

# Predraft for Amendment 5b to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan



Atlantic Highly Migratory Species Management Division  
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## 1.0 INTRODUCTION

This document is a Predraft for Amendment 5b to the 2006 Consolidated Atlantic Highly Migratory Species (HMS) Fishery Management Plan (FMP). A Predraft document allows the National Marine Fisheries Service (NMFS) to obtain additional information and input from Consulting Parties on potential alternatives prior to development of the formal Draft Environmental Impact Statement (DEIS) and proposed rule. The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires NMFS to “consult with and consider the comments and views of affected [Regional Fishery Management] Councils, commissioners, and advisory groups appointed under Acts implementing relevant international fishery agreements pertaining to highly migratory species, and the [HMS] advisory panel in preparing and implementing any fishery management plan or amendment.” As such, NMFS is requesting comments and views on this Predraft document for Amendment 5b to the 2006 Consolidated HMS FMP (Amendment 5b). An electronic version of this Predraft is also available on the website of the HMS Management Division at: <http://www.nmfs.noaa.gov/sfa/hms>.

NMFS previously considered alternatives for management of dusky sharks in Draft Amendment 5, which proposed measures that were designed to reduce fishing mortality and effort in order to rebuild various overfished Atlantic shark species, including dusky sharks, while ensuring that a limited sustainable shark fishery for certain species could be maintained consistent with legal obligations and the 2006 Consolidated HMS FMP. After reviewing all of the comments received, NMFS decided to conduct further analyses on measures pertaining to dusky sharks in an FMP amendment, EIS, and proposed rule separate from but related to the FMP amendment, EIS, and rule for the other species of sharks. This Predraft is the first step in that process and NMFS is considering alternatives that were not within the scope of the original proposals and new information. NMFS prepared this Predraft considering the feedback it received on those initial proposals and to solicit additional public input and meaningful consultation with its Advisory Panel at its Spring 2014 meeting. NMFS is developing Amendment 5b in response to the results of the Southeast Data, Assessment, and Review (SEDAR) 21 dusky shark stock assessment and public comment received on Draft Amendment 5 to the 2006 Consolidated HMS FMP.

NMFS anticipates that the proposed rule and DEIS will be available in Fall 2014 and that Final Amendment 5b and its related documents will be available sometime in 2015. Given the time frame, NMFS requests receipt of any comments on this Predraft by April 30, 2014.

Any written comments on this Predraft should be submitted to Peter Cooper, HMS Management Division, F/SF1, Office of Sustainable Fisheries, 1315 East-West Highway, Silver Spring, MD 20910 or emailed to [peter.cooper@noaa.gov](mailto:peter.cooper@noaa.gov) by April 30, 2014. For further information, contact Peter Cooper or Karyl Brewster-Geisz at (301) 427-8503.

This Predraft includes a summary of the anticipated purpose and need (Chapter 1) of Amendment 5b, potential recreational and commercial management alternatives that could meet that purpose and need (Chapter 2), and a preliminary summary of the potential environmental, social, and economic impacts of these management alternatives (Chapter 3). The alternatives

outlined in Chapter 2 may be modified, removed, or supplemented in the DEIS based on any comments received on this Predraft, additional analyses, and other factors, as appropriate.

NMFS specifically solicits opinions and advice on the potential range of alternatives and whether there are additional alternatives that should be addressed and considered in the rulemaking process. Additionally, NMFS solicits opinions and advice on the impacts described for each alternative.

## **1.1 Management History**

On November 28, 1990, the President of the United States signed into law the Fishery Conservation Amendments of 1990 (Pub. L. 101-627). This law amended the Magnuson Fishery Conservation and Management Act (later renamed the Magnuson-Stevens Fishery Conservation and Management Act or Magnuson-Stevens Act) and gave the Secretary of Commerce (Secretary) the authority (effective January 1, 1992) to manage HMS in the exclusive economic zone (EEZ) of the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea under authority of the Magnuson-Stevens Act (16 U.S.C. §1811). This law also transferred from the Fishery Management Councils to the Secretary, effective November 28, 1990, the management authority for HMS in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea (16 U.S.C. §1854(f)(3)). At that time, the Secretary delegated authority to manage Atlantic HMS to NMFS.

The HMS Management Division within NMFS develops regulations for HMS fisheries, although some actions (e.g., Large Whale Take Reduction Plan) are taken by other NMFS offices if the main legislation (e.g., Marine Mammal Protection Act) requiring action is not the Magnuson-Stevens Act or the Atlantic Tunas Convention Act (ATCA). NMFS management of HMS species has components at the international, national, and state levels because of the highly migratory nature of these species. NMFS primarily coordinates the management of HMS fisheries in Federal waters (domestic) and the high seas (international) while individual states establish regulations for HMS in state waters. There are exceptions to this generalization. For example, Federal bluefin tuna regulations apply by law in most state waters and federally permitted shark and swordfish fishermen, as a condition of their permit, are required to follow Federal regulations in all waters, including state waters, unless the state has more restrictive regulations. Additionally, the Atlantic States Marine Fisheries Commission (ASMFC) developed a Coastal Shark Interstate FMP. This Interstate FMP coordinates management measures among all states along the Atlantic coast (Florida to Maine). NMFS participated in the development of this interstate shark FMP, which became effective in 2010.

### **1.1.1 Pre-1999 Atlantic Shark Fisheries and Management**

In the early 1900s, a Pacific shark fishery supplied limited demands for fresh shark fillets and fish meal as well as a more substantial market for dried fins of soupfin sharks (*Galeorhinus zyopterus*). In 1937, the price of soupfin shark liver skyrocketed when it was discovered to be the richest source of vitamin A available in commercial quantities. A shark fishery in the Caribbean Sea, off the coast of Florida, and in the Gulf of Mexico developed in response to this demand (Wagner, 1966). At that time, shark fishing gear included gillnets, hook and line, anchored bottom longlines (BLL), floating longlines, and benthic lines for deepwater fishing. These gear types are slightly different than the gears used today and are fully described in Wagner (1966). By 1950, the availability of synthetic vitamin A caused most shark fisheries to be abandoned (Wagner, 1966).

The U.S. Atlantic shark fishery developed rapidly in the late 1970s due to increased demand for shark meat, fins, and cartilage. At the time, sharks were perceived to be underutilized as a fishery resource. The high commercial value of shark fins led to the controversial practice of

finning, or removing the valuable fins from sharks and discarding the carcass at sea. Growing demand for shark products encouraged expansion of the commercial fishery throughout the late 1970s and the 1980s. Tuna and swordfish vessels began to retain a greater proportion of their shark incidental catch and conduct some directed fishing. The Secretary published the Preliminary FMP for Atlantic Billfish and Sharks in 1978, which noted, among other things, the need for international management regarding sharks. Catches accelerated through the 1980s, with peak commercial landings of large coastal and pelagic sharks reported in 1989.

