part of the state (south of Highway 58) where shorter lengths of net are used and can be more readily attended. However, this requirement could also lead to increased time in-between fishing different shots of net that could cause enforcement issues and may lead to increased dead discards. The distance threshold could be modified to require being physically in contact with the gear at all times. This modification would cause set nets to be fished more like runaround or drift gill nets and would likely limit dead discards and would be easily enforced. However, this would eliminate the ability to set multiple shots of gill net and could create unsafe fishing conditions. This modification would likely lead to extreme declines in small mesh set net effort.

Set time and area restrictions

Set time and area restrictions for gill nets currently in rule prohibit setting nets: within 150 or 300 yards of bridge crossings in various rivers and waterbodies (15A NCAC 03J .0102; 15A NCAC 03J .0103(d)(2)); within various distances from pound nets (15A NCAC 03J .0103(d)(1)); in numerous small embayments, basins, and areas (15A NCAC 03J .0402); and in joint fishing waters of Lake Mattamuskeet and within 800 feet of Lock Number 1 on the Cape Fear River (15A NCAC 03Q .0107(2)(a); .0107(3)). Pursuant to Rule 15A NCAC 03J .0103(b), the DMF director may, by proclamation, specify the time, area, and means and methods for setting gill nets. Per proclamation M-3-2014, it has been unlawful to set gill nets in joint coastal waters from midnight on Friday to midnight on Sunday except for portions of Albemarle and Currituck sounds since Feb. 5, 2014. Additional area restrictions implemented in proclamation include prohibiting the use of gill nets near Martins Point in Currituck Sound since Dec. 2, 2016 (M-26-2016) to reduce user group conflict, and upstream of the ferry lines in the Neuse and Pamlico rivers since March 18, 2019 (M-6-2019) to fulfill a directive by the MFC pursuant to N.C. General Statute 113-221.1 (d).

Keeping the current restrictions for set time and area for small mesh gill nets would allow for the DMF director to maintain the ability to modify restrictions via proclamation, which may reduce confusion for fishermen who are familiar with the current set time and area restrictions. However, this option does not address the concerns raised with conflict between user groups in areas not covered under current rule or proclamation. By codifying the restrictions on set time and area currently in proclamation into rule, regulatory complexity could be reduced but would limit the ability of the DMF director to modify restrictions via proclamation, reducing flexibility to address variable conditions. The process for rule change is lengthy and as a result could delay changes to management strategies and could complicate the ability to implement FMPs in a timely fashion.

Further restricting the time and/or days that small mesh gill nets may be set and retrieved could potentially reduce user conflict by removing the gear from the water during times when recreational activities are highest (i.e., recreational fishing, kayaking, pleasure boating, etc. in daylight hours, on weekends, and during high effort seasonal times). Set time restrictions could potentially only be required during certain times of the year when the expectation of user conflicts is diminished due to low effort from other gear and user groups. This could allow greater access for gill nets during certain times of the year to maximize cost efficiency of trips. Reduced soak times may limit the number of dead discards, as well as aid in the management of quota managed species (i.e., Spanish mackerel and bluefish) by constraining landings, potentially leading to longer fishing seasons. Depending on what time nets are specified to be retrieved, the expected reductions in conflict could be diminished if the soak times extend too long into daytime hours. Conversely, if the specified retrieval time is early in the morning, safety at sea becomes an issue for fishermen travelling long distances in dark conditions to retrieve their gear on time. Restricting the time nets may be set and fished could potentially result in lost revenue from declines in effort, as well as disrupt the supply of harvest to markets.

Defining the times in specific areas that nets can be set could potentially serve as a more fine-tuned approach to address user group conflict issues with the small mesh gill net fishery. Restricting soak times in certain areas or management units could result in the same outcomes (both positive and negative) as discussed for set time restrictions. However, the area and time restrictions could be tailored to fit areas where the need to reduce user group conflict is highest. While it might be beneficial in reducing conflict, restrictions by area would result in regulatory inconsistencies across waterbodies and could create a perceived inequality among commercial fishermen who fish different areas of the state. Another option would be to prohibit the use of nets in certain areas or within a specified distance of docks or improved shorelines, regardless of the time of day. While this option could permanently reduce conflict in restricted areas, it would remove access for net fishermen from public trust waters. Also, implementing this option could result in increased localized abundance of some species if the loss of harvest by gill nets is not recouped by other gears.

