BLUE CRAB FMP AMENDMENT 3 -DIAMONDBACK TERRAPIN MANAGEMENT AREAS

DIAMONDBACK TERRAPIN MANAGEMENT AREA MEMO

DIAMONDBACK TERRAPIN MANAGEMENT AREA MAP

DIAMONDBACK TERRAPIN MANAGEMENT AREA INFORMTAION PAPER

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DIAMONDBACK TERRAPIN MANAGEMENT AREA PUBLIC COMMENT LETTERS

ROY COOPER
Governor

MICHAEL S. REGAN
Secretary

STEPHEN W. MURPHEY
Director

April 29, 2020

MEMORANDUM

TO: N.C. Marine Fisheries Commission

FROM: Corrin L. Flora, Blue Crab Fishery Management Plan Co-Lead, and Joseph J. Facendola, Diamondback Terrapin Management Area Issue Paper Author, Fisheries Management Section

SUBJECT: Recommendations for the Designation of Diamondback Terrapin Management Areas in Masonboro Sound and the Lower Cape Fear River

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Issue

The Blue Crab Fishery Management Plan (FMP) Amendment 3 established a framework the division uses to propose Diamondback Terrapin Management Areas (DTMAs). In these areas, all crab pots fished would be required to use DMF-approved terrapin excluder devices or modified pot designs. The excluder requirement would be implemented by proclamation once the DTMAs are approved by the MFC. Currently, two proposed DTMAs are recommended for consideration by the MFC.

Overview

The MFC adopted the Blue Crab FMP Amendment 2 in November 2013, recognizing diamondback terrapins as a resource in need of protection from bycatch in the blue crab pot fishery. As a proactive conservation measure, MFC Rule 15A NCAC 03L .0204(b) granted the DMF Director proclamation authority to require terrapin excluder devices to be used in crab pots. However, prior to any use of this authority, the MFC must approve criteria for the use of excluder devices. At their February 2020 meeting the MFC adopted the North Carolina Blue Crab FMP Amendment 3, including the use criteria necessary for issuance of proclamations requiring terrapin excluder devices and implementing a framework which the DMF would use to propose DTMAs.

Using the steps established in the adopted framework, the division proposes two DTMAs, the Masonboro Island DTMA and the Bald Head Island DTMA. These proposed DTMAs have been identified as containing populations of diamondback terrapins and meeting the depth and distance from shore criteria where diamondback terrapins are vulnerable as bycatch. If these areas are designated as DTMA's, all crab pots fished within the DTMAs from March 1 through October 31, would be required to use a DMF-approved terrapin excluder devices or modified pot design.

The proposed DTMAs contain lands designated as N.C. Coastal Reserves and National Estuarine Research Reserves. These areas are terrapin research sites with documented terrapin abundance and instances of pot captures. Additionally, both areas have been nominated by the MFC as Strategic Habitat Areas. The bycatch of terrapins may put the currently allowed traditional use of crab potting in direct conflict with the stated principal purposes of the Coastal Reserves. Since landings data are

collected by trip ticket area, and not specific geographic location of catch, it is not possible to determine the impact on landings from the specific areas proposed as DTMAs. We have, however, calculated the percentage of the trip ticket area that is comprised by the proposed DTMA's, and examined the total trip ticket area data in reference to those to examine the possible impact on the fishery, a full discussion of which can be found in the issue paper (See link below).

A public comment period was open for 30 days and all submitted comments can be found in your briefing materials (See link below).

Findings

- Implements a MFC selected management strategy, which is a proactive conservation measure for a state and federal listed "Species of Concern".
- Removes conflict between commercial crab potting and research or educational activities occurring at National Estuarine Research Reserve sites.
- Addresses issue causing negative ratings by sustainable seafood consumer advisory groups due to the bycatch of diamondback terrapins in the N.C. blue crab fishery.
- Only impacts fishermen (commercial and recreational) who crab pot within DTMAs.
- Creates additional cost and regulatory burden to modify crab pots for compliance.
- Has economic impact from potential reduction in crab pot catch within DTMAs.

Action Needed

A vote on the designation of the proposed Masonboro and Bald Head Island DTMAs to implement selected management measures for the reduction of diamondback terrapin bycatch in the blue crab pot fishery in accordance with the Blue Crab Fishery Management Plan Amendments 2 and 3.

Recommendations

- The division recommends establishing the areas described in the issue paper as the Masonboro Island and Bald Head Island DTMAs by proclamation.
- The Southern Regional Advisory Committee concurs with the division's recommendation above, as well as recommending:
    - To explore options for funding to offset cost of excluder devices to current fishermen.
    - To explore options for research on approved designs and additional designs.
- Following a review of the management options implemented by the approval of the Blue Crab FMP Amendment 3 and DTMA public comment, the division recommends a modification of the western border of the proposed Bald Head Island DTMA so it meets the boundary of the newly established Cape Fear River Inlet Crab Spawning Sanctuary. The division views this as a modification intended to simplify compliance by stakeholders and to improve enforceability.

For more information, please refer to the following documents:

Proposed Modification of Bald Head Island Diamondback Terrapin Management Area (DTMA) Boundary (Map)

Issue Paper: Designation of Diamondback Terrapin Management Areas in Masonboro Sound and the Lower Cape Fear River

Diamondback Terrapin Management Area Public Comment

Proposed Modification of Bald Head Island Diamondback Terrapin Management Area (DTMA) Boundary

Map of proposed Bald Head Island DTMA (white) and the recommended boundary modification (yellow) developed in accordance with the criteria established in the Blue Crab FMP Amendment 3. The modification is recommended by the division as an administrative modification intended to reduce public confusion and simplify compliance with the newly established Cape Fear River Inlet Spawning Sanctuary (red) and the proposed Bald Head Island DTMA.

DESIGNATION OF DIAMONDBACK TERRAPIN MANAGEMENT AREAS IN MASONBORO SOUND AND THE LOWER CAPE FEAR RIVER

April 15, 2020

I. ISSUE

Designation of Diamondback Terrapin Management Areas in Masonboro Sound and the lower Cape Fear River.

II. ORIGINATION

This issue is being brought forth by the division following the criteria approved by the North Carolina Marine Fisheries Commission in Amendment 3 to the N.C. Blue Crab Fishery Management Plan.

III. BACKGROUND

Diamondback terrapins are susceptible to substantial population declines or even localized extirpations through incidental bycatch in crab pots and removal of a relatively low number of individuals from the population annually (Dorcas et al. 2007). Diamondback terrapins were moved from "Near Threatened" to the greater risk category "Vulnerable" on the Red List of Threatened Species by the International Union for Conservation of Nature (IUCN) after their most recent assessment in 2018. Ongoing range-wide population declines due to accidental mortality as bycatch in commercial blue crab fisheries, and coastal habitat impacts due to development were cited as primary justifications for moving this species into the increased risk category. The North Carolina Wildlife Resources Commission (NCWRC) lists diamondback terrapin as a North Carolina species of "Special Concern" statewide and as a Federal "Species of Concern" in Dare, Pamlico and Carteret counties in NC. The status of "Special Concern" or "Species of Concern" does not specifically provide any special protection under the federal Endangered Species Act, however the federal status may be upgraded to "Threatened" or "Endangered" if natural or human-made factors are affecting its continued existence, or there is an inadequacy of existing regulatory mechanisms in place (e.g. unmitigated mortality from bycatch in crab pots). In February 2011, the NCWRC Nongame Wildlife Advisory Committee received a report from the Scientific Council on Amphibians and Reptiles which recommended the diamondback terrapin be listed as "Threatened" (Dorcas et al. 2011). This report, citing a large body of evidence from numerous studies, concluded incidental bycatch in crab pots is the most serious threat to diamondback terrapins in North Carolina (Seigel and Gibbons 1995; Roosenburg et al.1997; Butler et al. 2006; Dorcas et al. 2007). Seafood Watch, one of the best-known seafood consumer awareness programs, gives the North Carolina blue crab fishery their lowest rating of "Avoid", stating that serious concerns about the lack of implementation of any regulations to protect diamondback terrapins from bycatch in crab pots are the primary reason for this poor rating.

The North Carolina Marine Fisheries Commission (NCMFC) adopted Amendment 2 of the N.C. Blue Crab Fishery Management Plan (FMP) in November 2013. In this plan, the NCMFC recognized diamondback terrapins as a wildlife resource in need of protection from crab pot fishing

activities under its jurisdiction and sought to proactively implement conservation measures to prevent localized diamondback terrapin depletions or extirpations through incidental bycatch from current or future activity in the blue crab fishery. To implement this selected management strategy, the NCMFC granted proclamation authority for the director of the North Carolina Division of Marine Fisheries (NCDMF) to require terrapin excluder devices to be used in crab pots. This proclamation authority was placed in NCMFC Rule 15A NCAC 03L .0204(b), which became effective April 1, 2014. This rule states the Fisheries Director may, by proclamation, require the use of terrapin excluder devices in each funnel entrance in crab pots and impose the following restrictions concerning terrapin excluder devices: (1) specify areas; (2) specify time periods; and (3) specify means and methods. However, prior to this proclamation authority being used the commission first had to approve use criteria. In February 2020 the NCMFC adopted Amendment 3 of the North Carolina Blue Crab FMP, in which they approved the issuance criteria necessary for the director to use this proclamation authority. Amendment 3 implemented a series of steps which the NCDMF will use to propose "Diamondback Terrapin Management Areas" (DTMAs) where all crab pots fished within would be required to use a NCDMF approved terrapin excluder device or modified pot design.

Proposed DTMAs must have documented populations of diamondback terrapins through capture in NCDMF sampling programs, North Carolina Natural Heritage Program (NCNHP) datasets, and/or through academic research, as well as contain significant waterbody area in which diamondback terrapins are susceptible to incidental capture in crab pots (water less than 3 m (9.8 ft) deep as well as less than 250 m (820.2 ft) from shore). The full criteria and framework which identifies and creates a DTMA is described in the issue paper: Establish a Framework to Implement the Use of Terrapin Excluder Devices in Crab Pots, in Amendment 3 to the North Carolina Blue Crab FMP. In an approved DTMA, all crab pots, including peeler pots, fished between March 1 and October 31 are required to have approved terrapin excluder devices constructed out of heavy plastic or wire (no smaller than 10-gauge) properly secured in each funnel opening. Excluder devices would not be required to be used if the maximum inner opening dimensions of all funnel entrances did not exceed those of an approved excluder device (a narrow funnel design), and the funnels were rigid enough to maintain these dimensions.

Diamondback terrapins have been observed to have relatively small home ranges in North Carolina. In Core Sound, average home range size from tagged diamondback terrapins was calculated to be 3.05 km^2 (1.18 mi^2), with a maximum observed home range of 7.41 km^2 (2.86 mi^2) (Spivey 1998). To be effective the size of a DTMA should at a minimum allow for the protection of the entire possible home range size of the target local diamondback terrapin population and may include adjacent unoccupied suitable habitat to allow for population recovery.

IV. AUTHORITY

North Carolina General Statute 113-134 – Rules
North Carolina General Statute 113-182 – Regulation of fishing and fisheries
North Carolina General Statute 113-182.1 – Fishery Management Plans
North Carolina General Statute 113-221.1 – Proclamations; emergency review
North Carolina General Statute 143B-289.52 – Marine Fisheries Commission – powers and duties
NCMFC Rule 15A NCAC 03H .0103 – Proclamations, General

NCMFC Rule 15A NCAC 03J .0301 – Pots
NCMFC Rule 15A NCAC 03L .0201 – Crab Harvest Restrictions
NCMFC Rule 15A NCAC 03L .0204 – Crab Pots

V. DISCUSSION

The areas behind Masonboro Island and in the lower Cape Fear River behind Bald Head Island have been identified as containing populations of diamondback terrapins using NCDMF and NCNHP data sets, as well as meeting the depth and distance from shore criteria which would identify them as potential areas for diamondback terrapin interactions with crab pots (Figure 1). Both areas have also served as study sites for diamondback terrapin research on abundance as well as documenting diamondback terrapins caught in crab pots (Grant 1997; Thorpe et al. 2005; Thorpe and Likos 2008; Southwood et al. 2009; Alford 2010; Southwood Williard and Harden 2010; Harden and Southwood Williard 2012; Chavez and Southwood Williard 2017; Munden 2018).

Summary of Diamondback Terrapin Research Documenting Presence and Interaction with Crab Pots:

Grant (1997) identified the marshes behind Masonboro Island as an area with both a population of diamondback terrapins and an active commercial blue crab pot fishery. Diamondback terrapins were documented and capture in crab pots was observed. Terrapin excluder devices were tested and opening heights of 4 cm (1.6 in) resulted in 100% exclusion of diamondback terrapins compared to 5 cm (2 in) height terrapin excluder devices which still allowed diamondback terrapin capture in crab pots. Both terrapin excluder device dimensions resulted in reductions in blue crab catch.

Thorpe et al. (2005) captured diamondback terrapins in crab pots fished in a typical manner by a commercial fisherman set in a location in the lower Cape Fear River near Bald Head Island, NC during a crab pot bycatch study. It was commented that the rate of diamondback terrapin capture suggests a high potential for bycatch.