In 1989, the five Atlantic Fishery Management Councils (Councils) asked the Secretary to develop a Shark FMP. The Councils were concerned about the late maturity and low fecundity of sharks, the increase in fishing mortality, and the possibility of the resource being overfished. The Councils requested that the FMP cap commercial fishing effort, establish a recreational bag limit, prohibit “finning,” and begin a data collection system.

In 1993, the Secretary of Commerce, through NMFS, implemented the FMP for Sharks of the Atlantic Ocean (1993 Shark FMP). At that time, NMFS identified large coastal sharks (LCS) as overfished and pelagic and small coastal sharks (SCS) as fully fished. The quotas were 2,436 mt dressed weight (dw) for LCS and 580 mt dw for pelagic sharks. No quota was established for the SCS complex to limit SCS fishing. Under the rebuilding plan established in the 1993 FMP, the LCS quota was expected to increase every year from 1993 to 1995 up to 3,787 mt dw, which was the maximum sustainable yield (MSY) estimated in the 1992 stock assessment.

A number of difficulties arose in the initial year of implementation of the 1993 Shark FMP that resulted in a short season and low ex-vessel prices. To address these problems, a commercial trip limit of 4,000 lb dw for permitted vessels for LCS was implemented on December 28, 1993 (58 FR 68556), and a control date for the Atlantic shark fishery was established on February 22, 1994 (59 FR 8457). A final rule implementing additional measures authorized by the FMP published on October 18, 1994 (59 FR 52453).

In 1994, under the rebuilding plan implemented in the 1993 Shark FMP, the LCS quota was increased to 2,570 mt dw. However, a new stock assessment was completed in March 1994 that indicated LCS rebuilding could take as long as 30 years and suggested a more cautious approach for pelagic sharks and SCS. A final rule that capped quotas for LCS and pelagic sharks at the 1994 levels was published on May 2, 1995 (60 FR 21468).

In June 1996, NMFS convened another stock assessment to examine the status of LCS stocks. The 1996 stock assessment found no clear evidence that LCS stocks were rebuilding and concluded that “[a]nalyzes indicate that recovery is more likely to occur with reductions in [the] effective fishing mortality rate of 50 [percent] or more.” In response to these results, in 1997, NMFS reduced the LCS commercial quota by 50 percent to 1,285 mt dw and the recreational retention limit to two LCS, SCS, and pelagic sharks combined per trip with an additional allowance of two Atlantic sharpnose sharks (*Rhizoprionodon terraenovae*) per person per trip (62 FR 16648, April 2, 1997). In this same rule, NMFS established an annual commercial quota for SCS of 1,760 mt dw and prohibited possession of five species (sand tiger, bigeye sand tiger, whale, basking, and white sharks). As a result of litigation, NMFS prepared additional economic analyses on the 1997 LCS quotas and was allowed to maintain those quotas during resolution of the case.

In June 1998, NMFS conducted another LCS stock assessment. The 1998 stock assessment found that LCS were overfished and would not rebuild under the 1997 harvest levels. Based in part on the results of the 1998 stock assessment, in April 1999, NMFS published the 1999 FMP for Atlantic Tunas, Swordfish, and Sharks (1999 FMP), which included numerous measures to rebuild or prevent overfishing of Atlantic sharks in commercial and recreational fisheries. The 1999 FMP replaced the 1993 Atlantic Shark FMP. Management measures related to sharks that changed in the 1999 FMP included, but were not limited to, reducing commercial LCS and SCS quotas, modifying the pelagic shark quotas, reducing the recreational retention limits for all sharks, establishing a recreational minimum size for all sharks except Atlantic sharpnose, expanding the list of prohibited shark species to 19 species, implementing limited access in commercial shark fisheries, and establishing a shark public display quota. Finally, the 1999 FMP identified essential fish habitat (EFH) for all Atlantic tunas, swordfish, and sharks. As part of the 1999 FMP, the regulations for all Atlantic HMS, including billfish, were consolidated into one part of the Code of Federal Regulations, 50 CFR Part 635.

The implementing regulations were published on May 28, 1999 (64 FR 29090). However, in July 1999, the District Court for the Middle District of Florida enjoined implementation of the 1999 shark regulations because of ongoing litigation on the 1997 quotas. A year later, on June 12, 2000, the case was settled and the court issued an order clarifying that NMFS could proceed with implementation and enforcement of the 1999 prohibited species provisions (64 FR 29090, May 28, 1999).

### **1.1.2 Amendment 1 to the FMP for Atlantic Tunas, Swordfish, and Sharks**

As noted in Section 1.1.1, in 1999, a court enjoined the Agency from implementing many of the shark-specific regulations of the 1999 FMP. In 2000, the injunction was lifted when a settlement agreement was entered to resolve the 1997 and 1999 lawsuits. The settlement agreement required, among other things, an independent (i.e., non-NMFS) review of the 1998 LCS stock assessment. The settlement agreement did not address any regulations affecting the pelagic shark, prohibited species, or recreational shark fisheries. Once the injunction was lifted, on January 1, 2001, the pelagic shark quotas adopted in the 1999 FMP were implemented (66 FR 55). On March 6, 2001, NMFS published an emergency rule implementing the settlement agreement (66 FR 13441). This emergency rule expired on September 4, 2001, and established the LCS and SCS commercial quotas at 1997 levels.