Mesh size limits

Minimum mesh size for gill nets has basically gone unchanged since the 2.5 inch mesh size for all “nets” was first implemented by the Department of Conservation and Development in 1927. Minimum mesh size restrictions currently in rule make it unlawful to use gill nets with a mesh size less than 2.5 inch ISM. (15A NCAC 03J .0103 (a) (1)). The only variations are in proclamations effective in areas of the Albemarle, Currituck, Roanoke, and Croatan sounds (Management Unit A) that restrict gill net minimum mesh sizes to 3.0 inch ISM. Gill nets from 2.5 inches to less than 5.0 inches are generally considered small mesh nets.

Preliminary analysis of mesh sizes indicates that the minimum mesh size currently in rule is smaller than what fishermen are using. Gill net trips for sea mullet and spot are typically those using mesh sizes smaller than 3.0 inch ISM. The most common mesh sizes used in the small mesh fishery was 3.25 inches and mesh sizes generally ranged from 3.0 to 3.5 inch ISM (Tables 2, 4, and 5).

Mesh size options presented include minimums of 2.625, 2.75, and 3.0 inch ISM. DMF staff reached out to multiple gill net fishermen and there was no support for increasing the minimum mesh size requirements to 3.0 inch ISM. Most of the fishermen were in support of increasing the minimum mesh size to 2.75 inch ISM because they currently use that size or larger. Some fishermen expressed concern that an increase in minimum mesh size requirements might adversely affect the sea mullet fishery in the ocean that generally uses 2.5 – 2.625 inch ISM sizes. There was considerable discussion that increasing the minimum mesh size would allow escapement of smaller spot and croaker and that sea mullet normally captured in the smaller mesh sizes would eventually “grow into” the larger mesh sizes.

Increases in minimum mesh size requirements could potentially reduce incidence of regulatory discards in some fisheries by modifying gill net selectivity. Although some catches of marketable species may decline due the change in selectivity, it is hard to know the level of impact, good or bad, this increase may have. It is likely that changes may result in both positive and negative impacts to fisheries and stocks depending on the species.

VII. PROPOSED MANAGEMENT OPTIONS

Yardage limits

Option 1: *status quo* – no yardage limit in rule for gill nets with stretched mesh less than four inches

- + No rule change required
- + DMF director has proclamation authority under current rules to implement yardage limits.
- + No need for fishermen to modify current gear
- + No additional regulation for Marine Patrol to enforce
- Unlimited yardage makes controlling harvest for quota managed fisheries difficult
- Excessive yardage can contribute to high mortality of discarded fish and other marine organisms

Option 2: Specify that the allowable yardage of gill nets with stretched mesh less than four inches shall not exceed 2,000 yards per vessel in Internal Coastal Waters regardless of the number of individuals involved.

- + Establishes small mesh yardage limit above current statewide average providing minimal impact to fishermen, but constrains further expansion of small mesh gill net effort
- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- + Would create consistency with current yardage limit for nets with stretched mesh greater than four inches
- Some fisheries currently use in excess of 2,000 yards and will be disproportionately affected by the yardage limit.
- Some fishermen may need to modify gear/vessel to comply.

Option 3: Specify that the allowable yardage of gill nets with stretched mesh less than four inches shall not exceed 1,500 yards per vessel in Internal Coastal Waters regardless of the number of individuals involved.

- + Uses the best available data to set the yardage limit at the current statewide average
- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- + Is consistent with current management measures in proclamation for gill nets with stretched mesh greater than four inches
- + DMF director has proclamation authority under current rules to implement yardage limits less than 1,500 if needed.
- +/- Reduces the current average level of effort and provides conservation benefits by potentially increasing the frequency that attended gear is fished and thereby increasing the potential for survival of discarded fish
- +/- Areas of the state south of Hwy 58 average considerably less than 1,500 yards and will not be affected by this limit.
- Some fisheries currently use in excess of 1,500 yards and will be disproportionately affected by the yardage limit.
- Some fishermen may need to modify gear/vessel to comply.