Thorpe and Likos (2008) evaluated terrapin excluder devices in commercial blue crab pots in the lower Cape Fear River near Bald Head Island, NC. One diamondback terrapin was captured in a crab pot using a 5 x 12 cm (2 x 4.7 inches) excluder. Further assessment was recommended based on terrapin size and range in NC. Additionally, recreational and recreational commercial gear license crab pots were observed tied to piers and set close to shore in creeks in areas which would likely have diamondback terrapins.

Southwood et al. (2009) used radio telemetry to document diamondback terrapin distribution and habitat use in the lower Cape Fear River and near Masonboro Island. Diamondback terrapins were documented in these areas, and when found swimming they were typically in shallow water less than 3 m (9.8 ft). Both alive and dead diamondback terrapins were observed entrapped in a crab pot which was exposed during low tide. It was suggested that placing crab pots in deeper water and further from the marsh edge would help reduce diamondback terrapin bycatch.

Alford (2010) used tall crab pots (which prevented bycatch mortality) to capture diamondback terrapins and monitor their population between May and October in the areas behind Masonboro Island. Diamondback terrapins were captured at the highest frequency in May, and 65% of all captured diamondback terrapins were male. As males were more likely to be captured in crab pots, due to their smaller size, it was suggested there was the potential to cause a skewed sex ratio in the population due to bycatch mortality.

Southwood Williard and Harden (2010) used a postcard survey to investigate potential interactions between blue crab fisheries and diamondback terrapins. Results of this survey were incorporated into the NCNHP dataset, which include occurrences near Bald Head Island and behind Masonboro Island.

Harden and Southwood Williard (2012) evaluated the seasonal bycatch risk of diamondback terrapins in crab pots. Diamondback terrapins were captured and monitored by radio telemetry behind Masonboro and Figure Eight Islands, New Hanover Co., NC. Diamondback terrapins were observed to be active and out of dormancy between April 1 and September 30. Crab pots were documented in these areas during the diamondback terrapin active season and were found to typically be located between 15 and 30 m (49 and 98 ft) from the marsh edge and in water ranging from 0 to 2.8 m (0 to 9.8 ft) deep at low tide. Between June 2008 and May 2009, four of the 29 monitored diamondback terrapins were captured as bycatch in crab pots. Results indicate crab pots and diamondback terrapins co-occur with a patchy distribution, resulting in a greater than expected potential for interaction than if both were uniformly distributed. In coastal New Hanover County, NC, the maximum straight-line travel distance of radio tagged diamondback terrapins observed was 1.20 km (0.75 mi) for individuals captured in Masonboro Sound, and 1.05 km (0.65 mi) for Figure 8 Island marshes

Chavez and Southwood Williard (2017) assessed the impact of two terrapin excluder device sizes, 5.1 x 15.2 cm, and 3.8 x 15.2 cm (2 x 6 in and 1.5 x 6 in), in crab pots on blue crab catch at sites in Masonboro and Bogue sounds, NC. Areas behind Masonboro Island had the highest rates of diamondback terrapin capture in crab pots. It was concluded the larger size terrapin excluder device allowed male diamondback terrapins to enter traps, while the smaller size would have prevented their capture. Neither terrapin excluder device has a statistically significant impact on blue crab size or catch. However, the smaller excluder did show a non-significant downward trend.

Munden (2018) examined the population change of diamondback terrapins around Masonboro Island between 2009 and 2017, along with numbers of crab pots fished in this area. Diamondback terrapin head count and crab pot survey data collected as part of a fixed kayak route citizen science project during this period were analyzed. Mean number of diamondback terrapins observed per kilometer in 2017 decreased to a low of 0.016 from a high of 0.938 in 2014, while the mean number of crab pots observed per kilometer increased to 2.435 in 2017 from 0.804 in 2014.

Existing Ecological Areas:

Both Masonboro Island and the region in the lower Cape Fear River north of Bald Head Island are areas that are comprised of lands designated as North Carolina Natural Heritage Natural Areas (hereinafter referred to as Natural Areas) as well as designated National Estuarine Research Reserves (NERRs) (Figure 2). Natural Areas are designated by the North Carolina Division of

Parks and Recreation to protect areas sensitive to human activities and preserve and protect areas of scientific, aesthetic, or ecological value. The NERR system is a network of protected areas across the United States which protects costal and estuarine habitats for long-term research, education, and coastal conservation. The overarching goal of the national NERR system is to provide a foundation for effective coastal management through site research. Masonboro Island Reserve contains the largest undisturbed barrier island in the southern part of the North Carolina coast, and is considered an intact barrier island and estuarine ecosystem. Zeke's Island Reserve contains a complex of salt marshes, tidal flats, and barrier islands. The rules governing the North Carolina Coastal Reserves provide a provision to accommodate traditional activities, such as commercial fishing, as long as this activity does not disturb the Reserve environment and is compatible with any research and educational activities taking place there (See Appendix A for relevant reserve rules). The site manager for both Reserve locations has expressed a concern for declining diamondback terrapin head count numbers coinciding with increased crab pot numbers observed in the annual citizen science fixed route kayak survey, and has provided example results of this project (See Appendix B). This decline in diamondback terrapin populations within the Masonboro NERR have also been quantified by academic research in an analysis by Munden (2018). Negative impacts from crab pot mortality and low potential rates of recolonization may prevent maintaining ongoing populations of diamondback terrapins in refuges or reserves unless diamondback terrapin loss through bycatch is minimized (Lovich et al. 2018). A significant reduction or extirpation of the diamondback terrapin population within the Coastal Reserve sites caused by incidental mortality in the blue crab commercial fishery may put the currently allowed traditional use of commercial crab fishing in direct conflict with both research and educational activities occurring on site. Causing this activity to potentially be considered incompatible with the stated principal purposes of the North Carolina Coastal Reserves.

The areas encompassing both Masonboro Island and the lower Cape Fear River north of Bald Head Island have also been nominated as Strategic Habitat Areas (SHAs) by the NCMFC (Figure 3). SHAs represent priority locations for protection or restoration due to their exceptional ecological functions or areas that are particularly at-risk due to imminent threats to their ability to support coastal fisheries. The large areas in Masonboro Sound and the Cape Fear River were selected due to their biodiversity and high quality of habitats and fishery species. These SHAs also overlap with lands that are already managed for conservation, and were corroborated with biological data, ecological designations, and specific knowledge of the area

Proposed Management Areas:

Two Diamondback Terrapin Management Areas (DTMAs) are proposed, the Masonboro Island DTMA and the Bald Head Island DTMA (Figure 4). The proposed Masonboro Island DTMA lies entirely within, and shares nearly the entire boundary with, the Masonboro Island Estuarine Research Reserve and Natural Area. This area is also naturally bounded on the east by Masonboro Island, and on the west by the Intracoastal Waterway (ICW). The proposed Bald Head Island DTMA is comprised of Zeke's Island Estuarine Research Reserve in the northern portion of the management area and the Bald Head Island State Natural Area as the southern portion. This area is also naturally bounded by a barrier island to the east, and Bald Head island to the south. The western boundary of this management area follows the "Wall", a rock structure separating the Cape Fear River from Buzzard Bay, and also serves as the boundary for the Zeke's Island Estuarine Research Reserve. At the end of the Wall, a line is drawn southwesterly to the northern tip of Bald

Head Island. These two areas use boundaries such as the ICW, landmarks, or existing reserve borders to maximize ease of marking these areas and enforcement. Each DTMA has been selected to minimize the inclusion of areas outside the zone of potential diamondback terrapin interaction with crab pots, without creating overly complex and unenforceable borders (Table 1). Of the area that is water in the Masonboro Island DTMA, 85% meets the depth and distance criteria considered within the interaction zone, and 61% of the water area in the Bald Head Island DTMA is considered within the interaction zone. The area in the Masonboro Island DTMA that does not fall within this zone is primarily in Dick Bay, which is mostly less than 3 m (9.9 ft) deep at low tide, but is a large open area which contains waters greater than 250 m (820.2 ft) from any shoreline. Dick Bay is included within the proposed DTMA to reduce complexity in marking and enforcement, as the ICW forms a natural western boundary for this management area. In the Bald Head Island DTMA, the amount of water area that is not considered in the interaction zone is primarily caused by the larger open areas of water to the east of the Wall in the Basin, Second Bay, and Buzzard Bay. These areas are mostly less than 3 m (9.8 ft) deep at low tide but have waters greater than 250 m (820.2 ft) from any shoreline. These areas were also included in the proposed DTMA to reduce complexity in marking and enforcement, as the Wall forms a well-defined boundary for this management area. A map which plots a subset of NCDMF and NCNHP diamondback terrapin occurrence data points as 7.41 km^2 (2.86 mi^2) circles (the maximum known home range size for North Carolina diamondback terrapins) over proposed DTMA boundaries, illustrates the need for management areas of the size recommended (Figure 5).

Regional Commercial Blue Crab Fishery Information:

Landings and participation data for the blue crab fishery does not exist at a fine enough scale relative to specific waterbodies to directly assess the number of participants which could be impacted by the creation of the proposed DTMAs. Trip ticket reporting areas for this region include Masonboro Sound, which encompasses the proposed Masonboro Island DTMA and the Cape Fear River, which encompasses the proposed Bald Head Island DTMA. The proposed Masonboro Island DTMA comprises 64% of the Masonboro Sound trip ticket reporting area, while the proposed Bald Head Island DTMA comprises 29% of the Cape Fear River trip ticket reporting area (Table 1). From 2010 and 2019, between 12 and 19 (average of 16) participants reported landings of blue crabs from hard crab and peeler pots from Masonboro Sound, and between 8 and 16 (average 12) participants reported landings of blue crabs from hard crab and peeler pots from the Cape Fear River (Figure 6). Participants reporting landings are generally declining in the Cape Fear River and fluctuating in Masonboro Sound. Although the proposed Masonboro Island DTMA occupies a smaller footprint, it may likely impact more individual participants than the proposed Bald Head Island DTMA as there are more participants and the proposed Masonboro Island DTMA occupies a greater percentage of the trip ticket reporting area. Additional species which are landed from crab pots in these two trip ticket reporting areas include whelks "conch" (*Busycon and Busycotypus spp*.) and Florida stone crabs (*Menippe mercenaria*). Landings and participation data for whelk examined by trip ticket reporting area are considered confidential (having a small number of participants) when examined on an annual scale, and are only presented in this paper as ten-year averages (Table 2). From 2010 and 2019, between 5 and 11 (average of 8) participants reported landings of stone crab from hard crab and peeler pots from Masonboro Sound, and between 2 and 8 (average of 4) participants reported landings of stone crab from hard crab and peeler pots from the Cape Fear River (Figure 7). Landings of stone crabs show fluctuations in number between years and area, and average a very small percentage (less than 0.5%) of the overall

landings from crab pots in these two reporting areas. Ten-year average (from 2010 to 2019) landings values for these three species from the Masonboro Sound and Cape Fear River trip ticket reporting areas show blue crab has the highest average landings value, followed by stone crab, then whelk (Table 3).

Table 1. Total area in acres of proposed Masonboro and Bald Head Island DTMAs, including percent of DTMA that is water, percent of water area that is in the potential interaction zone [< 3 m (9.8 ft) deep, < 250 m (820.2 ft)], and percent of the total Trip Ticket reporting area (Masonboro Sound, Cape Fear River) the DTMA encompasses.

DTMA Characteristics	Masonboro	Bald Head
Total land and water area of DTMA (acres)	5,739	9,945
Percent of DTMA area that is water	59%	39%
Percent of DTMA water area in interaction zone	85%	61%
Percent DTMA is of total Trip Ticket reporting area	64%	29%

Table 2. Average landings of whelk (conch) meats from hard crab and peeler pots, and average number of participants reporting landings between 2010 and 2019 from Trip Ticket reporting areas Masonboro Sound, and Cape Fear River. 2019 landings data are preliminary and may change and may change after final review is completed.

	Masonboro Sound	Cape Fear River
Pounds	46	88
Participants	2	3

Table 3. Average value of annual reported landings of blue crab, whelk (conch), and stone crab from hard crab and peeler pots, between 2010 and 2019from Trip Ticket reporting areas Masonboro Sound, Cape Fear River, and statewide total. Numbers in parenthesis represent the percentage of each area to the statewide average for each species. 2019 landings data are preliminary with value calculations based on 2018 prices, and may change after final review is completed.