In late 2001, the Agency received the results of the peer review of the 1998 LCS stock assessment. These peer reviews found that the 1998 LCS stock assessment was not the best available science for LCS. Taking into consideration the settlement agreement, the results of the peer reviews of the 1998 LCS stock assessment, catch rates, and the best available scientific information (not including the 1998 stock assessment projections), NMFS implemented another emergency rule for the 2002 fishing year that suspended certain measures under the 1999 regulations pending completion of new LCS and SCS stock assessments and a peer review of the new LCS stock assessment (66 FR 67118, December 28, 2001; extended 67 FR 37354, May 29, 2002). Specifically, NMFS maintained the 1997 LCS commercial quota (1,285 mt dw), maintained the 1997 SCS commercial quota (1,760 mt dw), suspended the commercial ridgeback LCS minimum size, suspended counting dead discards and state landings after a Federal closure

against the quota, and replaced season-specific quota accounting methods with subsequent-season quota accounting methods. That emergency rule expired on December 30, 2002. On October 17, 2002, NMFS announced the availability of the 2002 LCS stock assessment and the workshop meeting report (67 FR 64098). The results of this stock assessment indicated that the LCS complex was still overfished and overfishing was occurring. Additionally, the 2002 LCS stock assessment found that sandbar sharks were no longer overfished but that overfishing was still occurring and that blacktip sharks were rebuilt and overfishing was not occurring. Based on the results of both the 2002 SCS and LCS stock assessments, NMFS implemented an emergency rule to ensure that the commercial management measures in place for the 2003 fishing year were based on the best available science (67 FR 78990, December 27, 2002; extended 68 FR 31987, May 29, 2003). Specifically, the emergency rule implemented the LCS ridgeback/non-ridgeback split established in the 1999 FMP, set the LCS and SCS quotas based on the results of stock assessments, suspended the commercial ridgeback LCS minimum size, and allowed both the season-specific quota adjustments and the counting of all mortality measures to go into place.

In December 2003, NMFS implemented, by regulation, Amendment 1 to the 1999 FMP (68 FR 74746; NMFS 2003). These regulations were based on the 2002 small and large coastal shark stock assessments. Some of the measures established in Amendment 1 included revising the rebuilding timeframe for LCS; re-aggregating the LCS complex; establishing a method of changing the quota based on MSY; updating some shark EFH identifications; modifying the quotas, seasons, and regions; adjusting the recreational bag limit; establishing criteria to add or remove species to the prohibited shark list; establishing gear restrictions to reduce bycatch and bycatch mortality; establishing a time/area closure off North Carolina for BLL fishermen; and establishing vessel monitoring system requirements for BLL and gillnet fishermen.

In addition, in 2004 the International Commission for the Conservation of Atlantic Tunas (ICCAT) adopted a recommendation concerning Atlantic sharks. The recommendation included measures regarding shark finning, research on gears and shark nursery areas, stock assessment schedules for shortfin mako (*Isurus oxyrinchus*) and blue sharks (*Prionace glauca*), and submission of shark data. ICCAT completed stock assessments for shortfin mako and blue sharks in 2004. This work included a review of their biology, a description of the fisheries, analyses of the state of the stocks and outlook, analyses of the effects of current regulations, and recommendations for statistics and research. The Standing Committee on Research and Statistics (SCRS) assessment indicated that the current biomass of North and South Atlantic blue sharks was above MSY ( $B > BMSY$ ), however, the SCRS noted that these results were conditional and based on assumptions that were made by the committee. These assumptions indicate that blue sharks were not overfished. This conclusion was conditional and based on limited landings data. The North Atlantic shortfin mako population had experienced some level of stock depletion, as suggested by the historical catch-per-unit-effort trend and model outputs. The stock may have been below MSY ( $B < BMSY$ ), suggesting that the species may have been overfished (SCRS, 2004).

### **1.1.3 The 2006 Consolidated HMS FMP**

NMFS issued two separate FMPs in April 1999 for the Atlantic HMS fisheries (NMFS 1999a; NMFS 1999b). As discussed previously above, the 1999 Fishery Management Plan for Atlantic

Tunas, Swordfish, and Sharks, combined, amended, and replaced previous management plans for swordfish and sharks, and was the first FMP for tunas. Amendment 1 to the Billfish Management Plan updated and amended the 1988 Billfish FMP.

During the time that these two FMPs co-existed, there had been a growing recognition by the Agency of the interrelated nature of these fisheries and the need to consolidate management actions. In addition, the Agency had identified some adverse ramifications stemming from separation of the plans, including administrative redundancy and complexity, loss of efficiency, and public confusion over the management process. Therefore, NMFS proposed to improve coordination of the conservation and management of the domestic fisheries for Atlantic swordfish, tunas, sharks and billfish by consolidating all HMS management measures into one FMP. The final Consolidated HMS FMP was completed in July 2006 and the implementing regulations were published on October 2, 2006 (71 FR 58058).

The 2006 Consolidated HMS FMP changed certain management measures, adjusted regulatory framework measures, and continued the process for updating HMS EFH. Measures that are specific to the shark fisheries include mandatory workshops and certifications for all vessel owners and operators that have PLL or BLL gear on their vessels and that have been issued or are required to be issued any of the HMS limited access permits to participate in HMS longline and gillnet fisheries. The aim of these workshops is to provide information and ensure proficiency with equipment to handle, release, and disentangle sea turtles, smalltooth sawfish, and other non-target species. The Consolidated HMS FMP also requires Federally permitted shark dealers to attend Atlantic shark identification workshops to train shark dealers how to properly identify shark carcasses. Additional measures specific to sharks include the differentiation between pelagic longline and bottom longline gear based upon the species composition of the catch onboard or landed, the requirement that the second dorsal fin and the anal fin remain on all Atlantic sharks through landing, and a new prohibition making it illegal for any person to sell or purchase any HMS that was offloaded from an individual vessel in excess of the retention limits specified in § 635.23 and 635.24. The 2006 Consolidated HMS FMP also implemented complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserves and established criteria to consider when implementing new time/area closures or making modifications to existing time/area closures.

Based on the 2002 SCS stock assessment, which found that finetooth sharks (*Carcharhinus isodon*) were not overfished but that overfishing was occurring on the stock, the 2006 Consolidated HMS FMP included a plan to prevent overfishing by expanding observer coverage, collecting more information on where finetooth sharks are landed, and coordinating with other fisheries management entities that were contributing to finetooth shark fishing mortality. The 2007 stock assessment of SCS in the U.S. Atlantic and Gulf of Mexico (72 FR 63888, November 13, 2007), found, among other things, that finetooth sharks were not experiencing overfishing, but blacknose sharks (*Carcharhinus acronotus*) were overfished with overfishing occurring. This peer reviewed assessment, which was conducted according to the SEDAR process, provides an update from the 2002 stock assessment on the individual status of SCS stocks and projects their future abundance under a variety of catch levels in the U.S. Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. The 2007 assessment includes updated catch estimates, new

biological data, and a number of fishery-independent catch rate series, as well as fishery-dependent catch rate series.

In 2007, NMFS expanded the equipment required for the safe handling, release, and disentanglement of sea turtles caught in the Atlantic shark BLL fishery (72 FR 5633, February 7, 2007). As a result, equipment required for BLL vessels is now consistent with the requirements for the PLL fishery. Furthermore, this action implemented several year-round BLL closures to protect EFH.