Option 4: Specify that the allowable yardage of gill nets with stretched mesh less than four inches shall not exceed 800 yards per vessel in Internal Coastal Waters regardless of the number of individuals involved

- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- + DMF director has proclamation authority under current rules to implement yardage limits less than 800 if needed.
- +/- Reduces the current average level of effort and provides conservation benefits by potentially increasing the frequency that attended gear is fished and thereby increasing the potential for survival of discarded fish

- +/- Changes to per-trip cash flows due to reduction of gear fished, potential increase of product quality, reduction of net needed to purchase and maintain, and increase in trip efficiency
- Most fisheries in internal waters north of Highway 58 will be affected; some may be reduced to the point that it is not feasible (i.e., drift gill net fishery).
- Some fishermen may need to modify gear/vessel to comply.

Option 5: Specify that the allowable yardage of gill nets with stretched mesh less than four inches shall not exceed 800 yards per vessel in Internal Coastal Waters north of Highway 58 and 500 yards south of Highway 58, regardless of the number of individuals involved

- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- + DMF director has proclamation authority under current rules to implement yardage limits less than 800 if needed.
- + Lesser yardage limit south of Highway 58 better reflects current yardage use in these areas and imparts some reduction in overall yardage fished.
- +/- Reduces the current average level of effort and provides conservation benefits by potentially increasing the frequency that attended gear is fished and thereby increasing the potential for survival of discarded fish
- +/- Changes to per-trip cash flows due to reduction of gear fished, potential increase of product quality, reduction of net needed to purchase and maintain, and increase in trip efficiency
- Most fisheries statewide will be affected; some may be reduced to the point that it is not feasible (i.e., drift gill net fishery).
- Some fishermen may need to modify gear/vessel to comply.
- Increases difficulty of enforcement; would require Marine Patrol to physically measure gear

Option 6: Specify that the allowable yardage of gill nets, with stretched mesh less than four inches, shall not exceed 800 yards per vessel in Internal Coastal Waters regardless of the number of individuals involved, except for drift gill nets from May 1 – October 31 shall not exceed 1,500 yards.

- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- + Provides exclusion for drift gill nets during the portion of the year the Spanish mackerel and bluefish fisheries are active
- +/- Reduces the current average level of effort and provides conservation benefits by potentially increasing the frequency that attended gear is fished and thereby increasing the potential for survival of discarded fish
- +/- Changes to per-trip cash flows due to reduction of gear fished, potential increase of product quality, reduction of net needed to purchase and maintain, and increase in trip efficiency
- Some fishermen may need to modify gear/vessel to comply.
- Increases difficulty of enforcement; would require Marine Patrol to physically measure gear

Option 7: Specify that the allowable yardage of gill nets with stretched mesh less than four inches shall not exceed 800 yards per vessel in Internal Coastal Waters north of Highway 58 and 500 yards south of Highway 58, regardless of the number of individual involved, except for drift gill nets from May 1 – October 31 shall not exceed 1,500 yards.

- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- + Provides exclusion for drift gill nets during the portion of the year the Spanish mackerel and bluefish fisheries are active
- + Lesser yardage limit south of Highway 58 better reflects current yardage use in these areas and imparts some reduction in overall yardage fished.

- +/- Reduces the current average level of effort and provides conservation benefits by potentially increasing the frequency that attended gear is fished and thereby increasing the potential for survival of discarded fish
- +/- Changes to per-trip cash flows due to reduction of gear fished, potential increase of product quality, reduction of net needed to purchase and maintain, and increase in trip efficiency
- Some fishermen may need to modify gear/vessel to comply
- Increases difficulty of enforcement; would require Marine Patrol to physically measure gear

Option 8: Specify that the allowable yardage of gill nets, with stretched mesh less than four inches, shall not exceed 800 yards per vessel in Internal Coastal Waters regardless of the number of individuals involved. The DMF director may by proclamation allow up to 1,500 yards of drift gill net and specify the area and time it may be fished.

- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- + Allows for flexibility to accommodate fisheries where a high volume of gear during certain times and/or areas could be utilized with low incidence of discards
- +/- Can reduce the current average level of effort and provide conservation benefits by potentially increasing the frequency that attended gear is fished and thereby increasing the potential for survival of discarded fish
- +/- Changes to per-trip cash flows due to reduction of gear fished, potential increase of product quality, reduction of net needed to purchase and maintain, and increase in trip efficiency
- Some fishermen may need to modify gear/vessel to comply.
- Increases difficulty of enforcement; would require Marine Patrol to physically measure gear

Option 9: Specify that the allowable yardage of gill nets with stretched mesh less than four inches shall not exceed 800 yards per vessel in Internal Coastal Waters north of Highway 58 and 500 yards south of Highway 58, regardless of the number of individuals involved. The DMF director may by proclamation allow up to 1,500 yards of drift gill net and specify the area and time it may be fished.

- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- + Allows for flexibility to accommodate fisheries where a high volume of gear during certain times and/or areas could be utilized with low incidence of discards
- + Lesser yardage limit south of Highway 58 better reflects current yardage use in these areas and imparts some reduction in overall yardage fished.
- +/- Can reduce the current average level of effort and provide conservation benefits by potentially increasing the frequency that attended gear is fished and thereby increasing the potential for survival of discarded fish
- +/- Changes to per-trip cash flows due to reduction of gear fished, potential increase of product quality, reduction of net needed to purchase and maintain, and increase in trip efficiency
- Some fishermen may need to modify gear/vessel to comply.
- Increases difficulty of enforcement; would require Marine Patrol to physically measure Gear

Option 10: Allow for an exemption up to 2,000 yards through proclamation from December 1st – April 30th. (Option added by MFC)

- + Allows for flexibility to accommodate fisheries where a high volume of gear during certain times and/or areas could be utilized with low incidence of discards
- +/- Changes to per-trip cash flows due to reduction of gear fished, potential increase of product quality, reduction of net needed to purchase and maintain, and increase in trip efficiency
- Some fishermen may need to modify gear/vessel to comply.
- Increases difficulty of enforcement; would require Marine Patrol to physically measure gear

Attendance requirements

Options for amending attendance requirements presented below were developed for areas south of Albemarle Sound. Attendance requirements in Albemarle sound and its tributaries are applicable to various ranges of mesh sizes and do not have distance from shore qualifiers. These restrictions were developed over countless years of FMP development and management responses to regional issues and differ drastically than regulations in the rest of the state.

Option 1: *status quo* – attendance requirements under current rule:

- “Attended” is currently defined in Rule 15A NCAC 03I .0101 as being in a vessel, in the water, or on the shore, and immediately available to work the gear and be within 100 yards of any gear in use by that person at all times. Attended does not include being in a building or structure.
- Within 100 feet of the Intercostal Waterway from start of Alligator River canal to South Carolina line
- For gill nets with a stretched mesh less than five inches and within 200 yards of shore, in any areas designated in Rule 15A NCAC 03R .0112(a)
- For gill nets with a stretched mesh less than five inches and within 200 yards of shore, from May 1 to November 30 in any areas designated in Rule 15A NCAC 03R .0112(b) including primary nursery areas, permanent secondary nursery areas, and no trawl areas

Attendance requirements currently in proclamation:

- Deer and School House creeks in Bogue Sound
- Newport River and its tributaries from 7:00 am to 7:00 pm
- Year round within 200 yards of shore in Bay and Pungo rivers and lower portions of the Pamlico and Neuse rivers
 - + No rule change required
 - + DMF director has proclamation authority under current rules to modify
 - + Fishermen are familiar with current attendance requirements
 - + No additional regulation for Marine Patrol to enforce
 - + Addresses concerns raised with conflict in some areas of the state
 - Attendance requirements are not consistent statewide, which can cause difficulty of enforcement

Option 2: Codify restrictions currently in proclamation into rule.

- + Reduces regulatory complexity by having all current attendance requirements in rule
- +/- Limits the discretionary ability of the DMF director to modify requirements via proclamation
- +/- Rule changes take time, which can delay changes to management strategy.
- Could add complexity to implementing FMPs in a timely manner

Option 3: Require year-round statewide attendance within 200 yards of shore and/or within designated areas currently in rule, whichever is more restrictive.

- + Reduces regulatory complexity by having consistent attendance requirements statewide
- + Potentially reduces incidence of dead discards by reducing soak times and requiring active fishing of gear
- +/- Limits the discretionary ability of the DMF director to modify requirements via proclamation
- Concerns with safety at sea if fishermen are required to attend gear
- Potential decline in efficiency of trips
- Rule changes take time, which can delay changes to management strategy.
- Could add complexity to implementing FMPs in a timely manner

Option 4: Require year-round statewide attendance for gill nets with mesh size less than four inches.