	Masonboro Sound	Cape Fear River	Statewide
Blue Crab	$ 138,682 (0.53%)	$ 596,242 (2.29%)	$26,077,194
Whelk	$ 99 (0.08%)	$ 178 (0.14%)	$125,502
Stone Crab	$ 1,384 (7.11%)	$ 622 (3.19%)	$19,476

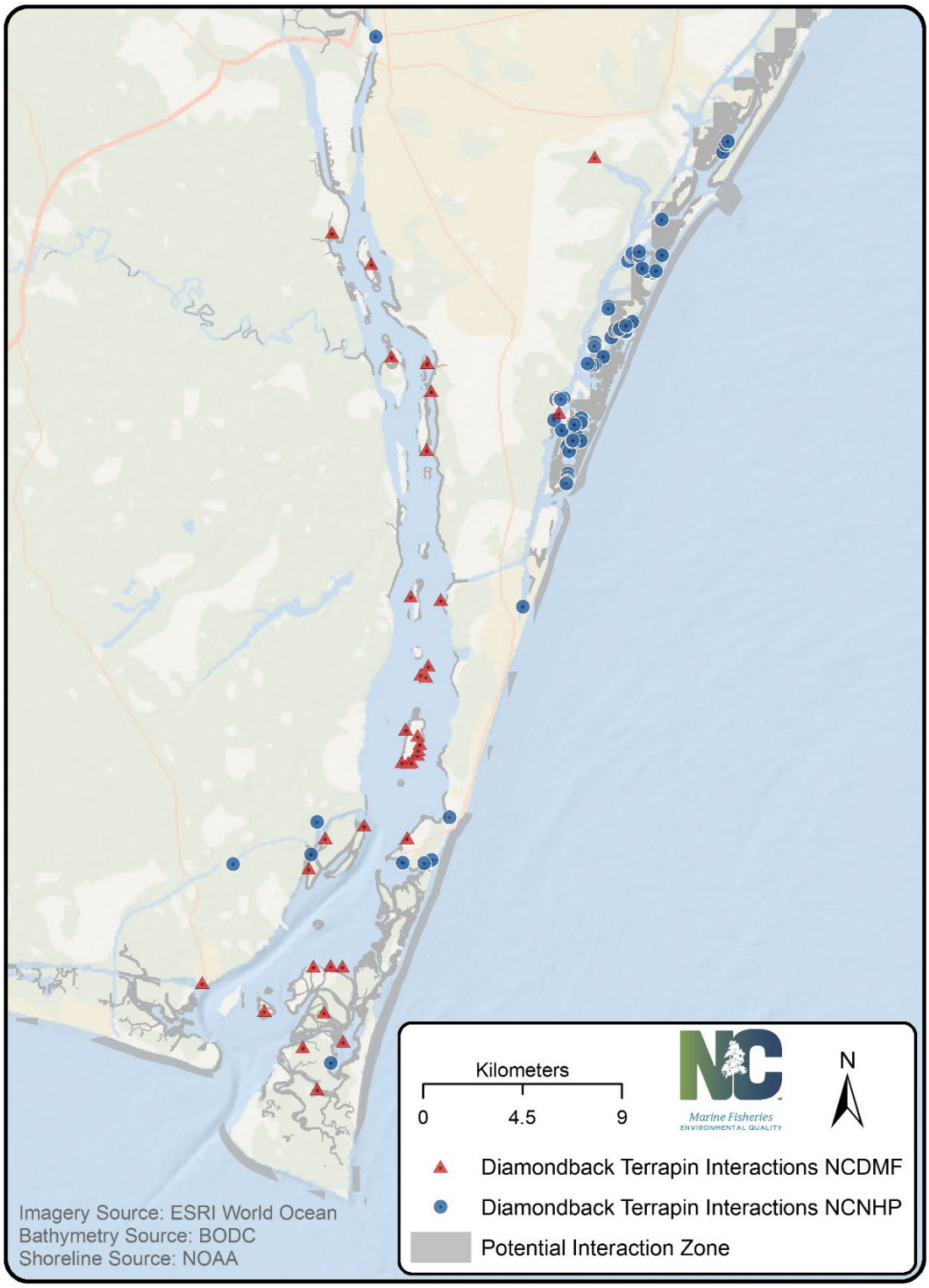

Figure 1. A map of coastal New Hanover and Brunswick counties showing the potential interaction zone (< 3 m (9.8 ft) deep and < 250 m (820.2 ft) from any shoreline) of diamondback terrapins and crab pots, overlaid with NCDMF (1971 – 2017) and NCNHP diamondback terrapin observations.

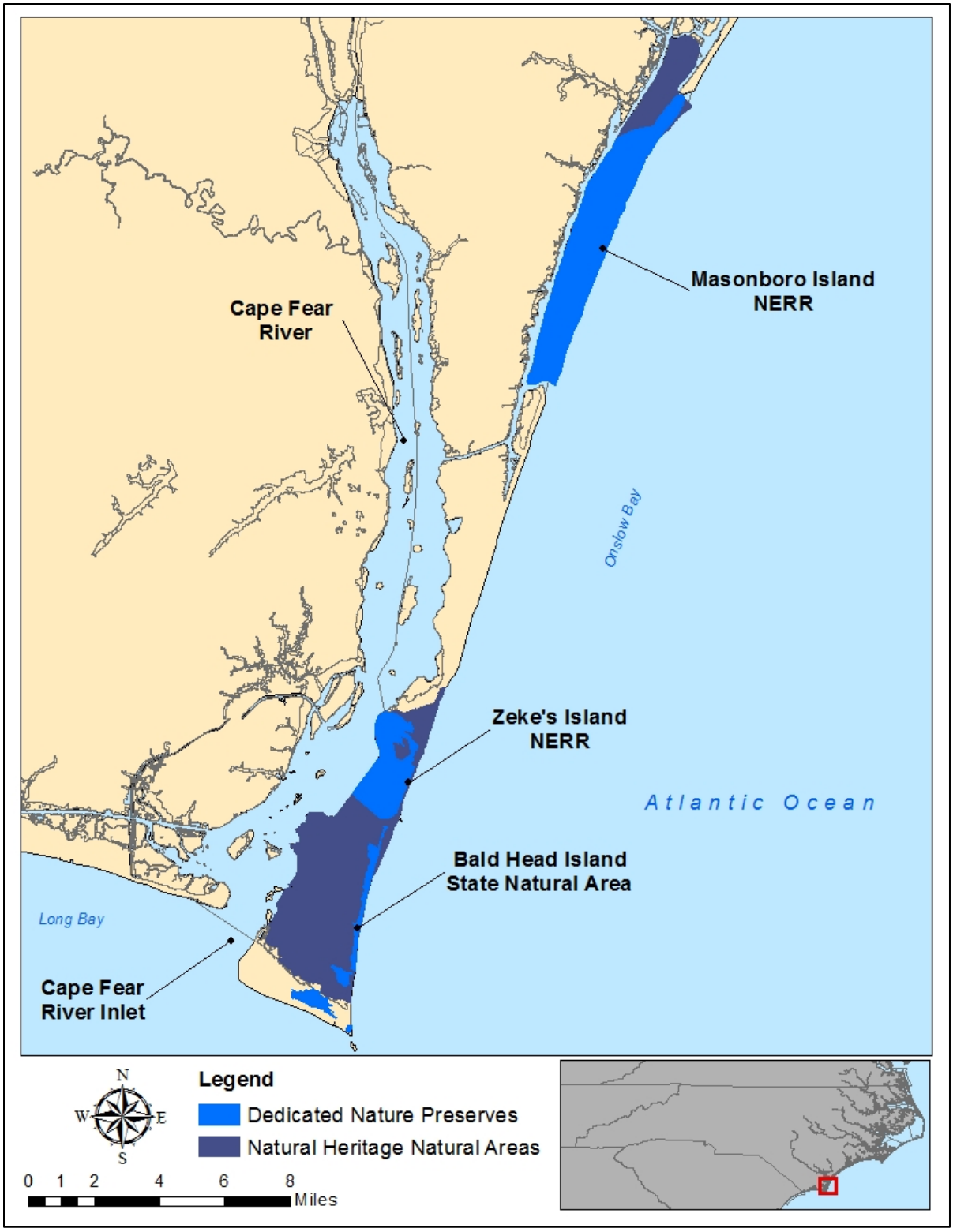

Figure 2. A map of coastal New Hanover and Brunswick counties showing North Carolina Natural Heritage Natural areas and National Estuarine Research Reserves (NERRs)

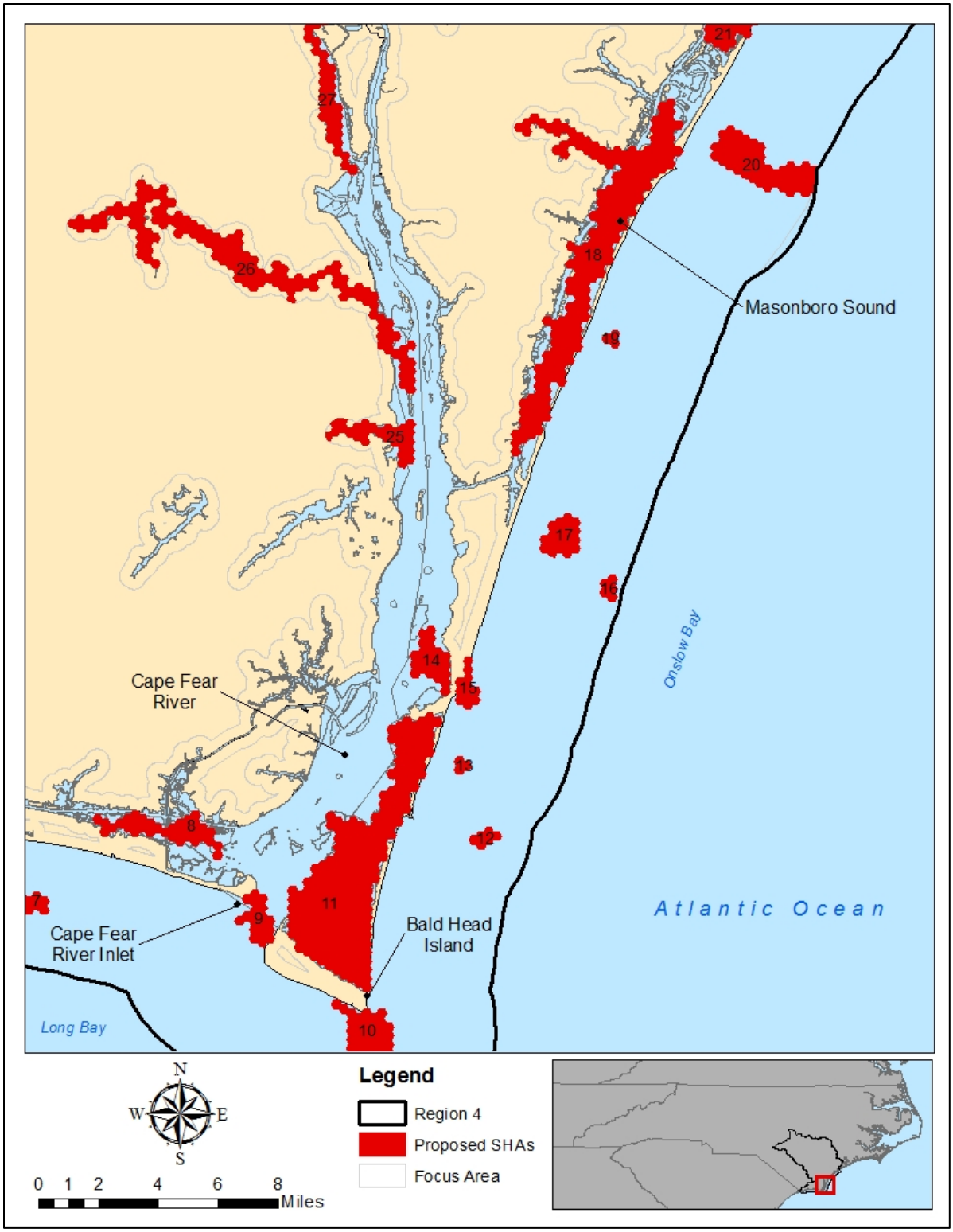

Figure 3.A map of coastal New Hanover and Brunswick counties showing nominated Strategic Habitat Areas in Region 4 of the North Carolina Coastal Habitat Protection Plan.