#### **1.1.4 Amendment 2 to the 2006 Consolidated HMS FMP**

On April 10, 2008, NMFS released the Final Environmental Impact Statement (FEIS) for Amendment 2 to the 2006 Consolidated HMS FMP (Amendment 2) based on several stock assessments that were completed in 2005/2006 (NMFS 2008). Assessments for dusky (*Carcharhinus obscurus*) and sandbar sharks (*Carcharhinus plumbeus*) indicated that these species were overfished with overfishing occurring and that porbeagle sharks (*Lamna nasus*) are overfished. NMFS implemented management measures consistent with recent stock assessments for sandbar, porbeagle, dusky, blacktip (*Carcharhinus limbatus*), and the LCS complex. The implementing regulations were published on June 24, 2008 (73 FR 35778; corrected version published July 15, 2008; 73 FR 40658). Management measures implemented in Amendment 2 included, but were not limited to, establishing rebuilding plans for porbeagle, dusky, and sandbar sharks consistent with stock assessments, implementing commercial quotas and retention limits consistent with stock assessment recommendations to prevent overfishing and rebuild overfished stocks, modifying recreational measures to reduce fishing mortality of overfished/overfishing stocks, modifying reporting requirements, requiring that all Atlantic sharks be offloaded with fins naturally attached, collecting shark life history information via the implementation of a shark research program, and implementing time/area closures recommended by the South Atlantic Fishery Management Council.

#### **1.1.5 Amendment 3 to the 2006 Consolidated HMS FMP**

Based on the 2007 SCS stock assessment (SEDAR 13), which was an update to the 2002 SCS stock assessment, NMFS determined blacknose sharks to be overfished with overfishing occurring in 2008 (73 FR 25665; May 7, 2008). In 2008, the ICCAT SCRS conducted an updated species-specific stock assessment for North Atlantic shortfin mako sharks. The ICCAT stock assessment found the stock is experiencing overfishing and is not overfished, but is approaching an overfished condition. Based on this stock assessment, NMFS determined that North Atlantic shortfin mako sharks had been experiencing overfishing as of December 31, 2008 (74 FR 29185, July 19, 2009). To address the results of these stock assessments, NMFS released the FEIS for Amendment 3 to the 2006 Consolidated HMS FMP (Amendment 3) to implement management measures to rebuild blacknose sharks and end overfishing of blacknose and shortfin mako shark (NMFS 2010). This amendment also added smoothhound sharks (smooth dogfish (*mustelus canis*) and Florida smoothhound (*Mustelus norrisi*)) under NMFS management. The implementing regulations were published on June 1, 2010 (75 FR 30484; June 1, 2010). Management measures implemented in Amendment 3 included, but were not limited to, establishing a non-blacknose SCS quota of 221.6 mt dw, and a blacknose shark quota of 19.9 mt dw. Quotas are linked so that both fisheries close when one of the quotas is reached.

Implementation of smoothhound management measures analyzed in Amendment 3 was initially delayed until the 2012 fishing season. However, the later enacted Shark Conservation Act of 2010 required NMFS to re-evaluate its shark management measures. Therefore, NMFS delayed the effective date of implementation to fully consider the Shark Conservation Act implications and allow time for Section 7 consultation under the Endangered Species Act (ESA) to be completed. The final rule to delay these measures became effective in December 2011 (76 FR 70064, November 10, 2011). The relevant regulatory sections will be re-established, with any needed amendments, in a final rule that implements both the smoothhound shark provisions of the Shark Conservation Act and any requirements of the Section 7 consultation regarding smoothhound sharks.

#### **1.1.6 Amendments 5, 5a, and 5b to the 2006 Consolidated HMS FMP**

Based on a stock assessment for scalloped hammerhead sharks, NMFS made the determination on April 28, 2011, that scalloped hammerhead sharks are overfished and experiencing overfishing (76 FR 23794). Following this determination, on October 7, 2011, NMFS published a notice announcing the intent to prepare Amendment 5 to the 2006 Consolidated HMS FMP with an Environmental Impact Statement in accordance with the requirements of the National Environmental Policy Act (76 FR 62331). NMFS made stock status determinations for sandbar, dusky, and blacknose sharks based on the results of SEDAR 21. Determinations in the October 2011 notice included that sandbar sharks are still overfished, but no longer experiencing overfishing, and that dusky sharks are still overfished and still experiencing overfishing (i.e., their stock status has not changed). The October 2011 notice also acknowledged that there are two stocks of blacknose sharks, the Atlantic blacknose shark stock and the Gulf of Mexico blacknose shark stock. The determination stated that the Atlantic blacknose shark stock is overfished and experiencing overfishing, and the Gulf of Mexico blacknose shark stock status is unknown.

A Federal Register notice on May 29, 2012 (77 FR 31562), notified the public that NMFS was considering the addition of Gulf of Mexico blacktip sharks to Amendment 5 to the 2006 Consolidated HMS FMP. This addition was proposed because Gulf of Mexico blacktip sharks were undergoing a stock assessment as part of the SEDAR 29 process, and that process would be completed before Amendment 5 to the 2006 Consolidated HMS FMP was finalized. Therefore, NMFS determined that the addition of Gulf of Mexico blacktip sharks to Amendment 5 to the 2006 Consolidated HMS FMP would allow NMFS to address new scientific information in the timeliest manner and facilitate administrative efficiency by optimizing our resources. NMFS also expected that this addition would provide better clarify and communicate to the public any possible impacts of the rulemaking on shark fisheries by combining potential management measures resulting from recent shark stock assessments into fewer rulemakings. Since publication of the Federal Register notice announcing the intent to consider the addition of Gulf of Mexico blacktip sharks in Amendment 5 to the 2006 Consolidated HMS FMP, NMFS accepted the results of the stock assessment as final. The results indicated that the Gulf of Mexico blacktip shark stock is not overfished and overfishing is not occurring.

The Notice of Availability of the DEIS for Amendment 5 to the 2006 Consolidated HMS FMP and the proposed rule published in the Federal Register on December 7, 2012 (77 FR 73029), and

November 26, 2012 (77 FR 70552), respectively. The public comment period ended on February 12, 2013.