- + Reduces regulatory complexity by having consistent attendance requirements statewide

- + Potentially reduces incidence of dead discards by reducing soak times and requiring active fishing of gear
- + Ease of enforcement compared to current requirements
- +/- Limits the discretionary ability of the DMF director to modify requirements via proclamation
- Concerns with safety at sea if fishermen are required to attend gear in open waters
- Concerns with safety of Marine Patrol in open waters
- Potential decline in efficiency of trips
- Rule changes take time, which can delay changes to management strategy.
- Could add complexity to implementing FMPs in a timely manner

Option 5: Require year-round attendance within 200 yards of shore in all areas currently designated in Rule 15A NCAC 03R .0112.

- + Reduces regulatory complexity by removing seasonal requirements (May 1 to November 30 in areas designated in Rule 15A NCAC 03R .0112(b)) creating consistency with other year-round attendance requirements
- + Potentially reduces incidence of dead discards by reducing soak times and requiring active fishing of gear
- +/- Limits the discretionary ability of the DMF director to modify requirements via proclamation
- Concerns with safety at sea if fishermen are required to attend gear
- Potential decline in efficiency of trips
- Rule changes take time, which can delay changes to management strategy.
- Could add complexity to implementing FMPs in a timely manner

Option 6: Require year-round attendance in all areas currently designated in Rule 15A NCAC 03R .0112.

- + Reduces regulatory complexity by removing seasonal requirements (May 1 to November 30 in areas designated in Rule 15A NCAC 03R .0112(b)) creating consistency with other year-round attendance requirements
- + Potentially reduces incidence of dead discards by reducing soak times and requiring active fishing of gear
- +/- Limits the discretionary ability of the DMF director to modify requirements via proclamation
- Concerns with safety at sea if fishermen are required to attend gear, especially in large open water areas
- Potential decline in efficiency of trips
- Rule changes take time, which can delay changes to management strategy.
- Could add complexity to implementing FMPs in a timely manner

Option 7: Require year-round attendance in all creeks and/or water bodies less than 200 yards wide. (Most areas that would be affected by this option already have a 200 yard requirement or are included in Rule 15A NCAC 03R .0112 and have seasonal attendance requirements. A year round 200 yards from shore attendance requirement would cover these areas.)

- + Potentially reduces conflict in confined areas that multiple user groups occupy
- + Reduces regulatory complexity by removing seasonal requirements (May 1 to November 30 in areas designated in Rule 15A NCAC 03R .0112(b)) creating consistency with other year-round attendance requirements
- + Potentially reduces incidence of dead discards by reducing soak times and requiring active fishing of gear
- +/- Limits the discretionary ability of the DMF director to modify requirements via proclamation
- Potential decline in effort and profitability of trips
- Rule changes take time, which can delay changes to management strategy.
- Could add complexity to implementing FMPs in a timely manner

Option 8: Modify distance requirement in the definition of "attend" to allow person and/or vessel being occupied to be within 500 yards of gear being fished.

- + An increase in the distance requirement will allow fishermen to set and attend multiple shots of shorter nets within a larger area as opposed to setting fewer, larger sets.
- + The ability to fish shorter shots of net over a larger area actively has the potential to increase efficiency of the gear and operation while simultaneously mitigating the incidence of dead discards.
- Increases the effort needed for enforcement by expanding the allowable area an operation can fish
- Can create scenarios where an operation would not be able to physically observe their nets for protected species interactions but still be considered “attended”, i.e., nets out of view around a marsh edge

Option 9: Modify distance requirement in the definition of “attend” to allow person and/or vessel being occupied to be within 500 yards of gear being fished south of Highway 58.

- + An increase in the distance requirement will allow fishermen to set and attend multiple shots of shorter nets within a larger area as opposed to setting fewer, larger sets.
- + The ability to fish shorter shots of net over a larger area actively has the potential to increase efficiency of the gear and operation while simultaneously mitigating the incidence of dead discards.
- + Increasing the attendance distance south of Highway 58 will allow operations in this area to more efficiently fish their gear within the narrow confines of the fishable habitat.
- Increases the effort needed for enforcement by expanding the allowable area an operation can fish
- Can create scenarios where an operation would not be able to physically observe their nets for protected species interactions but still be considered “attended”, i.e., nets out of view around a marsh edge

Option 10: Remove distance requirement from the definition of “attend” to require a person to be physically in contact with the gear at all times.