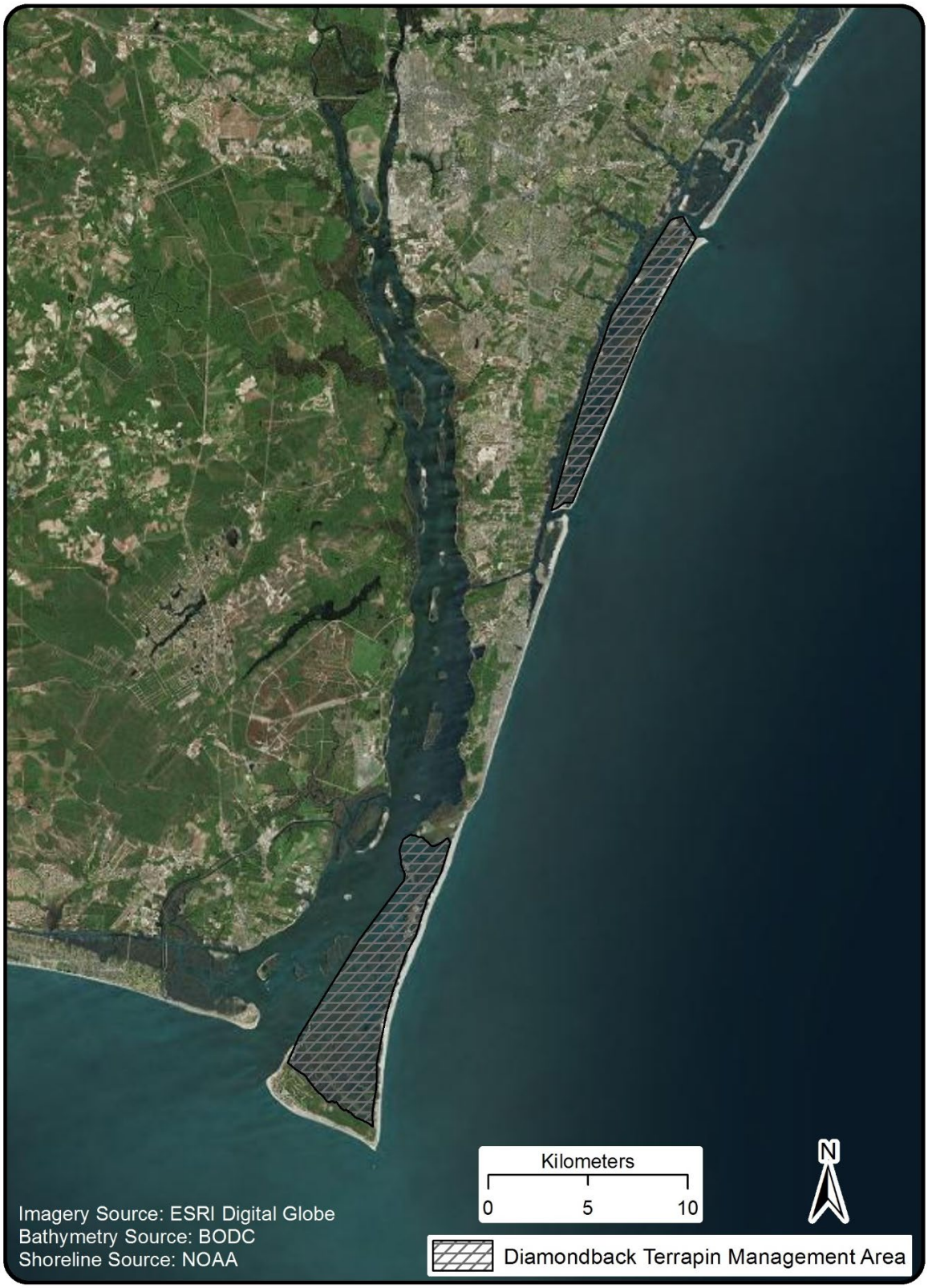

Figure 4. A map of coastal New Hanover and Brunswick counties showing proposed Diamondback Terrapin Management Areas.

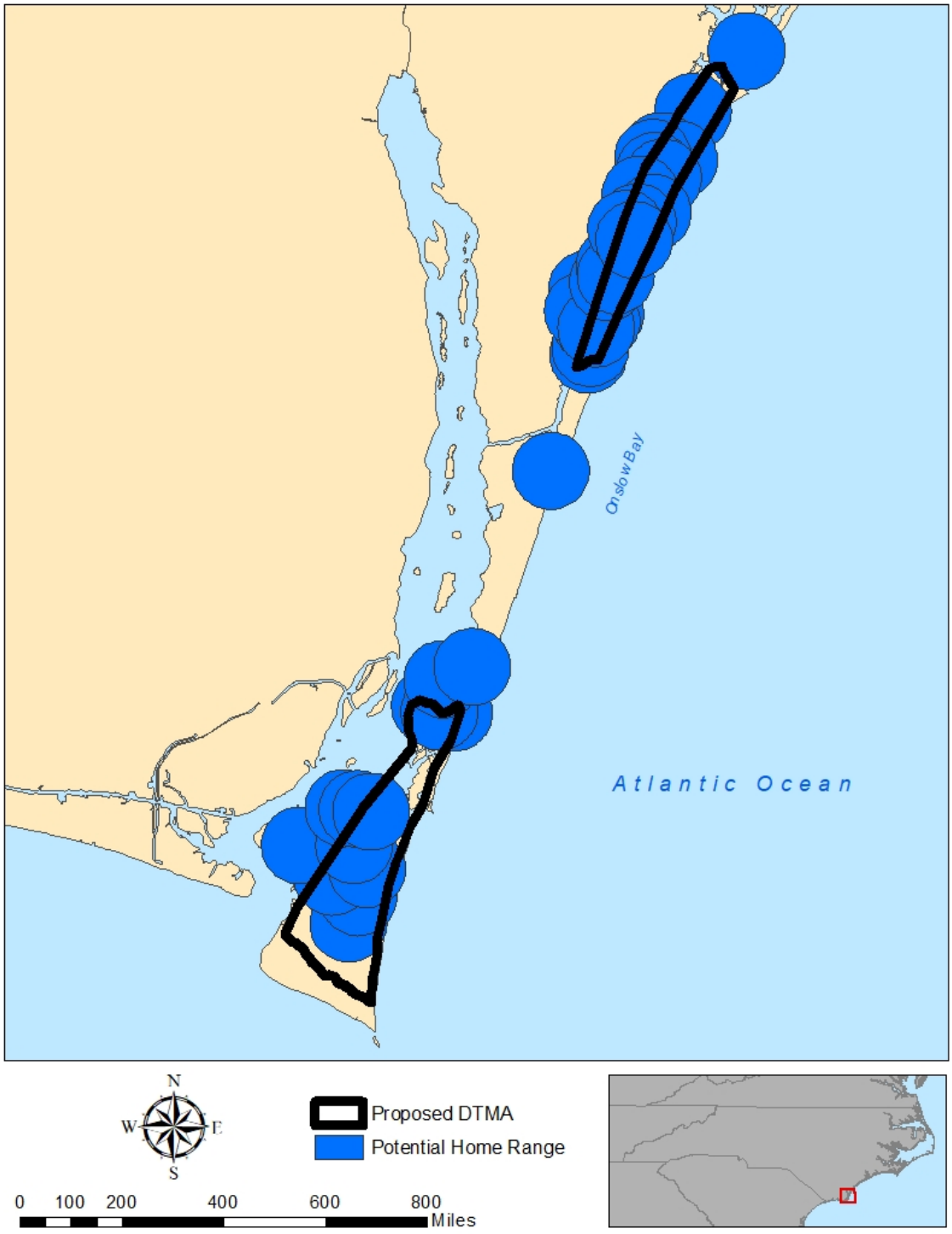

Figure 5. A map of proposed Diamondback Terrapin Management Areas compared with a subset of NCDMF and NCNHP diamondback terrapin locations shown as 7.41 km^2 (2.86 mi^2) circles to illustrate the potential maximum home range of each observed diamondback terrapin.

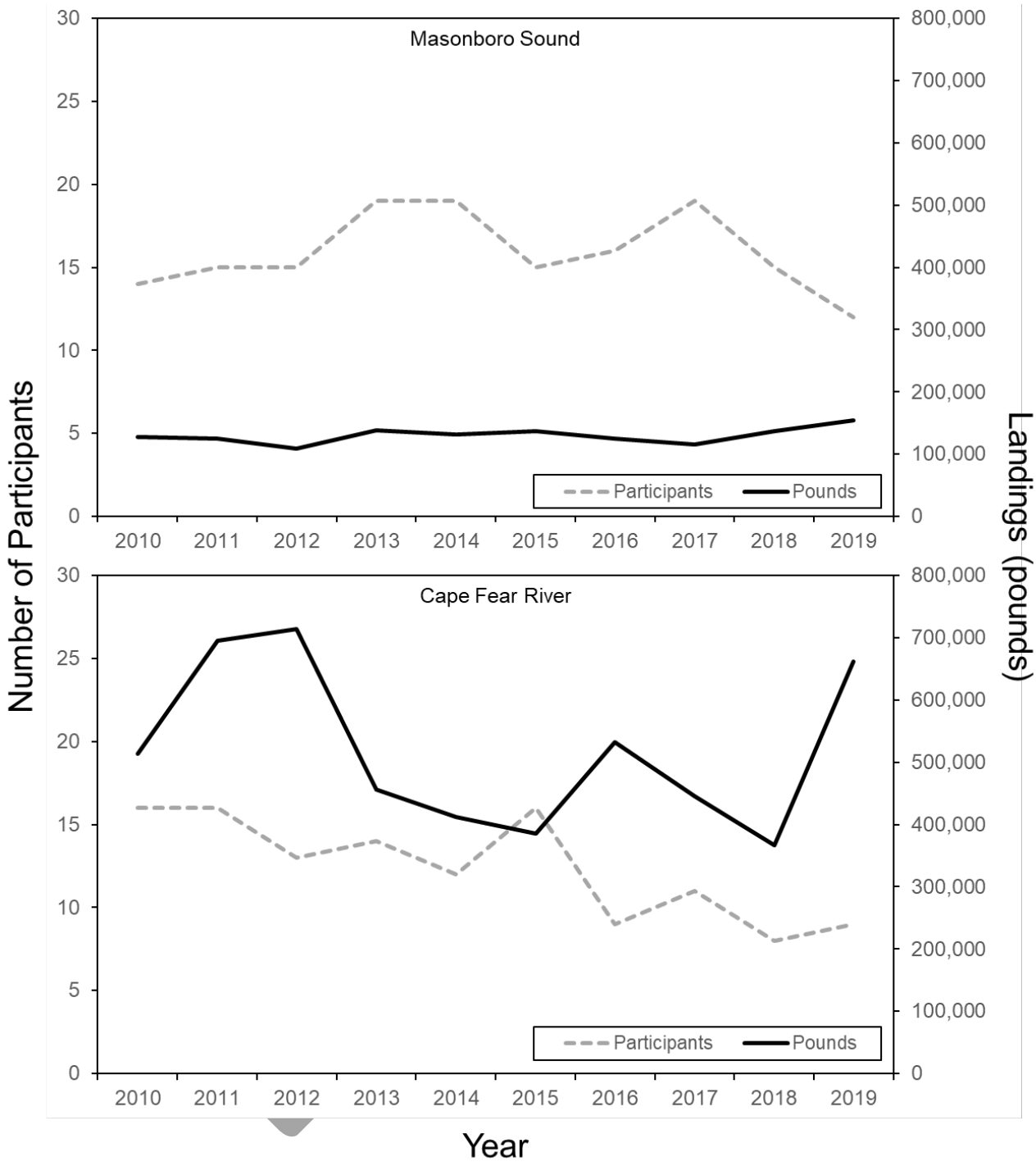

Figure 6. A graph showing number of participants (left axis, dashed line) and landings in pounds (right axis, solid line) of blue crabs in both, hard crab and peeler pots for the Masonboro Sound (upper panel) and Cape Fear River (lower panel) trip ticket reporting areas. 2019 landings data are preliminary and may change after final review is completed.

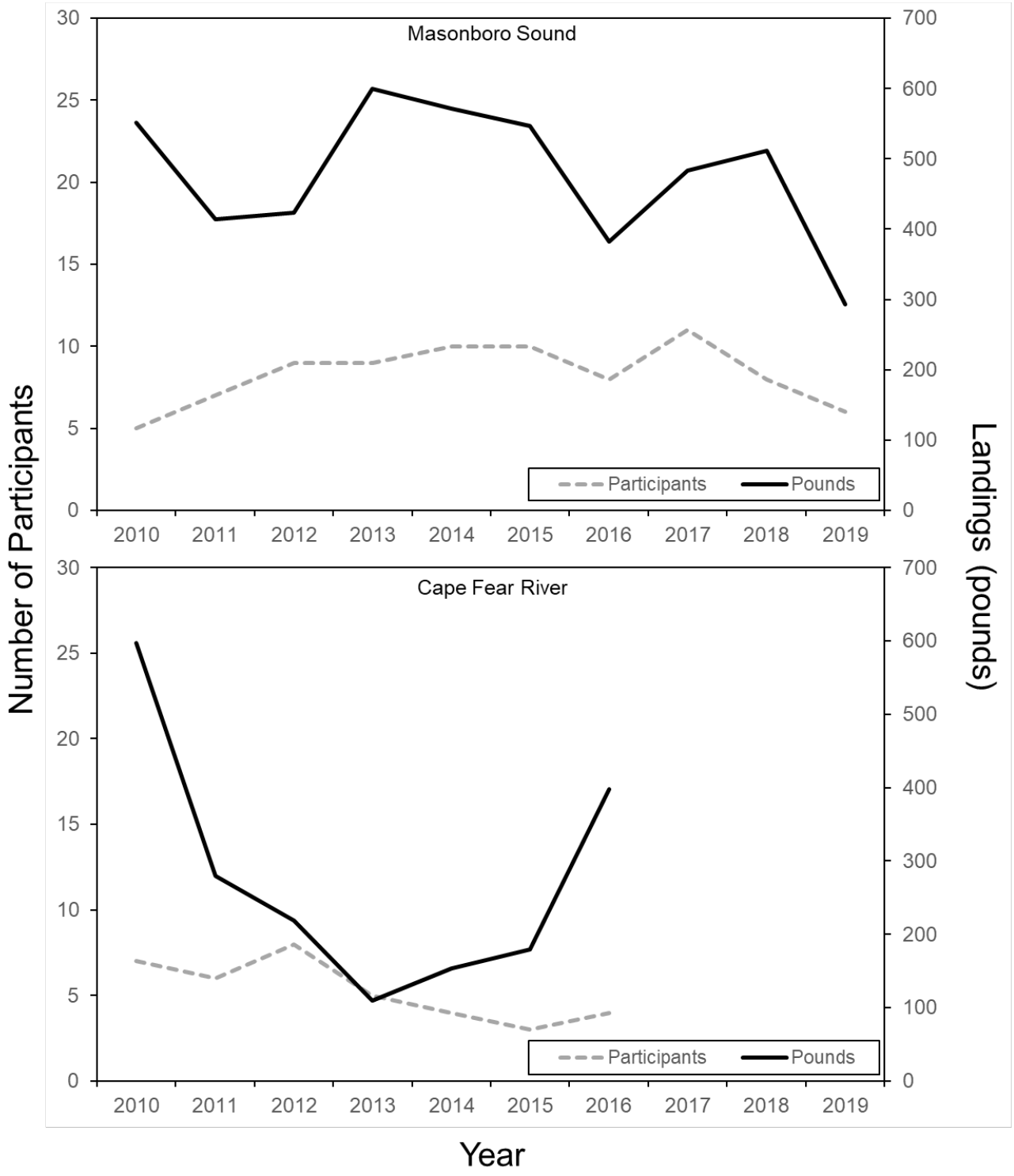

Figure 7. A graph showing number of participants (left axis, dashed line) and landings in pounds (right axis, solid line) of stone crabs in both, hard crab and peeler pots for the Masonboro Sound (upper panel) and Cape Fear River (lower panel) trip ticket reporting areas. Landings data after 2016 for the Cape Fear River are confidential. 2019 landings data are preliminary and may change after final review is completed.

