Inlet Corridors as a Management Tool to Increase Southern Flounder Escapement

August 7, 2020

I. ISSUE

Consider the development of inlet corridors to provide additional protection to mature female southern flounder during their escapement or migration out of coastal inlets to oceanic spawning areas.

II. ORIGINATION

The feasibility of establishing inlet corridors as a management tool is being explored based on comments by the Southern Flounder Advisory Committee at their October 2019 meeting and comments provided during the public scoping period.

III. BACKGROUND

Southern flounder (*Paralichthys lethostigma*) are an estuarine dependent species, spending most of their early life history as juveniles and sub-adults in the estuary before exiting the estuary at maturity and migrating to the ocean to spawn offshore (see *Description of the Stock*). It is during these fall estuarine migrations that southern flounder are most vulnerable to capture. Inlets, such as those common to North Carolina's estuaries, create a natural bottleneck which southern flounder must navigate to escape the final area of internal fishing pressure before entering the ocean to migrate offshore. The implementation of inlet corridors has been suggested as a possible management tool that, in theory, could alleviate fishing mortality during this presumed period of increased vulnerability. This issue paper will explore available data and possible strategies regarding the use of inlet corridors for southern flounder management. The questions to be explored are:

1) Do data exist that provide insight into which coastal inlets (i.e., corridors) are critical to southern flounder spawning migrations? Is there an inlet-specific seasonality to the migrations through these inlets to the ocean?
2) Do data indicate that inlets are truly acting as a bottleneck where elevated fishing mortality is occurring due to increased vulnerability to capture?
3) What are the potential gear interactions that may occur in coastal inlets and what potential restrictions should be considered for these gears? What will be the impact to other fisheries (species) that are pursued by these same gears?
4) Can any savings from inlet corridors be quantified or do the data indicate this will be a non-quantifiable precautionary measure?

IV. AUTHORITY

North Carolina General Statutes
G.S. 113-134 RULES
G.S. 113-182 REGULATION OF FISHING AND FISHERIES
G.S. 113-182.1 FISHERY MANAGEMENT PLANS
G.S. 143B-289.52 MARINE FISHERIES COMMISSION – POWERS AND DUTIES
North Carolina Marine Fisheries Commission Rules
15A NCAC 03H .0103 PROCLAMATIONS, GENERAL
15A NCAC 03M .0503 FLOUNDER

V. DISCUSSION

1) Do data exist that provide insight into which coastal inlets (i.e., corridors) are critical to southern flounder spawning migrations? Is there an inlet-specific seasonality to the migrations through these inlets to the ocean?

Removals from harvest and discards of southern flounder, regardless of sector, are comprised primarily of juvenile southern flounder residing in the estuary (Flowers et al. 2019). Southern flounder tend to remain within the estuaries until the onset of maturity. As fish of both sexes begin to mature (approximately age-2), they undergo a fall migration. Eventually, the migration will traverse through one of several coastal inlets and into oceanic waters where spawning occurs.

What is known about southern flounder movements and maturity is based on multiple studies that include tagging, otolith microchemistry, and maturity data, along with commercial and recreational catch information. Movement of juveniles within the estuary has been shown to be limited and often somewhat localized (Scharf et al. 2015). Data indicate that southern flounder overwinter as juveniles in the estuary (Monaghan 1996; Taylor et al. 2008; Craig et al. 2015). Southern flounder tend to reside in the estuary until age-2 or the onset of maturity (Rulifson et al. 2009), at which point migration offshore occurs from September through November of primarily age-2 and older fish (Monaghan and Watterson 2001; Loeffler 2018). Movement begins in a southerly direction within the Albemarle and Pamlico sound estuarine systems, with fish eventually exiting the estuaries through coastal inlets (Craig et al. 2015). After fish migrate into the ocean, fish tend to continue moving in a southern direction. Fish leaving North Carolina estuaries in the fall have been recaptured as far as South Carolina, Georgia, and Florida (Monaghan 1992; NCDMF unpublished data). Craig et al. (2015) found that all southern flounder recaptures that made large scale movements in the fall (>50 km) were recaptured in systems to the south of the original tagging location.