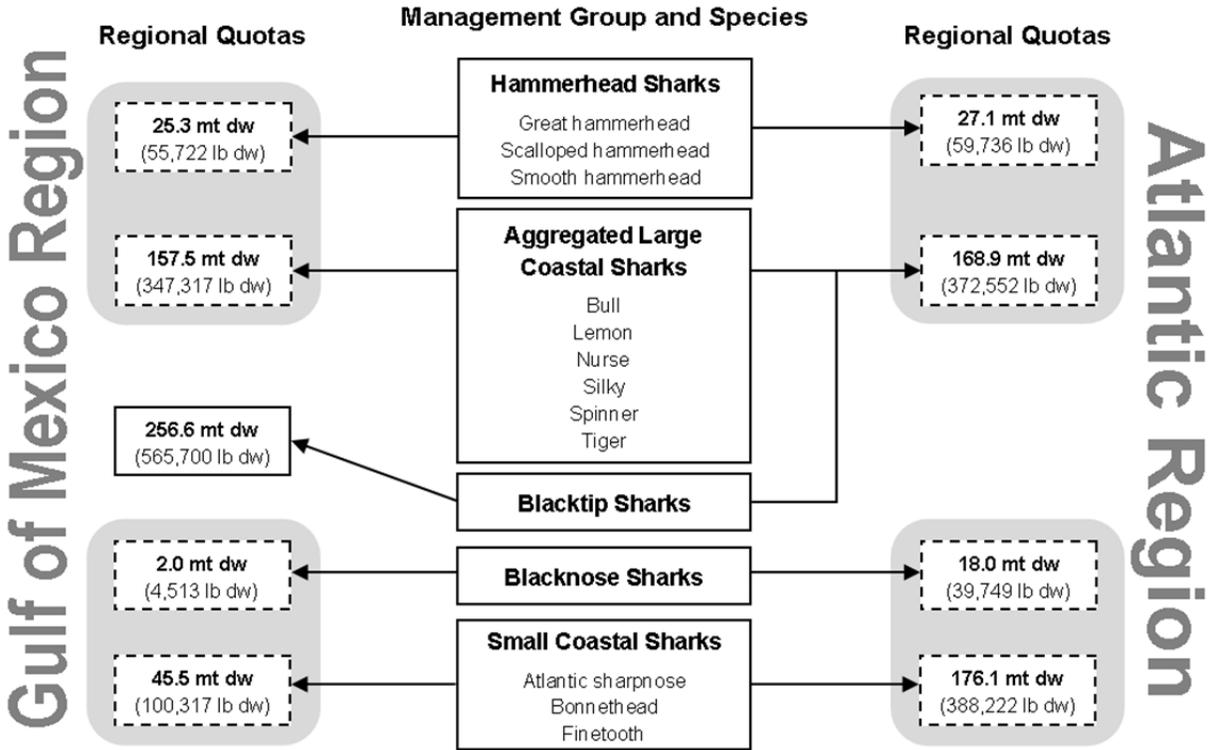
#### *Decision to Split Amendment 5 into Amendments 5a and 5b*

During the comment period, NMFS received numerous comments on the proposed dusky shark measures regarding the data sources used and the analyses of these data. NMFS also received many comments requesting consideration of approaches to dusky shark fishery management that were significantly different from those NMFS proposed and analyzed in the Amendment 5 proposed rule and DEIS. For example, commenters suggested exemptions to the proposed recreational minimum size increase that would protect dusky sharks but still allow landings of other sharks--such as blacktip sharks or “blue” sharks such as shortfin mako and thresher sharks--and other commenters suggested implementing gear restrictions instead of additional pelagic longline closures.

After reviewing all of the comments received, NMFS concluded that further analyses were needed for dusky shark measures and decided to conduct further analyses on those measures pertaining to dusky sharks in an FMP amendment, EIS, and proposed rule separate from but related to the existing FMP amendment, EIS, and rule for the other species of sharks.

#### *Amendment 5a*

The FMP amendment for non-dusky shark species (scalloped hammerhead, sandbar, blacknose, and Gulf of Mexico blacktip sharks) included in draft Amendment 5 was renamed “Amendment 5a” and continued to be developed into a final rule and FEIS. The final rule for Amendment 5a to the 2006 Consolidated HMS FMP was published on July 3, 2014 (78 FR 4038) and finalized the shark measures from the November 2012 proposed rule to maintain rebuilding of sandbar sharks; end overfishing and rebuild scalloped hammerhead and Atlantic blacknose sharks; and establish a TAC and commercial quota and recreational measures for Gulf of Mexico blacknose and blacktip sharks (NMFS 2013). The new management groups, commercial quotas, and quota linkages, which became effective on July 3, 2013, are outlined in Figure 1.1 below. The new recreational minimum size limit for hammerhead (great, scalloped, and smooth) sharks of 78 inches fork length became effective on August 2, 2013.



**Figure 1.1: Diagram of Management Group, Commercial Quotas, and Quota Linkages Resulting From the Implementation of Amendment 5a to the 2006 Consolidated HMS FMP. Source: NMFS 2013.**

*Amendment 5b*

Draft Amendment 5 proposed measures that were designed to reduce fishing mortality and effort in order to rebuild various overfished Atlantic shark species, including dusky sharks, while ensuring that a limited sustainable shark fishery for certain species could be maintained consistent with our legal obligations and the 2006 Consolidated HMS FMP. The proposed measures included changing commercial quotas and species groups, establishing several new time/area closures, changing an existing time/area closure, increasing the recreational minimum size for sharks, and establishing recreational reporting for certain species of sharks. After reviewing all of the comments received, we decided to conduct further analyses on measures pertaining to dusky sharks in an FMP amendment, EIS, and proposed rule separate from but related to the FMP amendment, EIS, and rule for the other species of sharks. The future FMP amendment for dusky sharks was renamed “Amendment 5b,” and NMFS indicated that it would explore a variety of alternatives to rebuild dusky sharks, and will likely consider alternatives similar to those considered in draft Amendment 5 as well as new alternatives based on comments, including comments received on the dusky shark measures in draft Amendment 5. This Predraft is the next step in the development of Amendment 5b.

## 1.2 Recent Dusky Shark Stock Assessment

### *2010/2011 Stock Assessment and Rebuilding Timeframe for Dusky Sharks*

The latest stock assessment for dusky sharks was completed through SEDAR 21 in 2011 (76 FR 62331, October 7, 2011). The stock assessment provided an update to the 2006 dusky shark stock assessment. The 2010/2011 stock assessment is the first assessment for dusky sharks conducted within the SEDAR process. Based on the 2006 assessment, dusky sharks were determined to be overfished and experiencing overfishing, and a rebuilding plan is currently in place for this species. The base model used for the 2010/2011 assessment showed that dusky sharks continue to be overfished (spawning stock biomass [ $SSB$ ]<sub>2009</sub>/ $SSB_{MSY}$ =0.44) and are still experiencing overfishing ( $F_{2009}/F_{MSY}$ =1.59). In addition, 19 sensitivity analyses were performed during the assessment cycle. The review panel at the independent peer-review panel workshop selected four sensitivity runs in addition to the base model to assess the underlying states of nature of the stock. Current biomass (*i.e.*,  $SSB$ ) values from these selected sensitivity runs all indicated that the stock is overfished ( $SSB_{2009}/SSB_{MSY}$ =0.41-0.50). In addition,  $F$  values from the selected sensitivity runs indicated that the stock is currently experiencing overfishing ( $F_{2009}/F_{MSY}$ =1.39-4.35). Based on this, NMFS determined that dusky sharks are still overfished and experiencing overfishing.