VII. PROPOSED MANAGEMENT OPTIONS

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

Option 1: Designate the Masonboro Sound area described above as a DTMA

+ Provide protection for documented diamondback terrapin populations in high quality habitat while still allowing commercial crab potting to occur.
+ A proactive conservation measure for a state and federal "Species of Concern".
+ Remove conflict between commercial crab potting and research or educational activities occurring at NERR sites.
+ Mitigate negative ratings by sustainable seafood consumer advisory groups for the bycatch of diamondback terrapin in the NC blue crab fishery.
- Additional cost and regulatory burden to modify crab pots for compliance.
- Economic impact from potential reduction in crab pot catch within DTMA area.
+/- Will only impact fisherman who crab pot within DTMA.

Option 2: Designate the lower Cape Fear River area described above as a DTMA

+ Provide protection for documented diamondback terrapin populations in high quality habitat while still allowing commercial crab potting to occur.
+ A proactive conservation measure for a state and federal "Species of Concern".
+ Remove conflict between commercial crab potting and research or educational activities occurring at NERR sites.
+ Mitigate negative ratings by sustainable seafood consumer advisory groups for the bycatch of diamondback terrapin in the NC blue crab fishery.
- Additional cost and regulatory burden to modify crab pots for compliance.
- Economic impact from potential reduction in crab pot catch within DTMA area.
+/- Will only impact fisherman who crab pot within DTMA.

VIII. RECOMMENDATION

NCDMF – Recommend establishing the areas described above as the Masonboro Island and Bald Head Island DTMAs by proclamation.

Southern Regional Advisory Committee –Recommended to have the areas created under the terms and conditions outlined in the presentation, to explore options for funding for offsetting cost of excluder devices to current fishermen, and to explore options for research on approved and additional designs.

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Prepared by Joe Facendola, Joe.Facendola@ncdenr.gov, 910-796-7291

APPENDIX A

15A NCAC 07O .0101 STATEMENT OF PURPOSE

The principal purposes of the North Carolina Coastal Reserve and supporting programs are to:

(1) preserve coastal ecosystems representative of the various biogeographic regions and typologies in North Carolina and to make them available for continuous future study of the processes, functions, and influences which shape and sustain the coastal ecosystems;

(2) provide new information on coastal ecosystem processes to decisionmakers as a basis for the promotion of sound management of coastal resources;

(3) provide a focal point for educational activities that increase the public awareness and understanding of coastal ecosystems, effects of man on them, and the importance of the coastal systems to the state and the Nation;

(4) accommodate traditional recreational activities, commercial fishing, and other uses of the Reserve as long as they do not disturb the Reserve environment and are compatible with the research and educational activities taking place there.

History Note: Authority G.S. 113-3; 113-8; 143B-10; Eff. July 1, 1986; Amended Eff. April 1, 1988.

15A NCAC 07O .0202 RESERVE USE REQUIREMENTS

The following use requirements shall apply to all of the components of the Reserve:

(1) The essential natural character of the Reserve shall be maintained.

(2) Traditional recreational uses within each component shall be allowed to continue as long as the activities do not disrupt the natural integrity of the Reserve or any research or educational projects. Incompatible traditional uses shall include:

(a) fishing, hunting, or trapping activities not allowed by state rules;

(b) target shooting;

(c) hydraulic clam dredging within Reserve boundaries;

(d) use of vehicles off designated corridors at components where vehicles are allowed for upland transportation according to the management plan; and

(e) production of noise disruptive to local wildlife and the aesthetic enjoyment of the Reserve as a natural area.

(3) No user shall disturb a research project or research equipment in place at the Reserve.

(4) Camping or any form of habitation, whether on the uplands, wetlands, or waters within Reserve boundaries, shall not be allowed unless written permission is posted by the Division of Coastal Management.

(5) Personal property not authorized by the management agency may not be placed within the boundaries of the Reserve for more than two consecutive days.

(6) Users of the Reserve shall not disturb or remove any live animals, except those allowed by local or state hunting and fishing rules as they apply to the Reserve, or vegetation within the Reserve unless such action is part of a research or educational project approved by the management agency.

(7) Persons wishing to engage in scientific research or collection of natural materials within the Reserve shall first secure written permission from the management agency.

(8) No activity shall be allowed which might pollute any stream or body of water in the Reserve. Acts of pollution shall include:

(a) Deposition of solid materials not indigenous to the local coastal ecosystem; and

(b) Discharge of liquids other than uncontaminated estuarine water.

(9) No other acts or uses which are detrimental to the maintenance of the property in its natural condition shall be allowed including, but not limited to, disturbances of the soil, mining, commercial or industrial uses, timber harvesting, ditching and draining, deposition of waste materials.

History Note: Authority G.S. 143B-10; Eff. July 1, 1986; Amended Eff. April 1, 1999; December 1, 1991; April 1, 1988.

APPENDIX B

Example results of diamondback terrapin and crab pot count data from fixed route kayak surveys in Masonboro Island National Estuarine Research Reserve.

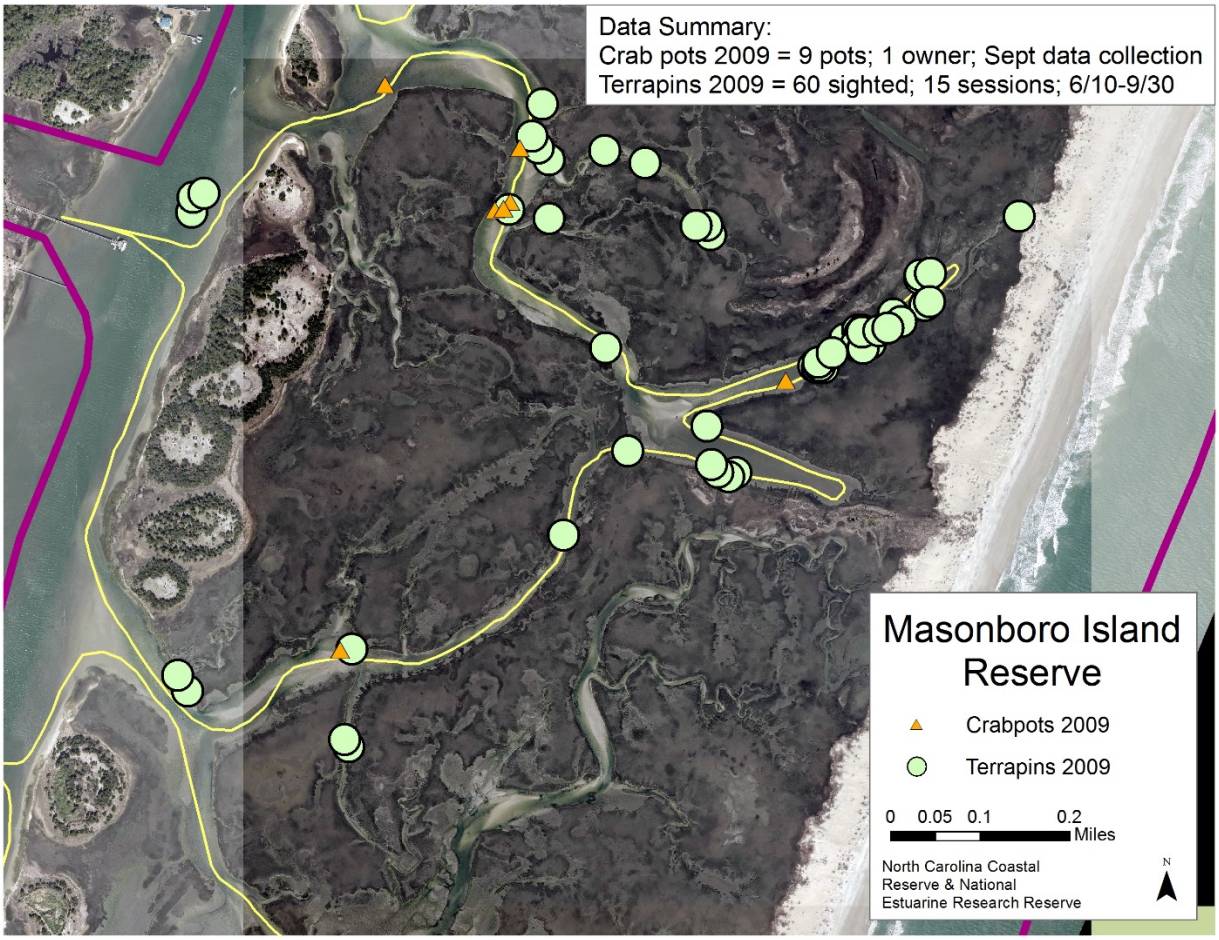

Figure A1. A map showing diamondback terrapin and crab pot locations and counts from a fixed route kayak survey conducted in the Masonboro Island NERR in 2009.

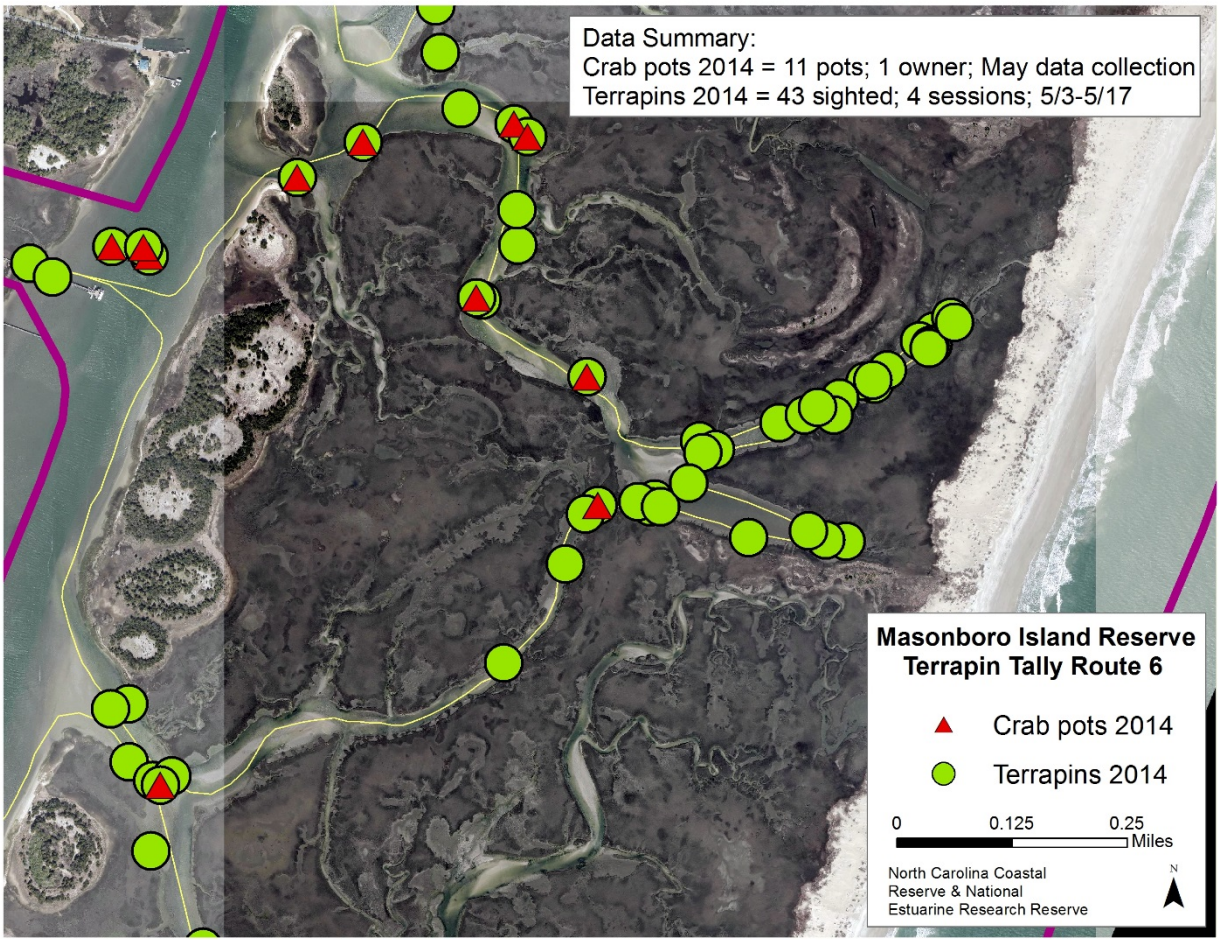

Figure A2. A map showing diamondback terrapin and crab pot locations and counts from a fixed route kayak survey conducted in the Masonboro Island NERR in 2014.