The timing of emigration through inlet corridors has been explored by acoustic telemetry work (Scharf et al. 2015; Scheffel et al. 2020). These studies used acoustic tags to investigate seasonal movement patterns and determine the rate and seasonality of movements from the estuary to the ocean (emigration) in New River, North Carolina. In this system, southern flounder emigration peaked between October and November (Figure 1) and emigration patterns were similar across years (Scheffel et al. 2020). This period also corresponds to the seasonal peak in statewide landings seen in the commercial fishery each year with increased movement and landings occur in the upper estuary during September transitioning to the lower estuary into October and November. Existing data from tagging and commercial landings would indicate that this general window of time (October through November) is likely the primary period of emigration for southern flounder, not just in New River, but throughout coastal North Carolina.

Current datasets do not allow any quantification of which inlets are most critical or most commonly used for southern flounder immigration. Tagging data indicate that Oregon Inlet is less frequently used than the more numerous inlets to the south (NCDMF unpublished data). As a result, inlets from Cape Hatteras southward are likely to be most critical for emigration by southern flounder, which is supported by available tagging data and the aforementioned studies. The timing of emigration is likely more defined and quantified than the specific corridors being used.

2) Do data indicate that inlets are truly acting as a bottleneck where elevated fishing mortality is occurring due to increased vulnerability to capture?

It is unknown if, and to what extent, southern flounder exploitation may be increased based on their emigration in the fall through coastal inlets. Harvest data specific to these locations would provide a good indicator to gauge whether coastal inlets serve as a bottleneck allowing for elevated exploitation. Unfortunately, landings data for neither commercial or recreational sectors can be pared down to include only harvest or releases from inlets. Activities in and around coastal inlets include a variety of means used to capture southern flounder. Recreational fishing for flounder species is very popular in coastal inlets. It occurs over many months, particularly from summer through early fall; however, flounder harvested include not just southern flounder, but also summer and Gulf flounder. Gigging, by both the recreational and commercial sectors, occurs in and around coastal inlets with fish targeted from summer through fall. While these more active and mobile gears effectively capture flounder in coastal inlets, the high energy habitat in many coastal inlets can be a limiting factor to the use of passive gears such as gill nets and pound nets. That is not to say that these gears are not used near coastal inlets, but just that the available areas suitable for fishing these gears in these high energy areas is more limited.

Tagging data specific to coastal inlets may offer another indicator to gauge whether coastal inlets are areas of increased exploitation for southern flounder. During a telemetry study conducted by Scharf et al. (2015) in New River, the inlet corridors were monitored for any telemetered southern flounder that emigrated from the estuarine system. In the study, it was noted that southern flounder exhibited two distinct behaviors. One behavior was described as a resident behavior where southern flounder were more sedentary with only limited movement within the estuary. This behavior occurred over a protracted time period. The second was a more sudden behavior where there was a brief but more extensive movement representing the onset of the spawning migration in the fall. This shift in behavior resulted in flounder leaving the system within a matter of days (Figure 2). This increased movement meant less time was spent by fish in the inlet corridor. Peak movement occurred between October 19th and November 16th, when 85% of the emigrations occurred. Tagged fish harvested in this study occurred primarily within the estuary, with movement through the inlet occurring over just a short time period.

A broader look at statewide tagging data could provide more insight into whether coastal inlets are acting as a bottleneck leading to increased harvest of southern flounder. Data are available from external tags placed on southern flounder by NCDMF from 2014 through 2019 (NCDMF unpublished data). In this study, tagging has occurred over a wide range of areas and across all months (Figure 3). Movements of southern flounder documented in this study are consistent with those described by Scharf et al. (2015). During this period, 299 recaptures have occurred for southern flounder where time at large has been at least 10 days (Figure 4). Of these recaptures, 270 (90%) were recaptured within the estuary, 25 (8%) were captured in the inlet corridor, and (<2%) were captured from the ocean. Inlet recaptures occurred from multiple gears and across sectors, with most taken by hook and line (n=10) followed by both recreational giggers (n=6) and commercial giggers (n=6). Inlet corridors were defined by placing two-mile perimeters around larger inlets (Oregon Inlet, Hatteras Inlet, Ocracoke Inlet and Barden Inlet) and one-mile or half mile perimeters around smaller southern inlets (Figure 4).