The 2006 assessment predicted that dusky sharks could rebuild within 100 to 400 years. The rebuilding year determined from the base model in the 2010/2011 assessment was calculated as the year the stock would rebuild with no fishing pressure (*i.e.*,  $F=0$ ), or 2059, plus one generation time (the generation time for dusky sharks is 40 years) or 2099. The target year for rebuilding ranged from 2081 to 2257 depending on the state of nature (*i.e.*, sensitivity run) of the stock. The base model indicated that the current fishing mortality ( $F_{2009}=0.06$ ) would have to be reduced by more than half (to  $F=0.02$ ) in order to have a 70 percent probability of rebuilding by 2099. The base model also estimated that with the current fishing mortality rate there is a low probability (11 percent) of stock recovery by 2408 (or 400 years).

Dusky sharks have been listed as a prohibited species since 2000. Even though they cannot be legally landed, they are still overfished with overfishing occurring. This is likely a result of continued dusky shark mortalities in pelagic and bottom longline fisheries as bycatch and misidentified landings, and in the recreational fishery as misidentified landings. The measures considered in this Predraft focus on reducing mortality of dusky sharks by reducing bycatch and bycatch mortality in the recreational shark and commercial pelagic longline fisheries. Measures to ensure that the rebuilding timeframe is met for dusky sharks include, but are not limited to, increasing outreach to commercial and recreational fishermen on dusky shark identification and possession prohibition, increasing the recreational minimum size to reduce dusky shark mortalities in the recreational fishery, modifying existing closed area timeframes, and establishing new time/area closures for dusky sharks. .

## 1.3 Dusky Shark Biological Information

Dusky sharks are found between Cape Cod, Massachusetts and Georges Bank to Florida (including the Gulf of Mexico and Caribbean Sea). Dusky sharks are classified as a coastal-pelagic species, and may range from continental waters inshore to outer continental shelf and

adjacent ocean waters; they are also rarely found in estuaries or regions with reduced salinity (Musick et al. 1993; Musick and Colvocoresses 1986). These animals move along the U.S. east coast in the spring and fall, likely following changes in water temperature (Musick and Colvocoresses 1986). In the Gulf of Mexico, Hoffmayer et al (2014) tracked 10 dusky sharks with pop up satellite tags (from 6-124 days) and found that these dusky sharks spent most of their time in waters with depths ranging from 20 to 126 meters and temperatures ranging from 23 to 30 °C. Tagging data also showed dusky shark movements of over 200 km; one dusky shark swam outside of U.S. waters into territorial waters of Mexico.

The SEDAR 21 Data Workshop Life History working group determined that Atlantic dusky shark populations constitute one stock, and identified a triennial reproductive cycle. Fecundity was estimated at  $7.13 \pm 2.06$  pups per litter (range of 3-12 pups) (SEDAR 2011; Romine et al., 2009).  $L_{\infty}$  estimated for male and female sandbar shark are 373 cm FL and 349 cm FL, respectively. The age at 50 percent maturity was estimated by the SEDAR shark life history working group at just under 20 years for both sexes. One hundred percent maturation for both sexes was estimated to occur at 26 years.

Since the SEDAR 21 stock assessment was completed, a study by Natanson et al. (2013), updated estimates related to dusky shark age and size-at-maturity. This study estimated age at 50 percent maturity to be 17.6 years for females (227 cm fork length) and 17.4 years for males (226 cm fork length). This is a decrease in dusky shark age at 50 percent maturity for females and males (19 and 21 years, respectively) from a previous study by Natanson et al. (1995), which was used in the SEDAR 21 stock assessment. Demographic analysis by Romine et al. (2009) imply a decline in dusky shark populations at low levels of fishing mortality due to life history characteristics, suggesting it is one of the more vulnerable shark species in U.S. waters.

#### **1.4 Purpose, Need, and Objectives**

The overarching purpose of Amendment 5b is to develop and implement management measures that would end overfishing of dusky sharks and rebuild the dusky shark stock in conformance with applicable requirements under the Magnuson-Stevens Act to rebuild overfished stocks and end overfishing. As stated above in Section 1.2, alternatives to address the overfished/overfishing occurring status of the dusky shark stock were proposed in the Amendment 5 DEIS and proposed rule. But after reviewing all of the comments on that DEIS and proposed rule, NMFS decided that further analyses were needed for dusky shark measures, and that the further analyses would be conducted in a separate proposed rule and EIS. The goal of this Predraft is to develop and collect comments on management measures that would meet the purpose and need of Amendment 5b and to obtain meaningful and timely public input, including from the HMS Advisory Panel. The purpose and need of Amendment 5b would be as follows:

**Purpose:** The purpose of the proposed measures is to manage fishery resources in a manner that maximizes resource sustainability, while minimizing, to the greatest extent possible, the socioeconomic impacts on affected fisheries.

Need: To achieve this purpose, NMFS needs to implement management measures to rebuild overfished stocks and end overfishing. More specifically, NMFS has identified the following objectives with regard to this proposed action:

- End overfishing and achieve optimum yield for dusky sharks;
- Modify the current rebuilding plan for dusky sharks to ensure that fishing mortality levels for dusky sharks are maintained at or below levels that would result in a 70 percent probability of rebuilding in the timeframe recommended by the assessment.

## **1.5 Public Comment and Review**

The final rule for Amendment 5a to the 2006 Consolidated HMS FMP did not contain any dusky shark-specific management measures and thus did not address public comments received on the Amendment 5 DEIS and proposed rule regarding management measures specifically designed to end overfishing and rebuild dusky sharks. The dusky shark comments received on Draft Amendment 5 have been considered in the development of dusky shark-specific potential alternatives contained in this Predraft. These potential alternatives represent the range of alternatives considered reasonable, based on screening criteria outlined in Chapter 2, that would achieve the purpose and need of Amendment 5b, and address public comments pertaining to dusky shark management measures received on the proposed rule for Draft Amendment 5.