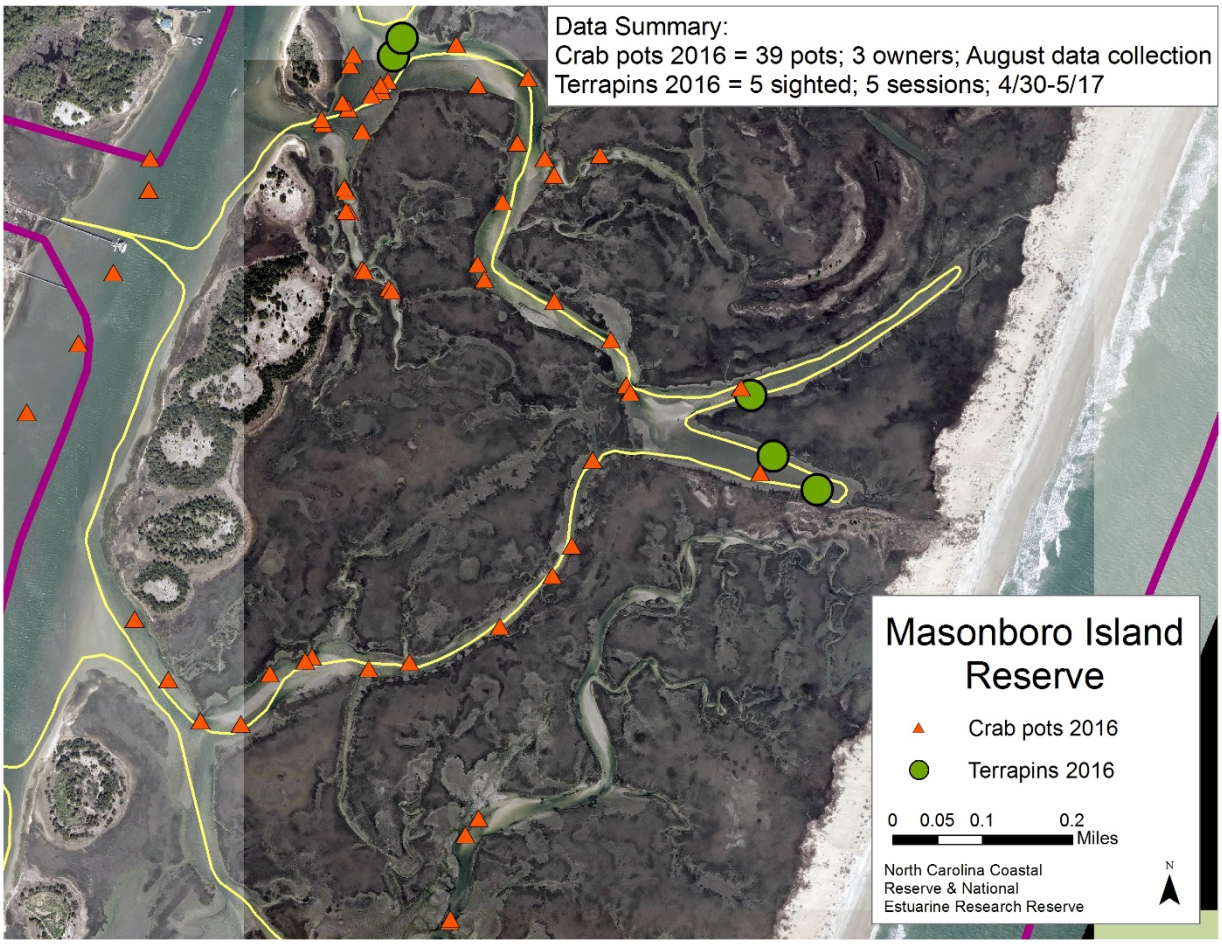

Figure A3. A map showing diamondback terrapin and crab pot locations and counts from a fixed route kayak survey conducted in the Masonboro Island NERR in 2016.

ROY COOPER
Governor

MICHAEL S. REGAN
Secretary

STEPHEN W. MURPHEY
Director

April 24, 2020

MEMORANDUM

TO: N.C. Marine Fisheries Commission

FROM: Corrin L. Flora, Blue Crab Fishery Management Plan Co-Lead, and Joseph J. Facendola, Diamondback Terrapin Management Area Issue Paper Author, Fisheries Management Section

SUBJECT: Public comments on the Designation of Diamondback Terrapin Management Areas in Masonboro Sound and the Lower Cape Fear River

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The Blue Crab Fishery Management Plan Amendment 3 established a framework the N.C. Division of Marine Fisheries uses to propose "Diamondback Terrapin Management Areas" (DTMAs). Two proposed DTMAs are recommended for consideration by the MFC. A 30-day public comment period on the proposed DTMAs was open until April 23 at 5pm. Nine comments or letters were received during the comment period, including letters from: North Carolina Wildlife Federation, Center for Biological Diversity, North Carolina Herpetological Society, North Carolina Wildlife Resources Commission, and North Carolina Coastal Reserve.

For more detail, please refer to the complete packet of public comments and letters provided in your briefing materials.

Coastal Management
ENVIRONMENTAL QUALITY

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
BRAXTON C. DAVIS
Director

April 21, 2020

N.C. Division of Marine Fisheries
PO Box 769
Morehead City, NC 28557

Marine Fisheries Staff and Commission Members,

These comments are submitted in support of the proposal to adopt Diamondback Terrapin Management Areas (DTMA) in North Carolina and to reinforce statements contained in the March 23, 2020 issue paper addressing the designation of DMTAs in Masonboro Sound and the Lower Cape Fear River.

The North Carolina Coastal Reserve and National Estuarine Research Reserve (Reserve), a program in the Division of Coastal Management, is supportive of the proposed approach and the initial two locations under consideration for this designation. The Reserve protects ten representative sites along North Carolina's coast for research, education, and compatible traditional uses. In accordance with the Reserve's authorizing legislation, the Coastal Area Management Act, our agency is both supportive of traditional fishing activities that occur within Reserve boundaries and responsible for the ongoing protection of the habitats and organisms found at the sites under our management. We appreciate the efforts of the Division of Marine Fisheries to develop a proactive approach to reduce bycatch and mortality of diamondback terrapins that occur as a result of interactions with the blue crab fishery by establishing DMTAs.

We feel that the proposed approach of utilizing the best available science to identify potential interaction zones is well-founded and will result in meaningful reduction in bycatch by focusing on areas of known terrapin presence, the season of greatest terrapin activity, and areas with habitat characteristics that can support healthy diamondback terrapin populations. In addition, we are supportive of the recommendation to utilize existing natural and demarcated conservation area boundaries to simplify public understanding and enforcement.

We anticipate that implementation of the recommended DMTAs will enhance the Reserve's ability to carry out its mission to protect the natural character of two Reserve sites– the Masonboro Island and Zeke's Island Reserves. These sites, which fall entirely within the proposed Masonboro Island DTMA and the Bald Head Island DTMA are also part of the N.C. National Estuarine Research Reserve and are Dedicated State Nature Preserves.

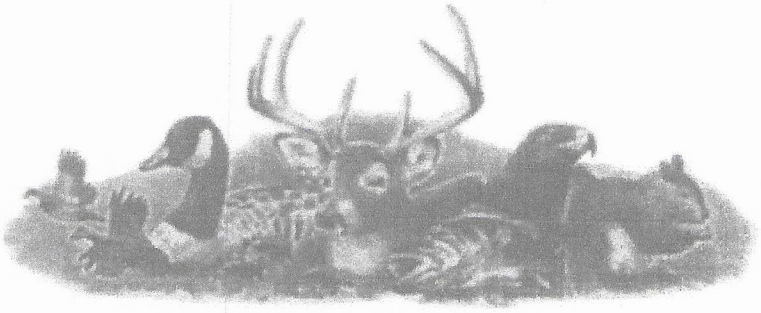
Designation and management of these DMTAs will complement the protection of these locations under these additional long-term management requirements.

Adoption of this approach will also ensure that valuable research efforts related to diamondback terrapins continue uncompromised at the Masonboro Island site. Multiple independent researchers have conducted research projects at the Masonboro Island Reserve; studies have resulted in publications with implications for management and conservation strategies for this species of concern, including several that are referenced in the Blue Crab Fishery Management Plan Amendment 3, adopted in February 2020. The Reserve has also partnered with the N.C. Wildlife Resources Commission to develop and implement a popular project utilizing citizen science-based surveying methods to address priority goals listed in the N.C. Wildlife Action Plan to collect diamondback terrapin population data to better understand population dynamics.

Establishment of DMTAs will result in reduction of diamondback terrapin bycatch, preservation of study populations, and long-term maintenance of terrapin populations in the state. The Reserve looks forward to working with the Division of Marine Fisheries to balance the shared goals of supporting the blue crab fishery while ensuring the protection of a priority wildlife species.

Sincerely,

Hope Sutton, Stewardship Coordinator & Southern Sites Manager
North Carolina Coastal Reserve and National Estuarine Research Reserve



North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

MEMORANDUM

TO: North Carolina Division of Marine Fisheries
North Carolina Department of Environmental Quality

FROM: Maria T. Dunn, Coastal Coordinator
Habitat Conservation Division

DATE: April 14, 2020

SUBJECT: Diamondback Terrapin Management Area Comments - Masonboro Island and Bald Head Island Proposed Management Areas.

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) reviewed the management area proposals with regard to impacts on fish and wildlife resources. Our comments are provided in accordance with provisions of the Coastal Area Management Act (G.S. 113A-100 through 113A-128), as amended, Sections 401 and 404 of the Clean Water Act, as amended, and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

The North Carolina Marine Fisheries Commission (MFC) has recognized diamondback terrapins (*Malaclemys terrapin)* as a wildlife resource in need of protection from crab pot fishing activities. The diamondback terrapin (terrapin) is as a nongame species found along coastal North Carolina that is recognized by the NCWRC as state-listed special concern. In February 2020 the MFC adopted Amendment 3 to the Blue Crab Fishery Management Plan (FMP) that established a framework to use terrapin excluder devices in crab pots. Part of this framework includes the establishment of Diamondback Terrapin Management Areas (DTMAs). Currently two areas are under consideration:

1. **The Masonboro Island Diamondback Terrapin Management Area**, which lies entirely within, and shares nearly the entire boundary with, the Masonboro Island Estuarine Research Reserve and Natural Area. This area is also naturally bounded on the east by Masonboro Island, and on the west by the Intracoastal Waterway.

2. **The Bald Head Island Diamondback Terrapin Management Area**, which is comprised of Zeke's Island Estuarine Research Reserve in the northern portion of the management area and the Bald Head Island State Natural Area as the southern portion. This area is also naturally bounded by a barrier island to the east, and Bald Head island to the south. The western boundary of this management area follows "the wall," which is a rock structure that separates the Cape Fear River from Buzzard Bay and serves as the

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Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

boundary for the Zeke's Island Estuarine Research Reserve. At the end of the wall, the boundary runs on a line southwesterly to the northern tip of Bald Head Island.

The NCWRC has reviewed Amendment 3 of the Blue Crab FMP and the boundaries of the proposed DTMAs. We appreciate the efforts being made by the NCDMF and MFC to minimize terrapin interactions in the commercial crabbing industry and overall believe this is a good first step to reduce terrapins as crab pot bycatch. Therefore, we ask for you to please consider the following:

- The framework for identifying potential DTMAs requires an area to have a documented terrapin population and to contain an area of susceptibility to crab pot incidental capture based on water depth (<3m deep) and distance from shore (<250m). This area of susceptibility definition is consistent with existing research on habitat use while swimming, based on terrapins around Masonboro Island. The two proposed DTMAs, Masonboro Island and Bald Head Island, have both been documented to be good terrapin habitat areas by our agency. The Terrapin Tally project, which has been conducted since 2014, has collected data around Masonboro Island that demonstrates habitat use by terrapins. Therefore, the NCWRC supports the decision to establish Masonboro Island and Bald Head Island as DTMAs.

- The management plan requires all crab pots within the designated DTMAs set between March 1 through October 31 be modified with an approved terrapin excluder device. This season is consistent with the time of year when terrapins are active in coastal North Carolina.

- Terrapin excluder devices have been considered and approved by NCDMF in consultation with the Shellfish.Crustacean Advisory Committee. Additional or alternative terrapin excluder devices or modified pot designs may be approved by NCDMF in consultation with the Shellfish Crustacean Advisory Committee provided they have been shown to reduce impacts to blue crab catch and maintain the level of terrapin protection offered by the approved device descriptions found in Amendment 3. The NCWRC supports the use of such devices to minimize terrapin bycatch and offers our consultation as requested.

- To determine the effectiveness of the DTMAs, the NCWRC recommends a monitoring plan be included as part of Amendment 3. This may include separate work by the NCDMF or cooperation and support of current efforts of the NCWRC and their partners to monitor and manage terrapin populations.

- The NCWRC requests the removal of derelict crab pots continue within DTMAs during the seasonal closure.