Available tagging data indicate that coastal inlets do not appear to be acting as a bottleneck serving as an area of increased exploitation of southern flounder. The primary source of fishing mortality on this species is occurring within the estuarine system.

3) What are the potential gear interactions that may occur in coastal inlets and what potential restrictions should be considered for these gears? What will be the impact to other fisheries (species) that are pursued by these same gears?

The southern flounder stock is subject to fishing mortality from the recreational and commercial sectors for much of the year, across a wide range of habitats from the upper estuaries to the inlets and oceans. Recreational harvest typically peaks in the summer months, while commercial harvest peaks in the fall. A likely reason for this discrepancy is that recreational anglers are mobile and typically fish their gear in an active fashion that is not dependent on fish movement to capture fish. The commercial sector, however, relies primarily on passive gear (gill nets and pound nets). These passive gears by nature, require southern flounder (or any fish species) to move in order to be captured. For this reason, the fall commercial fishery is directly linked to, and largely dependent on the fall migration of southern flounder. It is during this fall migration period of September through November that harvest peaks for these gears (NCDMF Trip Ticket Program). Scharf et al. (2015) observed some evidence for southern flounder movements and the rate of emigration coinciding with the passage of cold fronts in the fall. This is consistent with observed increases in catches reported by pound netters in other parts of the state after these types of fall weather events.

Recreational hook and line trips occurring in coastal inlets capture a diverse set of species. Anglers fishing with gear typically used to capture southern flounder will commonly encounter other species, and southern flounder will also be encountered when targeting other species. Summer flounder (*P. dentatus*), Gulf flounder (*P. albigutta*), red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), bluefish (*Pomatomus saltatrix*) and many other species are captured using similar tactics in coastal inlets. Closing inlet corridors to recreational fishing would be far reaching in its impact to these fisheries.

Gigging around coastal inlets is a commercial and recreational endeavor. Unlike hook and line fishing, gigging is more species specific, as fish are typically identified before they are gigged. For southern flounder, there is the added issue of their similarity in appearance to summer and Gulf flounder, which occur in these same areas. For this reason, it is not likely that gigging for flounder species would be feasible in inlet corridors if the intention of the regulation was to protect southern flounder.

Stationary gears such as flounder pound nets and gill nets have traditionally been fished in areas adjacent to inlets. All current flounder pound net sets are located from Core Sound and north to the Albemarle and Currituck sounds. As previously mentioned, flounder pound nets are somewhat limited in the immediate vicinity of coastal inlets. Flounder pound nets do, however, occur with regularity in areas adjacent to inlets as shallower habitat and lower energy conditions allow. These locations are productive fishing areas for southern flounder during the fall migration. Similarly, gill nets have traditionally been fished around coastal inlets, although much of the habitat in the high energy portion of the inlet is not conducive to setting anchored gill nets. It should be noted

corridors already exist that limit large mesh gill nets, crab pots and trawling in the vicinity of inlets. The large mesh gill net closures exist in inlet corridors because of restrictions maintained through the Incidental Take Permit (ITP) under Section 10(a)(1)(B) of the Endangered Species Act (ESA) of 1973 (Public Law 93-205) to "minimize, monitor, and mitigate" sea turtle interactions in the commercial anchored gill net fisheries. Inlet corridors to protect sea turtle ingress and egress through coastal inlets exist for Oregon Inlet, Hatteras Inlet and Ocracoke Inlet (Figure 4). These inlet closures are in effect from September 1 through December, which is inclusive of the period of the spawning migration for southern flounder. Additionally, the area around Barden Inlet has also been closed to large mesh anchored gill nets during each of the last two years (2018 and 2019). This closure was due to excessive interactions with green sea turtles in 2017, but it is not explicitly required by the ITP.

4) How will any savings from inlet corridors be quantified or does the data indicate this will be a non-quantifiable precautionary measure?