- + Will ensure that nets are attended and actively fished, potentially reducing to the maximum extent practicable the incidence of dead discards
- Fishermen would be limited to one net and therefore efficiency of trips may be reduced.
- Profitability of some trips may be reduced to the point that some fisheries may no longer be Feasible.

Option 11: No attendance requirement statewide from December 1 – April 30th. (Option added by MFC)

- +/- Changes to per-trip cash flows due to potential changes in trip efficiency
- Would remove the attendance requirement from all areas currently designated in 15A NCAC 03R .0112(a & b) thereby increasing the likelihood of bycatch and dead discards within nursery areas
- Would remove the attendance requirement within 100 feet of the Intercoastal Waterway thereby increasing the likelihood of interactions with marine traffic
- Would remove the attendance requirement in areas of the state currently covered in proclamations as part of user conflict resolutions

Set time and area restrictions

Option 1: status quo – prohibition on setting gill nets in current rule:

- Within 150 or 300 yards of bridge crossings in numerous river systems statewide
- Use of gill nets within various set distances from pound nets
- Numerous small embayments, basins, and areas described in Rule 15A NCAC 03J .0402
- In joint fishing waters of Lake Mattamuskeet and within 800 feet of Lock No. 1 on the Cape Fear River
- Adjacent to marked fishing piers

Prohibition on setting gill nets in current proclamations:

- Joint coastal fishing waters from midnight on Friday to midnight on Sunday except for portions of Albemarle and Currituck Sounds
 - + No rule change required
 - + DMF director has proclamation authority under current rules to modify
 - + Fishermen are familiar with current set time and area restrictions.
 - + No additional regulation for Marine Patrol to enforce
 - Does not address concerns raised with conflict in areas not covered under current rule or proclamation

Option 2: Codify restrictions currently in proclamation into rule.

- + Reduces regulatory complexity by having all restrictions in rule
- +/- Limits the discretionary ability of the DMF director to modify restrictions via proclamation
- Rule changes take time, which can delay changes to management strategy.
- Could add complexity to implementing FMPs in a timely manner

Option 3: Specify that nets may be set no sooner than one hour before sunset and retrieved no later than one hour after sunrise statewide.

- + Potentially reduces conflict between user groups
- + Potentially reduces incidence of dead discards by reducing soak times
- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- Reduces the time that gear is in the water

Option 4: Specify that nets may be set no sooner than one hour before sunset and retrieved no later than noon the following day statewide.

- + Potentially reduces conflict between user groups
- + Potentially reduces incidence of dead discards by reducing soak times
- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- + Promotes safety at seas by allowing additional time during daylight hours to retrieve gear
- Expected reductions in conflict may be diminished due to increased soak time during daylight hours.

Option 5: Specify that nets may not be fished from midnight on Friday to midnight on Sunday statewide.

- + Reduces the potential for user conflict by removing nets from the water during times when recreational and pleasure boat activity is presumed to be high
- + Enforcement staff can more easily identify and enforce net violations.
- Potential loss in revenue from decline in effort
- Disruption in supply of harvest to local markets

Option 6: Specify that nets may be set no sooner than one hour before sunset and retrieved no later than one hour after sunrise in areas or Management Units determined by the MFC.

- + Potentially reduces conflict between user groups
- + Potentially reduces incidence of dead discards by reducing soak times
- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- + Limits setting time requirements to areas where conflict occurs
- Creates inconsistent restrictions across areas that may prove troublesome for enforcement
- Reduces the time that gear is in the water

Option 7: Specify that nets may be set no sooner than one hour before sunset and retrieved no later than noon the following day in areas or Management Units determined by the MFC.

- + Potentially reduces conflict between user groups
- + Potentially reduces incidence of dead discards by reducing soak times
- + May help constrain landings of quota managed species (Spanish mackerel and bluefish) and provide for greater fishing opportunities through extended open seasons
- + Limits setting time requirements to areas where conflict occurs
- + Promotes safety at seas by allowing additional time during daylight hours to retrieve gear
- Creates inconsistent restrictions across areas that may prove troublesome for enforcement
- Expected reductions in conflict may be diminished due to increased soak time during daylight hours.

Option 8: Specify that nets may not be set within 200 feet of docks and improved shorelines. Allow exemption for personal docks and docks where the fishing operation has written permission to fish within 200 feet of dock and/or improved shoreline.