Thank you for the opportunity to review and provide comment on this management plan. We appreciate the efforts to minimize negative interactions with terrapins during commercial crabbing activities and look forward to any opportunities we may assist. If you need further assistance or additional information, please contact Maria Dunn at (252) 948-3916 or at maria.dunn@ncwildlife.org

Elise Bennett, Center for Biological Diversity, FL

I am writing on behalf of the Center for Biological Diversity and its more than 1.7 million members and supporters, many of whom live in or enjoy visiting North Carolina. We appreciate North Carolina Division of Marine Fisheries' (NCDMF) affirmative efforts to protect diamondback terrapins from drowning in blue crab pots in state waters. The species is in decline (Roosenberg et al. 2019), and crab pot mortality is one of the greatest threats to the species' future existence (Butler et al. 2006; Grosse et al. 2011; Chambers and Maerz 2018). Accordingly, we support the designation of Diamondback Terrapin Management Areas (DTMAs) in Masonboro Sound and the Lower Cape Fear River and the requirement that terrapin excluder devices or properly modified pots be used in those areas (see generally Draft Designation of Diamondback Terrapin Management Areas in Masonboro Sound and the Lower Cape Fear River ("Draft Designation")). We agree that these two proposed DTMAs meet the criteria necessary for designation and will provide meaningful protection for diamondback terrapins.

We also believe there are a few potential positive impacts of the proposed DTMAs that were not covered in Section VII of the Draft Designation. First, these proposed DTMAs offer ecosystem-wide conservation benefits that are not limited to just the conservation of one species. Diamondback terrapins are potentially keystone species in the salt marshes and mangroves they inhabit, which means they help maintain the ecological health of their associated ecosystems. Among the prey of diamondback terrapins are the salt marsh snails (Littorina spp.) (Tucker et al. 1985), which in high numbers contribute to loss and erosion of salt marshes by grazing on the epiphytes that live on stems of grasses and thereby killing the grasses (Silliman and Bertness 2002). Because terrapins feed on the snails, it has been suggested that their potential effect on snail populations could reduce salt marsh erosion and loss. The potential top down predation effect suggest that the terrapin may play an important role in salt marsh ecosystem function, particularly when terrapins occur at high densities. (See Brennessel 2007). Terrapins also move substantial quantities of nutrients and calories from the water to land in the form of eggs and adult terrapins, which are then eaten by a variety of terrestrial and avian predators (Seigel 1980a; Clark 1982; Cecala et al. 2008).

Second, the DTMAs will protect significant research and educational activities occurring in the North Carolina Natural Heritage Natural Areas and National Estuarine Research Reserves, which overlap the DTMAs. As the Draft Designation acknowledges, "A significant reduction or extirpation of the diamondback terrapin population within the Coastal Reserve sites caused by incidental mortality in the blue crab commercial fishery may put the currently allowed traditional use of commercial crab fishing in direct conflict with both research and educational activities occurring on site" (Draft Designation at 4-5). Adopting the DTMAs would prevent this conflict.

Third, there is some evidence to suggest the use of excluder devices in the DTMAs could keep crabs in more marketable condition by keeping terrapins out of traps. Davenport et al. (1992) studied terrapin feeding behavior on crabs by providing hungry male terrapins crabs of different

size classes and observing the terrapins' behavior (Davenport et al. 1992 at 837–846). The size classes for crabs were small (10–25 mm carapace width), medium (30-50 mm), and large (52–75 mm) (Davenport et al. 1992 at 837). They observed that although terrapins are not specialized anatomically for a diet of hard-shelled animals, they will still exploit such food sources if they are hungry and do not have other options (Davenport et al. 1992 at 846). Specifically, they will eat crabs (Davenport et al. 1992 at 846). Small crabs were eaten whole, while medium and large crabs were "cropped"—that is, their walking legs were eaten without killing the crab (Davenport et al. 1992 at 847). Applying their findings to diamondback terrapins in the field, the scientists predicted that terrapins might eat blue crabs through a "cropping" technique (Davenport et al. 1992 at 847). Generally, terrapins will attack smaller crabs before medium crabs, and medium crabs before larger crabs (Davenport et al. 1992 at 847). Because terrapins captured in crab pots are in closed conditions without access to their preferred prey, it is possible that they will shear crabs, thus making them less marketable.

Fourth and finally, the DTMAs are likely to produce significant savings in terms of state resources required to protect the diamondback terrapin—a declining species of concern—by proactively protecting it before it reaches a more critical threatened or endangered status and necessarily requires more significant state resources and interventions to prevent extinction and recover populations.

We do wish to express one point of concern. While we recognize that Amendment 3 to the Blue Crab Fishery Management Plan limits the designation of DTMAs to water less than 3 m deep and less than 250 m from shore, these limitations create rifts in the overall protection afforded by the DTMAs. First, as Figure 5 of the Draft Designation illustrates, these parameters exclude large areas of terrapin home ranges, which are consequently not protected from potential crab pot mortality (Draft Designation at 12).

Second, these parameters do not account for the risk to terrapins from derelict traps that may originate from deeper waters but get pushed into shallower waters by storms or other means. These so-called "ghost pots" can be even more detrimental to terrapin populations than active pots, capturing numerous terrapins over a period of time (Bishop 1983 at 428; Guillory et al. 2001 at 4; Rook et al. 2010 at 172). For example, Grosse et al. (2009) reported finding 133 diamondback terrapin carcasses among two abandoned crab pots in one tidal marsh in Georgia. But regardless of the aforementioned concerns over the spatial limitations on the DTMAs, we still strongly support designation of both the Masonboro Sound and Lower Cape Fear River DTMAs because they will provide added protection for this declining species.

In closing, we strongly support designation of these DTMAs and also urge NCDMF to act swiftly to identify and designate additional DTMAs along North Carolina's coast, particularly in areas where the terrapin's status is of concern—for instance, along the coasts of Dare, Pamlico, and Carteret counties where the North Carolina Wildlife Resources Commission has identified the terrapin as a federal species of concern (see Draft Designation at 2). Thank you for the opportunity to comment. If you have any questions or would like PDF copies of any of the studies cited, please contact me at ebennett@biologicaldiversity.org.

Sincerely,

Elise Pautler Bennett
Reptile and Amphibian Staff Attorney
Center for Biological Diversity
ebennett@biologicaldiversity.org
(727) 755-6950

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Tim Gestwicki, North Carolina Wildlife Federation, NC

Friday, April 17, 2020

Mr. Rob Bizzell, Chairman

North Carolina Marine Fisheries Commission

North Carolina Division of Marine Fisheries

ATTN: Diamondback Terrapin Management Area Comments

P.O. Box 769

Morehead City, North Carolina 28557

Dear Chairman Bizzell and Marine Fisheries Commissioners,

We, the North Carolina Wildlife Federation (NCWF), believe the proposed Diamondback Terrapin (Malaclemys terrapin) Management Areas (hereafter DTMAs) represent a "baby step" for terrapin conservation and are hardly reflective of a precautionary management approach to the Blue Crab (Callinectes sapidus) fishery. The comments below are provided in response to the North Carolina Department of Environmental Quality (NCDEQ) and North Carolina Division of Marine Fisheries (NCDMF) news releases on March 25th and April 3rd, 2020 (NCDEQ 2020a, b), soliciting public comment on the proposed DTMAs in the southern coastal area of the state where fishermen will be required to use turtle excluder devices in crab pots.

Taking into account the current status of both Diamondback Terrapin and Blue Crab populations in North Carolina (based on the latest stock assessment, Blue Crabs are overfished with overfishing occurring; see NCDMF 2018, 2019a, 2019b), AND the ranking of North Carolina's Blue Crab fishery as "avoid" by Seafood Watch (Simon 2019; Monterey Bay Seafood Watch 2020), more significant by-catch mitigation measures are desperately needed. We hope the NCMFC and NCDMF will take the actions necessary to protect the aforementioned public trust resources for all North Carolinians. NCWF strongly recommends consideration of the following measures which we believe would more effectively ensure the long-term ecological, economic, and cultural vitality of Blue Crab and Diamondback Terrapin populations in North Carolina and the Blue Crab fisheries (commercial and recreational).

- At a minimum, consider extending the DTMAs from the proposed Masonboro Sound area, south to the South Carolina state line. As noted by committee member Tom Smith during the Southern Regional Advisory Committee meeting on April 8, there are Diamondback Terrapin populations in the Elizabeth River and Lockwood's Folly Inlet, which would then be afforded some measure of protection particularly from Blue Crab pot by-catch mortality.

- Implement a requirement for Diamondback Terrapin excluders in all Blue Crab pots within North Carolina waters which meet pre-established criteria for where Diamondback

Terrapins are likely to occur (i.e., depth and distance from shore, see Facendola 2020, pg 3). This preferred measure can easily be accomplished by fishermen and women through use of the excluder device recently developed by the Keck Environmental Laboratory (College of William and Mary, and South Carolina Department of Natural Resources Marine Resources Division), which excludes Diamondback Terrapins but retains Blue Crabs with minimal to no impact on catch (Grubbs et al. 2018).

- Investigate and certify additional excluder designs or pot/trap modifications (i.e., narrow funnel entrance) which can effectively halt Diamondback Terrapins from entering pots with minimal impact on Blue Crab, Stone Crab and/or Whelk catches, of which the latter two species are marketable by-catch. This measure was also recommended during the Southern Regional Advisory Committee meeting.

- Consider a Blue Crab fishery trap limitation/reduction program. Such programs have proven effective at reducing effort and overcapitalization in multiple other east coast crustacean trap fisheries, as well as reducing the potential for ghost traps and trap clean-ups (i.e., American Lobster, Florida Stone Crab and Spiny Lobster fisheries; see the following citations: Milon et al. 1999, Buesa 2010, Clark 2011, Gandy et al. 2018). These programs have in fact been suggested by North Carolina Blue Crab fishermen themselves in the past (e.g., see Greene 2006).

- Consider a Blue Crab pot closed season in all areas documented to have Diamondback Terrapin populations. This could be done using the designated criteria adopted in the North Carolina Blue Crab Fishery Management Plan (FMP), Amendment 3.

The viability and conservation of Diamondback Terrapins is of great concern within North Carolina and throughout the species' range. By-catch in Blue Crab pots/traps is the primary reason for their range-wide decline and imperilment, along with other habitat-related factors (Dorcas et al. 2007, Roosenburg 2004, Roosenburg et al. 2019, Bennett et al. 2020, Facendola 2020). Within North Carolina, this species is considered of "Special Concern" statewide (North Carolina Wildlife Resources Commission 2015, Table 3.22, Pg 126) and is designated a Species of Greatest Conservation Need (Table 3.29, Pg 155). Diamondback Terrapins have a Vulnerable (S3) classification under the North Carolina Natural Heritage Program (Ratcliffe 2019) and the International Union for the Conservation of Nature recently moved this species from "Near Threatened" to the greater risk category of "Vulnerable" on the Red List of Threatened Species after their most recent 2018 assessment (Roosenburg et al. 2019). Finally, due to concerns for Diamondback Terrapin by-catch, the Monterey Bay Aquarium Seafood Watch Program has given the North Carolina Blue Crab fishery a rating of "avoid" which is their lowest rating (Simon 2019), adversely affecting the marketability of Blue Crab products from our state.

Prior to submitting these comments, we reviewed the Issue Paper on the DTMAs prepared by NCDMF staff (Facendola 2020) and the draft of Amendment 3 to the North Carolina Blue Crab Fishery Management Plan (NCDMF 2019b; final plan not yet available via the NCDMF website). In addition, other pertinent published literature and reports were reviewed and a representative listened-in virtually to the April 8, 2020, meeting of the NCMFC's Southern Regional Advisory Committee. At the meeting, members were briefed on the DTMAs by Mr.

Facendola and voted unanimously to support their establishment, which NCWF supports as a minimal step toward Diamondback Terrapin conservation.

However, the NCDMF and NCMFC's proposal does not fully address NCWF's concerns in relation to high Diamondback Terrapin crab pot by-catch, which has been discussed by NCMFC and NCDMF staff for at least 22 years, if not longer (e.g., see McKenna et al. 1998, North Carolina Fishery Management Plan for Blue Crab, Section 10.2.8, Pgs 38-39). Data compiled and analyzed by North Carolina National Estuarine Research Reserve (NC NERR) site managers for the proposed DTMAs are already sufficient to demonstrate that educational and research activities for which the NC NERR and the associated Coastal Reserves were designed have been compromised by the high quantity of Diamondback Terrapin by-catch. Therefore, commercial crabbing in the reserves is an incompatible activity and should be eliminated. The current NCDMF proposal can be viewed as yet another attempt to postpone any serious effort to conserve Diamondback Terrapins on North Carolina's coast. The proposal, even with measures recently approved by the NCMFC (taking into consideration NC Blue Crab FMP Amendment 3), falls short of specifying measures that will restore, maintain, and conserve Blue Crab populations in North Carolina while maintaining the economic vitality of the fishery, nor does it meet the necessary criteria to conserve, protect, and restore Diamondback Terrapins within all North Carolina estuarine waters where they occur.