Not every public comment on Draft Amendment 5 related to dusky shark management was developed into an alternative contained in this Predraft. Rather, NMFS considered all of these comments and created a range of reasonable alternatives, based on screening criteria outlined in Chapter 2, to develop potential alternatives that would meet the purpose and need of Amendment 5b. This Predraft does not go into an in-depth analysis of the ecological and economic impacts in the same way that a DEIS would, but, based on past analyses in other documents (e.g., Draft Amendment 5, Draft Amendment 7) and general understanding of what the impacts of these alternatives might be, NMFS anticipates that a combination of these alternatives could meet the purpose and need of Amendment 5b.

Many of the measures in Draft Amendment 5 were contained within alternative suites, because of the multiple shark stocks addressed in the amendment and the overlap of impacts these alternatives would have on these stocks. The only dusky shark-specific management measures contained in the Amendment 5 alternative suites addressed the recreational fishery because those measures could have immediate impacts on all recreationally-caught sharks. However, measures to reduce fishing mortality in the commercial bottom longline and pelagic longline fisheries were developed and included as stand-alone alternatives in Draft Amendment 5. These measures were not included as part of the alternative suites because methods establishing commercial quotas to reduce and/or limit mortality for the other shark stocks that were included in Draft Amendment 5 cannot be applied to dusky sharks since they are a prohibited species. In this Predraft, individual, stand-alone alternatives are grouped into two categories, recreational and commercial, for ease of understanding which fishery could be impacted.

## *Recreational Alternatives*

This Predraft contains for consideration eight recreational management alternatives, which cover the scope of reasonable alternatives that could meet the purpose and need of Amendment 5b. These alternatives are outlined in Chapter 2 and discussed in additional detail in Chapter 3. This Predraft considers public comments received on the recreational dusky shark measures in Draft Amendment 5 into management alternatives that would meet the purpose and need of Amendment 5b. These could include reasonable alternatives that are similar in approach to those included in Draft Amendment 5. Public comments on Draft Amendment 5 also offered alternative management measures to reduce dusky shark mortality in the recreational fishery that were not considered in the proposed rule. Therefore, this predraft anticipates that Amendment 5b would include new alternatives that were not considered in Draft Amendment 5, but that are within the scope of reasonable alternatives that meet the purpose and need of Amendment 5b and also address public comment on Draft Amendment 5.

One of the alternative suites in Draft Amendment 5 contained a management measure to increase the recreational minimum size for sharks from 54 inches fork length to 96 inches fork length. This minimum size increase was developed based on female dusky shark size at 50 percent maturity, which, at that time, was estimated to be 93 inches fork length, rounded up to 96 inches (8 feet) for ease of enforcement purposes. Public comments were received for and against the increase in the minimum size and against rounding up a minimum size-based size at maturity to the nearest foot for enforcement purposes. The other recreational dusky shark-specific management measure that was included in Draft Amendment 5 involved increasing public outreach efforts to improve shark identification skills (specifically dusky shark identification) and knowledge of current fishing rules and regulations that pertain to dusky sharks of recreational anglers.

An alternative to increase the recreational minimum size is included but modified from the alternative included in Draft Amendment 5 to address more recent scientific age and growth information (Natanson et al., 2013) and to address public comment that the minimum size should be based on the age of maturity and not be rounded up to aid enforcement. Increasing public outreach regarding dusky shark management and stock status information was also a management measure that was considered in the Draft Amendment 5 and is also included in this Predraft. This alternative was supported in public comments on Draft Amendment 5 as a management measure that could end overfishing and rebuild dusky sharks.

Other recreational alternatives included in this Predraft that were not included in Draft Amendment 5 were developed based on public comment on Draft Amendment 5. They are considered reasonable alternatives that would meet the purpose and need of Amendment 5b. These alternatives include modifying the group of sharks authorized for recreational harvest based on a key identifying characteristic and modifying permit requirements for fishermen who want to recreationally harvest sharks in federal waters.

## *Commercial Alternatives*

Similar to the recreational alternatives, the commercial alternatives included in this Predraft incorporate public comment received on the commercial measures in Draft Amendment 5. This Predraft contains 10 commercial management alternatives, which cover the scope of reasonable alternatives that could meet the purpose and need of Amendment 5b. These potential alternatives are outlined in Chapter 2 and discussed in additional detail in Chapter 3. All of the comments regarding the commercial dusky shark fishing measures in Draft Amendment 5 were considered in the development of these potential alternatives, and, at this time, this list represents a range of reasonable alternatives that could meet the purpose and need of Amendment 5b.

While the majority of the commercial dusky-shark specific alternatives in Draft Amendment 5 were focused on reducing dusky shark mortality in the pelagic longline fishery, two alternatives focused on the bottom longline fishery (dusky sharks are rarely seen in the directed shark gillnet fishery, which is why there were no gillnet-specific management measures included in Draft Amendment 5 or this Predraft for Amendment 5b). Commercial fishing impacts on dusky sharks have been reduced in the directed shark bottom longline fishery since 2008 with the implementation of Amendment 2, mainly resulting from prohibiting the commercial harvest of sandbar sharks outside of the Shark Research Fishery (NMFS 2012). The prohibition on the commercial harvest of sandbar sharks outside the research fishery resulted in shark fishermen targeting other species of sharks (e.g., blacktip, lemon, bull) that tend to inhabit areas closer to shore than sandbar and dusky sharks. However, dusky sharks are still caught in the Shark Research Fishery partly because participants in the Shark Research Fishery are allowed to commercially harvest sandbar sharks and tend to fish in areas where they would encounter both sandbar and dusky sharks. As a result, the possibility for Shark Research Fishery participants to interact with dusky sharks is much higher than fishermen who are no longer targeting sandbar sharks, although the number of such fishermen is significantly lower because the shark research fishery permits so few fishermen. Table 1.1 below shows all the dusky shark interactions in the Shark Research Fishery from 2008 – 2012. Because of these interactions, NMFS included an alternative in Draft Amendment 5 focused on the Shark Research Fishery.

**Table 1.1 Regional dusky shark interactions in the Shark Research Fishery from 2008-2012**

<b>Region</b>	<b>Year</b>	<b>Released Alive</b>	<b>Discarded Dead*</b>	<b>TOTAL</b>
Gulf of Mexico	2008	1	20	21
	2009	20	38	58
	2010	20	26	46
	2011	12	14	26
	2012	0	3	3
	Average	10.6	20.2	30.8
Atlantic	2008	0	0	0
	2009	32	15	47
	2010	48	104	152
	2011	54	44	98
	2012	34	202	236
	Average	33.6	73	106.6
<b>Total</b>		<b>221</b>	<b>466</b>	<b>687</b>
<b>Total Annual Average</b>		<b>44.2</b>	<b>93.2</b>	<b>137.4</b>

\*Dead includes sharks discard dead and sharks dead from predation.