- + Potentially reduces conflict between net fishermen and property owners by removing the gear from areas that could pose conflict
- Removes access for net fishermen from public trust waters
- Need to define docks and improved shorelines for effective enforcement
- Reductions in conflict around docks and improved shorelines may be offset by concentrated effort in other areas.

Option 9: Prohibit use of small mesh nets in areas of high conflict determined by the MFC.

- + Temporarily or permanently reduces conflict in restricted areas
- + Abundance of some marine species may increase in these areas if loss of harvest is not completely recouped by other participants and gears.
- +/- Limits the discretionary ability of the DMF director to modify restrictions via proclamation
- Potentially reduces profitability of gill net trips around restricted areas
- Could add complexity to implementing FMPs

Option 10: No set time requirements from December 1st – April 30th. (Option added by MFC)

- + Allows access to areas during times of the year when effort from other fisheries and user groups may be low translating into lower probability of conflict
- +/- Changes to per-trip cash flows due to potential changes in trip efficiency
- Would remove midnight on Friday to midnight on Sunday restriction for Joint Coastal Waters potentially increasing the incidence of conflict between gill nets and other gears and users

Mesh size limits

Option 1: status quo – current rule prohibits use of gill nets with mesh size less than 2.5 ISM

- + No rule change required
- + DMF director has proclamation authority under current rules to modify mesh size restrictions, if needed
- + No need for fishermen to modify current gear
- + No additional regulation for Marine Patrol to enforce
- Two and one-half inches may select for sub-legal sizes in some fisheries and promote excessive discards. However, the incidence of sub-legal/unmarketable catch is low and variable across species so impacts from mesh size are difficult to quantify and may be negligible.

Option 2: Increase the minimum mesh size to 2.625 inch ISM

- + Potentially reduces incidence of regulatory discards in some fisheries by modifying selectivity of gill nets
- + Few trips utilize mesh sizes less than three inches.
- Catches of some marketable species may decline due to changes in gill net selectivity; i.e., kingfishes, spot, and Atlantic croaker.
- Some fishermen may need to modify gear/vessel to comply.

Option 3: Increase the minimum mesh size to 2.75 inch ISM

- + Potentially reduces incidence of regulatory discards in some fisheries by modifying selectivity of gill nets
- + Few trips utilize mesh sizes less than three inches.
- Catches of some marketable species may decline due to changes in gill net selectivity; i.e., kingfishes, spot, and Atlantic croaker.
- Some fishermen may need to modify gear/vessel to comply.

Option 4: Increase the minimum mesh size to 3.0 inch ISM

- + Potentially reduces incidence of regulatory discards in some fisheries by modifying selectivity of gill nets
- + Few trips utilize mesh sizes less than three inches.
- Catches of some marketable species may decline due to changes in gill net selectivity; i.e., kingfishes, spot, and Atlantic croaker.
- Some fishermen may need to modify gear/vessel to comply.