Implementing inlet corridors for southern flounder cannot be quantified in terms of reductions in catch or harvest. No data sources exist to estimate what proportion of the catch comes from these specific areas. Based on available results from tagging studies, it does not appear that inlets serve as an area of increased exploitation. Telemetry results indicate that southern flounder may limit their travel time in inlets, specifically during their fall migration period. Recapture data from traditional tags support this finding and show that most of the catch and exploitation on this species is occurring within the estuary and not in the inlet or ocean. Based on these findings, it is possible that even with inlet corridors, exploitation rates are not likely to be controlled without more quantifiable and effective management measures.

While inlet corridors do not offer a viable management alternative that provides a quantifiable measure to rebuild southern flounder stocks, inlet corridors do provide an important transition habitat for this species, linking the estuarine nursery habitat with the offshore spawning habitat. For further information on habitat use and the importance of habitat by life stage for this species see *Description of the Stocks* and *Ecosystem and Fishery Impacts*. Additionally, a comprehensive review of habitats important to southern flounder is further described in the North Carolina Coastal Habitat Protection Plan (CHPP) (NCDEQ 2016).

In summary, inlet corridors while providing an essential function in the life history of southern flounder, present specific challenges when considered as a management tool to reduce harvest. Specific inlets critical to southern flounder migration are not fully understood and additional research is currently underway through CRFL funding to investigate southern flounder migration patterns and spawning locations. With respect to impacts to other fisheries, inlet corridor closures by season, area or gear, would have negative impacts on other species captured in these locations for both the commercial and recreational fisheries. Any potential reductions in harvest resulting inlet corridors would be unquantifiable. Further, available data do not suggest that inlets currently serve as a bottleneck for increased harvest. In terms of the overfished status, the most prudent approach would be to remove the incentive to overharvest southern flounder through more quantifiable measures such as quota management or seasonal closures. Seasonal closures could effectively act in the same manner as inlet corridors if the closed seasons

correspond to periods of emigration related to spawning. Likewise, quota management would set harvest levels to end overfishing and rebuild depleted stocks.

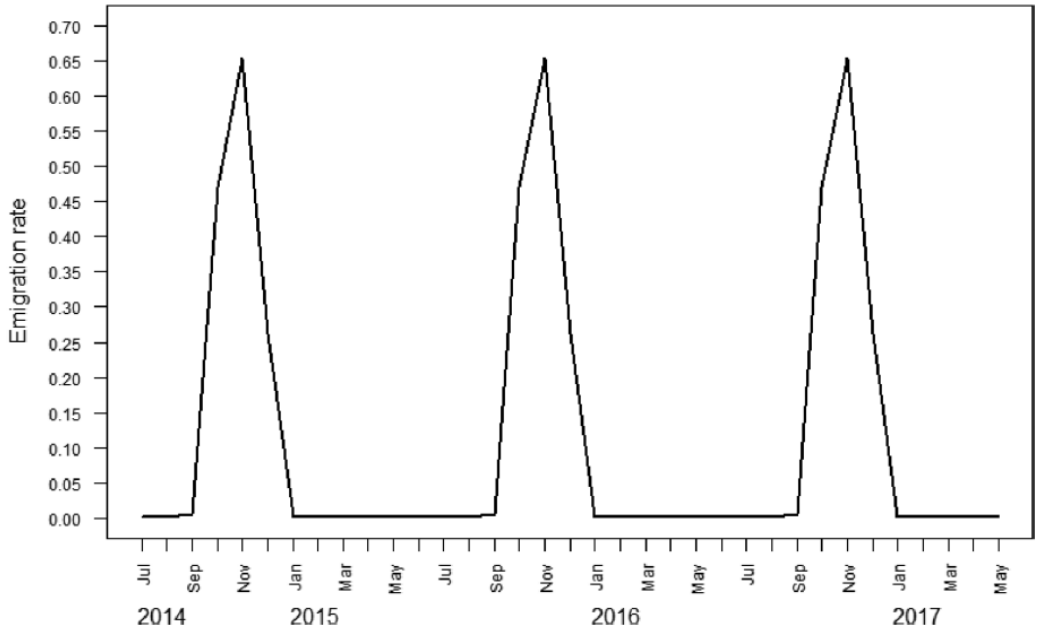

Figure 1. Estimates of instantaneous Emigration (E) for the New River estuary produced by a telemetry model. Annual E assumed to be equal across years (Source: Scheffel et al. 2020)