NCWF appreciates the opportunity to provide comments to the NCMFC and encourage their serious consideration to address the future of Blue Crab and Diamondback Terrapin populations in North Carolina. These public trust resources deserve the utmost consideration, which they have not received during the past 22 plus years of NCDMF and NCMFC deliberations. Also, we wish to commend NCDMF staff biologists Joe Facendola and Corinn Flora for their excellent and thorough presentation of the issues surrounding the DTMA proposal to the Southern Regional Advisory Committee, and their informative responses to questions asked by committee members during the April 8, 2020, virtual meeting and deliberations. Thanks are also due to Ms. Dana Gilliken for her expertise in coordinating the technical aspects of this first-ever virtual meeting of the committee, and to Committee Chair Dr. Fred Scharff for his leadership of the discussion.

Sincerely,

Tim Gestwicki

Chief Executive Officer

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Jeff Mette, North Carolina Herpetological Society, NC.

On behalf of the North Carolina Herpetological Society, I comment to urge the adoption of protective measures including the designation diamondback terrapin management areas and the use of diamondback terrapin excluder devices on crab pots.

For more than 40 years, the North Carolina Herpetological Society and its members have pursued the conservation of reptiles in North Carolina and around the world. Globally, turtle species are threatened with extinction due to human actions. In North Carolina, the diamondback terrapin is species of special concern.

Diamondback terrapin bycatch in crab pots has been shown to have substantial negative impacts on diamondback terrapins, and in fact crab pot bycatch mortality may be the most serious threat to diamondback terrapin populations in North Carolina. The small step of creating these management areas and requiring the use of excluder devices is needed to protect the species in North Carolina.

Again, I urge the adoption of these measures. Thank you for your consideration.

Sincerely,

Mr. Jeff Mette

President, North Carolina Herpetological Society

Mark William Ragozzino, Wilmington, NC

North Carolinians have the opportunity to: (1) reverse the rapid decline of the diamond back terrapin, (2) increase market demand for North Carolina crab and (3) create an unperturbed research site for future preservation of the blue crab fishery in North Carolina.

The booming North Carolina blue crab fishery is unintentionally drowning diamondback terrapins as bycatch. As a result, Seafoodwatch.org recommends that consumers do not buy North Carolina blue crab. Competing states using bycatch reducing devices are not subject to this ban. This ban reduces demand for North Carolina crab for major vendors such as Whole Foods.

Masonboro National Estuarine Research Reserve (NCNERR) and Bald Head Island estuaries, comprise less than 0.3 % of North Carolina estuarine waters. The NCNERR was "… established for long-term research, education and stewardship." Heavy commercial crabbing now allowed in these areas reduces their value as laboratories for maximizing the productivity and future viability of the North Carolina crab fishery.

Designation of Masonboro and Bald Head estuaries for terrapin and blue crab population studies will protect the future of the entire North Carolina crab fishery for the remaining 99.7% of the state estuarine waters and put more money into the pockets of the great majority of North Carolina crabbers.

Jeff Hall, Greenville, NC

I would like to take this time to thank the North Carolina Division of Marine Fisheries (NCDMF) for the opportunity to comment on the proposed Diamondback Terrapin (Malaclemys terrapin) Management Areas (DTMAs). Although I appreciate this first step of establishing some DTMAs, I suggest this is only the first step in a line of many that would truly represent an important step in the conservation of Diamondback Terrapins in NC. Because the Diamondback Terrapin is a Special Concern species in NC, it only makes sense to take more sweeping actions to help prevent an elevated listing status or even extirpation from NC waters.

I strongly recommend consideration of a variety of additional steps which would more effectively ensure the long-term ecological vitality of Diamondback Terrapin populations in North Carolina.

- Extend the DTMAs from the proposed areas to all areas of the state known to support the Diamondback Terrapin. This would essentially be the entire Coast. Terrapins are killed in all areas, not just the areas proposed for DTMAs.

- Implement a requirement for Bycatch Reduction Devices (BRDs) in all North Carolina waters where Diamondback Terrapins occur (i.e., depth and distance from shore). This preferred measure can easily be accomplished by fishermen and women through use of the excluder device recently developed by the Keck Environmental Laboratory (College of William and Mary, and South Carolina Department of Natural Resources Marine Resources Division), which excludes Diamondback Terrapins but retains Blue Crabs with minimal to no impact on catch (Grubbs et al. 2018).

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Thanks again for the opportunity to comment.

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Everett Blake III, Angier, NC

I feel that too often a turtle engagement is automatically associated with an endangered species. As a person pulling in a net with a CRFL holder, I have seen a common box turtle swim into a net while we were removing the net from the water. In most cases, an observer would have to classify the engagement as with a possible endangered species. There are certain gill nets, that when used properly, can target intended targets or targeted catches.

Aaron Ramus, Wilmington, NC

I'd like to begin by briefly describing my background in order to help others better understand my perspective on this issue. I'm from Beaufort, NC, and I've lived on the North Carolina coast my entire life. I hold a shellfish license (without SCFL), a CRFL, and have held a CRGL at times in the past. I'm also the operator of a NCDMF-authorized research sanctuary in Masonboro Sound, and I've spent the past 8 years conducting field research exclusively at low tide in the two National Estuarine Research Reserves that would be affected by the proposed regulation.

My purpose of writing here is not to question whether the proposed regulation is a good step in the right direction. After seeing a couple of dead terrapins in pots firsthand and releasing quite a few more that I found entrapped during low tide, I think it is. So, perhaps on some level, I might argue that this is a fair price to pay for conducting commercial fishing operations in National Estuarine Research Reserves. Yet, while I think we can all agree that the reduction of terrapin bycatch is a desirable conservation objective, I still have some concerns about the proposed DTMAs. These include (1) the underlying motivation for the proposed DTMAs and haste with which this process is being carried out as well as (2) what appears to be a serious deficiency of data on diamondback terrapin populations in these areas and the effectiveness of the proposed regulations in achieving the intended conservation outcome(s). In addition, I'd also like to raise some questions regarding (3) the true cost of compliance and (4) enforcement of the proposed DTMAs.

1. Diverging interests and misalignment in fisheries governance: a caution against haste

Regarding the motivation, or impetus, for the proposed DTMAs and haste with which this process is being undertaken, I'd like to first revisit some basic facts surrounding this situation. ALL North Carolina blue crabs from are currently listed in the 'Avoid' category on seafoodwatch.org because 'regulations to protect terrapins haven't been implemented'. According to the 2019 License-Statistics Annual Report issued by NCDMF, however, something like 95% of all North Carolina blue crab commercial landings occur in the northern parts of the state (e.g., Albemarle, Pamlico, etc.). It would thus seem to follow logically that these regulations are being fast-tracked through this process in order to get NC blue crabs off the 'Avoid' list as soon as possible, and thereby appease the 'northern crabbers' (who sell the vast majority of NC blue crab), despite the fact that they will not be the ones affected by these regulations, and who, in reality, are quite unlikely to subject themselves to these regulations willingly. My major point here is that the primary motivation for these regulations at present seems to be one of economic gain for some (i.e., so the 'northern crabbers' can sell more NC blue crab), rather than achieving desirable conservation outcomes. This is then coupled with the fact that there are clearly diverging interests between the parties involved. Such misalignment of motives and divergence in interests ultimately leads to an imbalanced situation that is a precarious breeding ground (and perhaps even recipe) for making bad management decisions, which do not achieve intended conservation outcomes. Even if our intentions were pure, this is not the way we want to go about this. The motivation here should be to achieve desirable conservation outcomes while also balancing them with the need for commercial fishing and food, and not just the economic gain of others in certain regions of the state.

2. A serious deficiency of data on DBT populations in the proposed DTMAs

Despite our general interest in this conservation issue and overwhelming concern for the well-being of these charismatic marine vertebrates, I strongly believe that any action taken on this issue should not only be supported by data, but also considered in such a way that the benefits and outcomes clearly outweigh the risk and costs (i.e., the ways should justify the means). Yet we know almost nothing at present about the size and demography of diamondback terrapin populations in either of two proposed DTMAs. Moreover, the most comprehensive data we do have on diamondback terrapin populations in the proposed DTMAs is less than ideal at best because it is collected by sampling methods with inherent bias, including namely what appears to be presence-only data derived from observations made by kayaking citizen scientist. Consequently, I'm not convinced that we even have a good handle on the scale of the issue at this time and this deficiency of data is problematic for a number of reasons:

First, simply observing something does not mean we have a good idea of the actual numbers in a population. For example, one might observe the same turtle 15 times on one day, but that doesn't mean there are 15 turtles.

Second, if we don't have good handle on the current population size in the proposed DTMAs, then how can we begin to measure success of the proposed regulations, or even progress toward achieving the intended conservation outcomes, for that matter?

Third, without good population estimates, how are we to weigh the costs against the benefits for the proposed regulations? For example, last year I visited Cobb Island in the Eastern Shore of Virginia, where I could count about 50 terrapin heads above the water at all times. So clearly the proposed regulations would make sense there. However, a previous study conducted by Chavez and Williard (2017) in North Carolina, which involved almost 2000 pot soaks over a two-year period, caught a total of just 14 terrapins. So, are we to do all of this just to save 14 turtles? That seems a little extreme to me.

Fourth, let's briefly consider an alternative scenario here, in which we'll go ahead and say that these regulations are passed and implemented. How do we know for a fact that this will not only (a) reduce terrapin bycatch (which I do believe there is sufficient evidence for), but also (b) achieve an increase in the overall terrapin populations within the DTMAs, i.e., the intended conservation outcome? If we do (a) without (b), then what's the point? Where are we then? My point being that it's important to consider the realized effectiveness of the proposed regulations in relation to their intended outcomes in a way that is both balanced and holistic. For example, if we start to consider the drivers of the decline in diamondback terrapins, one might make a valid argument that a combination of direct exploitation (hunting for meat) and recently coastal development and subsequent habitat loss have overwhelmingly contributed to the current situation we find ourselves in today with the diamondback terrapin being listed as a vulnerable 'species of concern; If this is true, the situation may already be irreparable such that all conservation measures taken now are done in vain without us first tackling the root of the problem.

Finally, are there alternative pot designs and configurations, such as modifications to entrances, that may prove more effective at catching crabs and excluding terrapins? The jury is still out on this, but I think these things should also be considered before moving forward.

3. The true cost of compliance

The actual cost of compliance is likely to be two- or threefold for the commercial fisherman affected by the proposed regulations, yet though they almost certainly do not stand to benefit economically from them. First, this includes the costs of materials and time required for retrofitting pots with BRDs, which is not trivial. For example, if we assume a cost of $20 for materials and labor to retrofit each pot, and you have 150 pots, that's a total of $3000. Especially during these volatile economic times, that alone may push low-income commercial fisherman past their breaking point. Second, we also need to factor in the high likelihood of not only reductions in the overall number of legal crabs caught, but also a reduction in the size of crabs (and, thus, the number of 'Number Ones') that are caught in pots equipped with BRDS, which local crabbers describe as the 'bread and butter' of their catch. For example, previous work conducted by Chavez and Williard (2017) in Masonboro suggests a reduction in mean crab catch from 2.1 in conventional pots to 1.0 in pots equipped with BRDs (a 52% decrease); whereas Roosenberg and Green (2000) suggest that BRDs have a significant effect on the size of crabs caught because the larger 'Number Ones' were excluded. Regardless, my point here is that the proposed DTMAs seem particularly unfair to the commercial crab fishermen who will be affected by these regulations. They are the minority who will ultimately be forced to front the bill for this, in order to benefit the larger blue crab industry from the northern part of the state, even though they do not stand to benefit from these regulations themselves. Given how unfair that seems, perhaps DMF or the 'northern crabbers' should consider the possibility of providing some financial assistance to help defray the cost of compliance for the fisherman affected, and thereby make these regulations somewhat more palatable.

Furthermore, and although I assume this to be the case, it remains unclear at present whether these regulations will also apply to recreational pots in the proposed DTMAs. There are considerably more recreational crab pots (fished by CRGL holders) in the proposed Masonboro DTMA than you may think, and failure to account for this could potentially undermine the intended outcome(s) of this conservation measure.

4. Issues with compliance and enforcement in areas of intertidal treachery

For one to call navigating in the proposed DTMAs a treacherous endeavor would be a gross understatement. Masonboro and Zekes are largely intertidal in nature and scatted with what is arguably the greatest diversity of underwater obstructions found anywhere in this state, ranging from natural and manmade oyster reefs to countless derelict crab pots (there is no 'ghost pot' cleanup here to my knowledge) and even granite rocks that were delivered from the mountains in the late 1800s. It's taken me years to develop an intimate knowledge of the ins and outs of these places, and even I would have an extremely difficult time with enforcing these regulations if that was my job. At this time, I'm not aware that Marine Patrol ever ventures beyond the safety of the ICW, which leaves much of the proposed DTMAs comparable to the old American 'wild west'.

So, unless Marine Patrol has an airboat that I don't know about (??), how do you propose to achieve enforcement of these regulation in the DTMAs? I would normally reference the 'tragedy of the commons' here, but I think we all know that gentleman's rules do not work in fisheries.

Moreover, it's also important to consider the actual cost of enforcement here, which essentially boils down to two things: manpower and time. Consequently, I must question whether it is in our collective best interest for Marine Patrol to be devoting their already limited resources to saving a few terrapins, when that time and money might be better spent enforcing new regulations to ensure the future of the southern flounder fishery.

In summary, I firmly believe the issues outlined above need to be fully considered and completely though through before moving forward with the adoption of any new regulations. I hope you agree.

Sincerely,

-Aaron