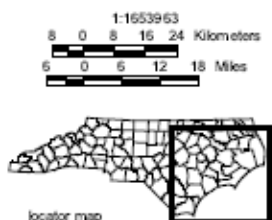
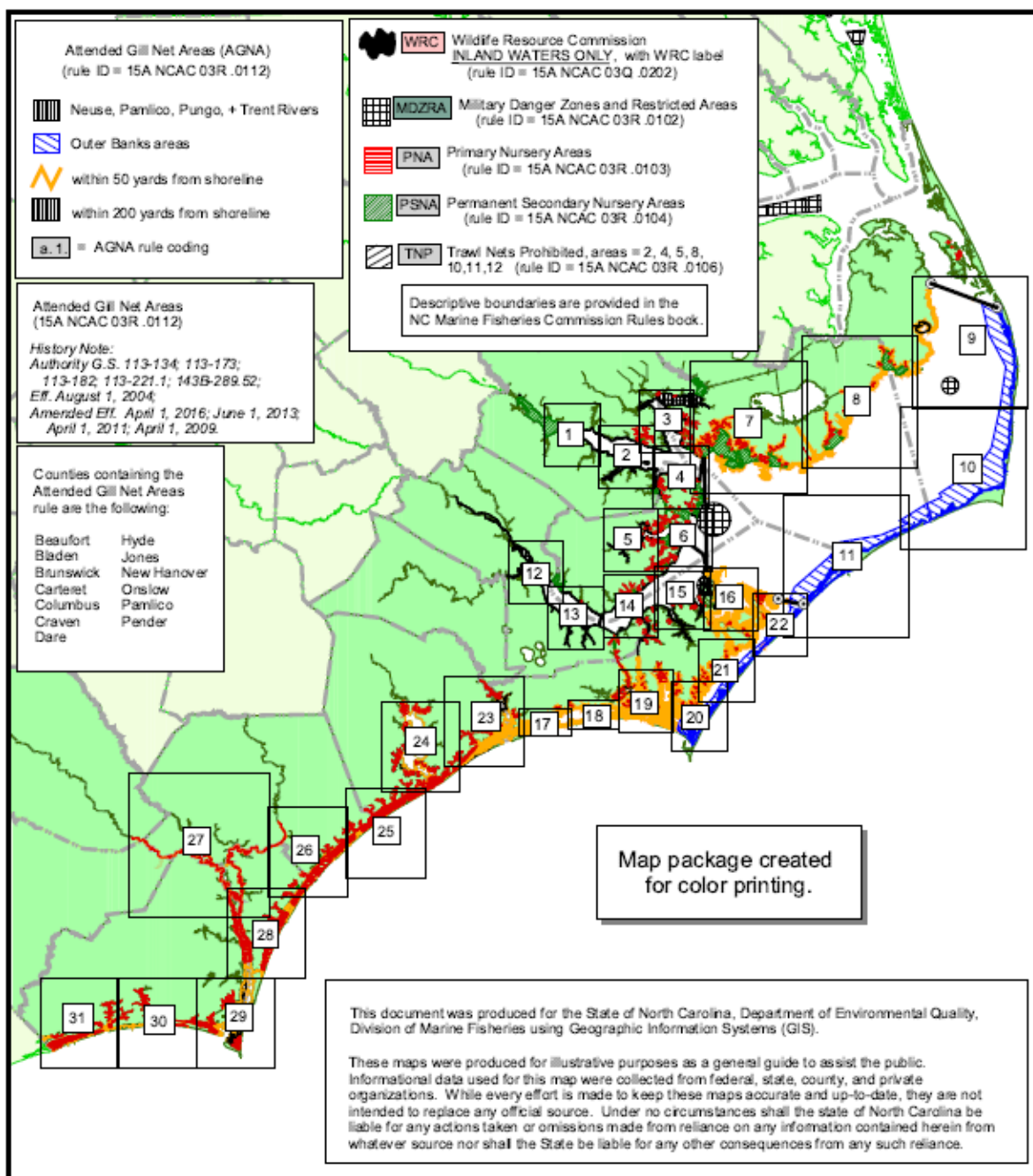
VII. SUMMARY FINDINGS AND RECOMENDATIONS

The above information summarizes the available data on the small mesh gill net fishery in North Carolina and provides an initial commentary on actions that the MFC may consider during deliberations of potential changes to the management of small mesh gill nets. The DMF's Gill Net Work Group requests that the MFC provide substantive feedback on the identified issues and potential management actions for further development and refinement. The Work Group acknowledges that the list of issues identified is not exhaustive and that other issues may arise through discussion by the MFC. Issues and actions are presented as potential rule changes but the MFC can elect to pursue implementation of preferred actions through proclamation or some combination with rule changes. It may be prudent to consider directing the implementation of some actions through the DMF director's proclamation authority while rule changes are developed to provide an opportunity to inform the effectiveness of the changes to the management strategy. Additionally, commercial fishermen with knowledge of the small mesh gill net fishery provided valuable input on the feasibility and practicality of some of the actions proposed in this document. However, public comment on the proposed actions has not been formally requested and the MFC may consider soliciting input from its advisory committees to aid in the MFC's deliberations.

VIII. REFERENCES CITED

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Appendix



Attended Gill Net Areas for Gill Nets Less Than 5 Inches Mesh Length

(Index Map)
Map A



Map Datum: North American Datum 1983
(NAD83)

Map Projection: North Carolina State Plane
(NC State Plane)

Map Date: April 2016

Figure A1. Map of attended areas for small mesh gill nets (<5 inch ISM) <http://portal.ncdenr.org/web/mf/attended-gill-net-areas>