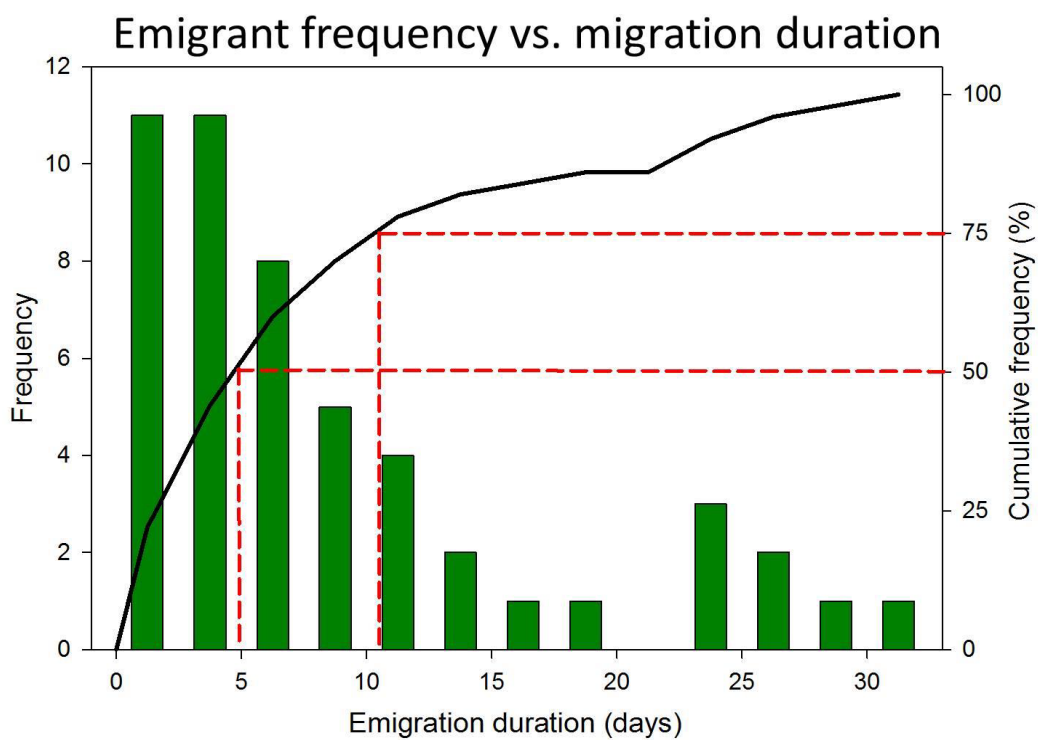

Figure 2. The number of days from the initiation of migratory behavior until southern flounder emigrated out of the New River estuary. The cumulative frequency distribution (solid black line) indicated that 50% of emigrants left the system within 5 days after initiation of migration behavior

(bottom dashed red line), while 75% of emigrants exited within about 10 days of first showing emigration behavior (top dashed red line) (Source: Scharf et al. 2015).

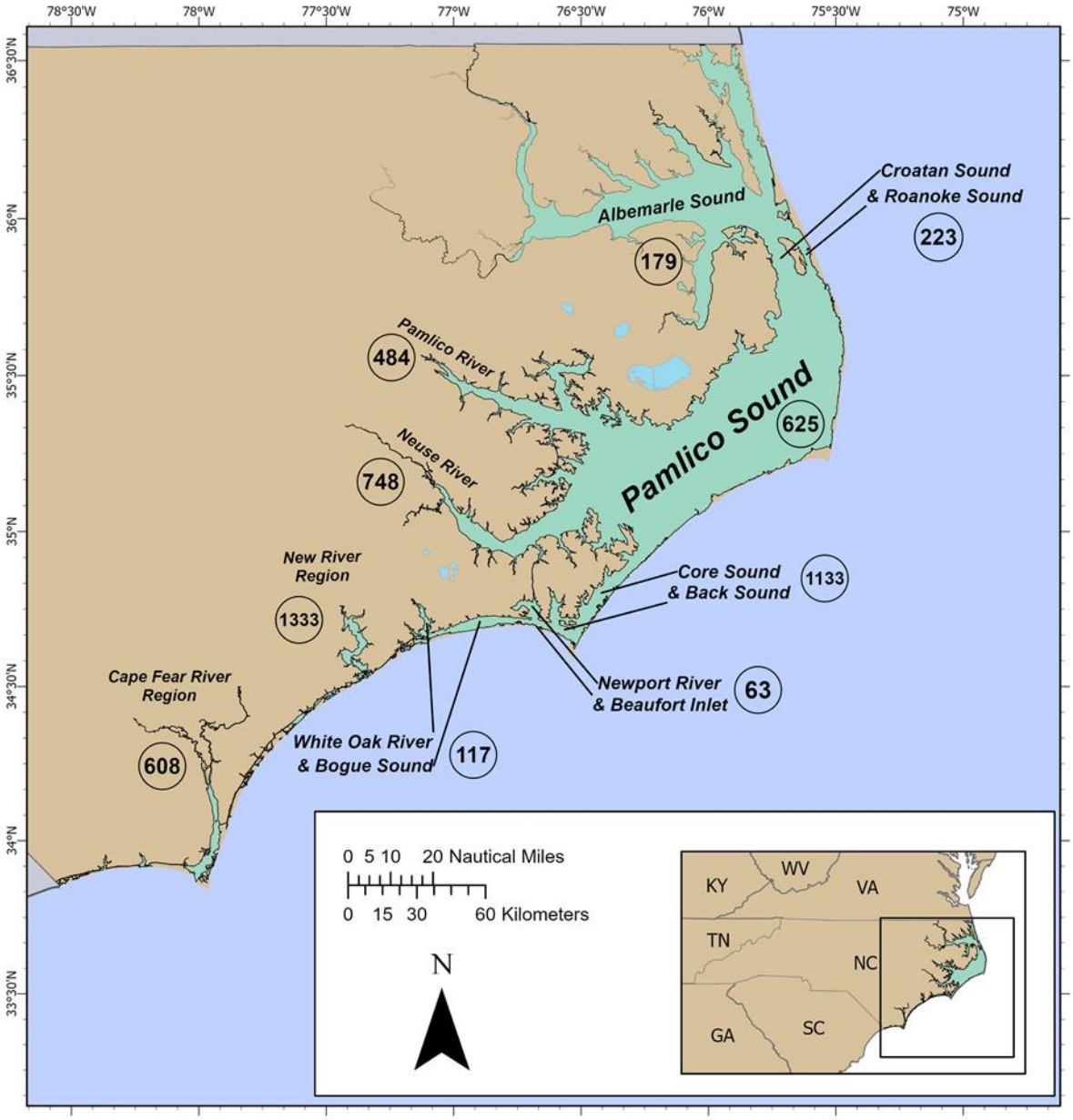

Figure 3. Tagging locations and number of southern flounder tagged in North Carolina estuarine waters from 2014 through 2019.

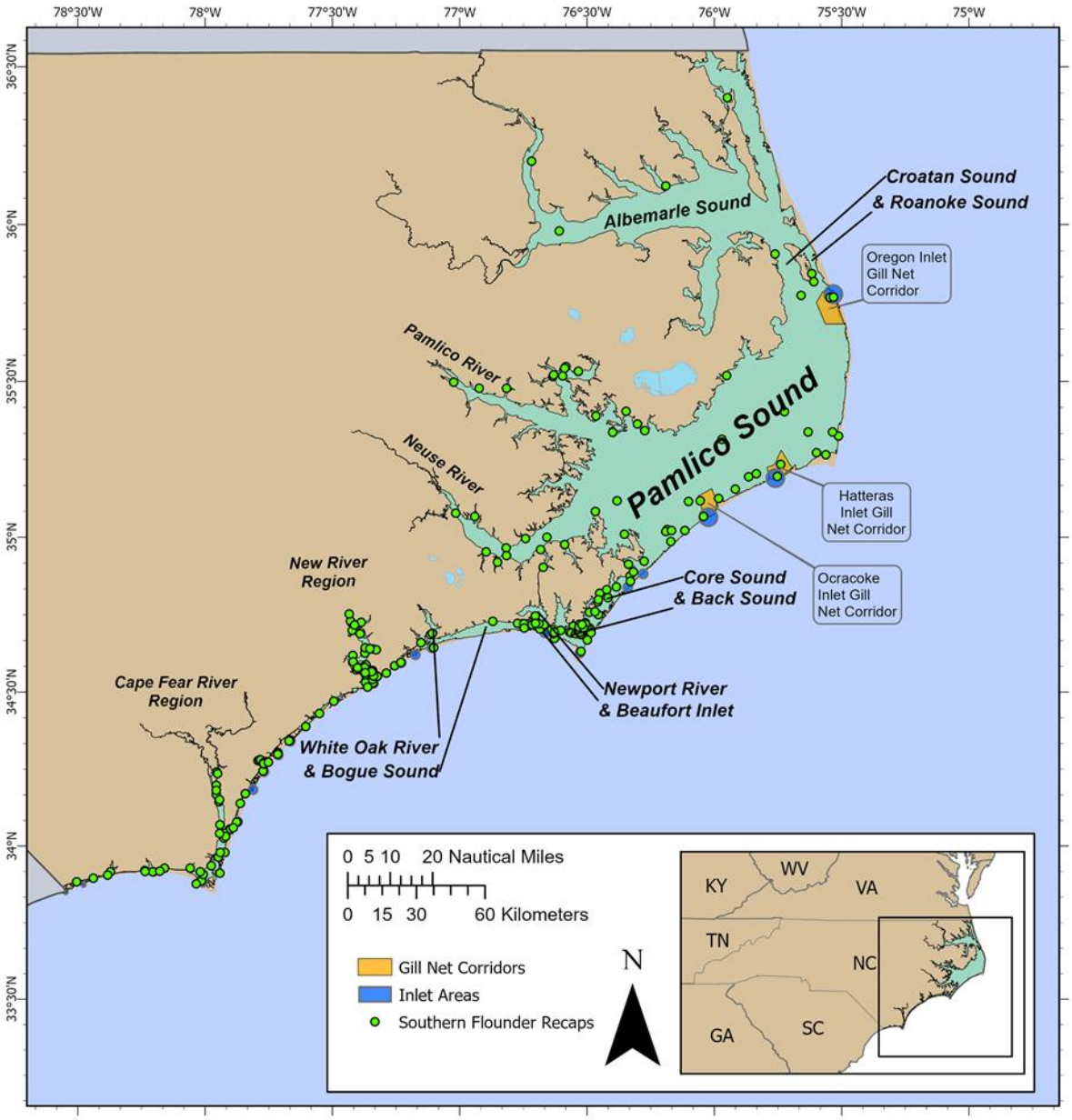

Figure 4. Tagging locations and number of southern flounder tagged in North Carolina estuarine waters from 2014 to 2019.

VI. PROPOSED RULE(S)

None

VII. PROPOSED MANAGEMENT OPTIONS

(+ potential positive impact of action)
(- potential negative impact of action)

Option 1: Status Quo, do not establish inlet corridors for southern flounder during spawning migrations.

+ No negative impact on current fishing practices (commercial and recreational)
+ Inlet corridors do not appear to result in increased fishing pressure for southern flounder
- Corridors would afford additional, albeit unquantifiable protection for stock
- Corridors would indirectly provide additional protection for other species

Option 2: Implement inlet corridors during the spawning migration for North Carolina coastal inlets.

+ Additional protection for southern flounder
+ Additional indirect impact and protection of other species
- Unquantifiable, would not contribute toward needed harvest reductions
- Negative impact on harvest of other species in these areas due to removal of gears that interact with southern flounder
- May simply shift fishing pressure to areas adjacent to corridor
- Contribution in magnitude of southern flounder and exact timing of migration by inlet is unknown

VIII. RECOMMENDATION

Based on available data and potential impacts to fisheries, the Division does not support using inlet corridors as a management tool to increase southern flounder escapement.

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Date, Revised Again **[Remember to include this information.]**

DRAFT

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