While NMFS did not finalize any dusky shark measures in Final Amendment 5a, in 2013, NMFS applied additional restrictions in the Shark Research Fishery to minimize interactions with dusky sharks to reduce dusky shark mortality. This included establishing a dusky shark interaction cap for the entire Shark Research Fishery of 45 dusky sharks per year. Six Shark Research Fishery regions were also established (North Carolina, South Carolina/Georgia, Florida East Coast, Florida Keys, Florida West Coast, and the Gulf of Mexico west of Panama City, FL), and each region was allocated five dusky shark interactions. The remaining 15 dusky shark interactions were a buffer in the event one region reached or exceeded its 5 dusky shark interactions. NMFS then would be able to allocate additional dusky shark interactions to a region if more data from that region was necessary, or NMFS could close that region for the remainder of the 2013 fishing season. Because fishermen must carry a NMFS-approved observer onboard when participating in a Shark Research Fishery trip, accounting for the dusky shark cap was accurately done in a timely manner and the interaction cap of 45 dusky sharks was not exceeded. These limits resulted in 24 dusky shark interactions in 2013, with 16 dusky sharks released alive and 8 discarded dead (Table 1.2).

**Table 1.2 Regional dusky shark interactions in the Shark Research Fishery in 2013**

<b>Region</b>	<b>Released Alive</b>	<b>Discarded Dead*</b>	<b>TOTAL</b>
Gulf of Mexico	5	4	9
Atlantic	11	4	15
<b>TOTAL</b>	<b>16</b>	<b>8</b>	<b>24</b>

\*Dead includes sharks discard dead and sharks dead from predation.

Because the changes to the Shark Research Fishery in 2013 led to a large reduction of dusky shark interactions, and similar dusky-shark specific measures for the 2014 Shark Research Fishery have been established, additional bottom longline-specific management measures to reduce dusky shark interactions and mortality are not included in this Predraft except to be considered in the effects analyses as appropriate.

Draft Amendment 5 also included an alternative that would change the timing of the mid-Atlantic shark closed area to December 15 to July 15 (from January 1 to July 31) per requests from the State of North Carolina in order to more closely align with the nursery area closures contained in the ASMFC Coastal Shark Interstate FMP. The State of North Carolina has made several requests, both formally and informally, since 2008 for the Agency to reconsider the timing of the end date of the mid-Atlantic Shark Closed Area. In Draft Amendment 5, NMFS determined that, given the status of dusky sharks, any changes in time or scope of the mid-Atlantic shark closed area could not result in additional dusky shark mortality. NMFS determined that direct and indirect, neutral, short and long-term ecological benefits for both dusky and sandbar shark stocks would occur as the closure area timing would be shifted by 15 days and should not have a significant impact on fishing effort with bottom longline gear in this area. Comments received from the State of North Carolina indicated that while they supported the move to July 15, they did not support the change in start time to December 15 because they felt it disadvantaged them compared to the other states. As a result, NMFS has not included this alternative in the Predraft. Rather, NMFS is considering whether to ask ASMFC, as part of Amendment 5b, to adjust its state water shark closure that includes dusky shark nursery grounds so that it matches the closure in federal waters off North Carolina.

Some of the pelagic longline-specific alternatives included in this Predraft are outside of the scope of alternatives included in Draft Amendment 5, but are management measures that were developed taking into account public comments on Draft Amendment 5. These include measures that would impose restrictions on fishing gear deployed on pelagic longline sets to reduce fishing effort on dusky sharks, such as limiting the number of hooks that can be deployed on a pelagic longline set or the mandatory use of weak hooks on all pelagic longline sets. Restricting authorized pelagic longline fishing areas by depth was also suggested and is included in the list of alternatives in this Predraft. Other alternatives, which include increasing fisherman knowledge of dusky shark regulations and identification, and establishing a pelagic longline fleet communication and dusky shark avoidance protocol to be used to reduce fleet-wide interactions with dusky sharks, aim to reduce dusky shark mortality through outreach and education, and

promoting best fishing practices. These alternatives are considered reasonable and likely to meet the purpose and need of Amendment 5b.

There are also alternatives in this Predraft that were within the scope of alternatives included in Draft Amendment 5 that have been modified to incorporate public comment on Draft Amendment 5. Draft Amendment 5 contained alternatives that would create dusky shark “hotspot closed areas” to reduce mortality of dusky sharks in the pelagic longline fishery. These hotspots were developed using pelagic longline data and would be applicable to only pelagic longline fishermen as other fisheries that use different gear types and fishing techniques may encounter dusky sharks in other areas. One of these dusky shark hotspot alternatives would have closed these dusky shark hotspot areas to pelagic longline fishing at certain times in the year, while another would have assigned a dusky shark bycatch cap to each area and would have allowed pelagic longline fishing in those areas as long as the bycatch cap was not exceeded and vessels had a NMFS-approved fishery observer onboard. Comments on the dusky shark hotspot alternatives contained in Draft Amendment 5 included concerns regarding how the impacts associated with the dusky shark hotspot areas and the associated redistribution analysis were calculated, the data sources used in the analyses, and the efficacy of the time/area closures on reducing dusky shark mortality in the pelagic longline fishery. All of the comments regarding the dusky shark hotspot alternatives were considered in this Predraft to create time/area closure alternatives that would be reasonable and likely to meet the purpose and need of Amendment 5b.

Analysis of ecological and economic impacts of dusky shark hotspot closure areas and bycatch caps in Draft Amendment 5 assumed that all effort that took place within a dusky shark hotspot closure would be redistributed to larger open areas adjacent to or surrounding the hotspot closure area. Public comment indicated that this approach might not best represent what would happen if some of these areas closed, as vessels that concentrate their fishing effort within the dusky shark hotspot areas may not have the ability to redistribute outside of the closure area. Noting this, NMFS later employed a different redistribution methodology when analyzing proposed pelagic longline gear restricted areas for bluefin tuna in Draft Amendment 7 to the 2006 Consolidated HMS FMP (78 FR 52032; August 21, 2013; Draft Amendment 7). In Draft Amendment 7, the ability of vessels to redistribute to areas outside of the proposed gear restricted areas, and where that redistribution would occur, was analyzed on an individual vessel level based on past fishing effort information. For example, vessels that made 40 percent or less of their sets in the gear restricted area had all 100 percent of their effort redistributed, those that had greater than 40 percent and less than 75 percent of their sets in the gear restricted area had 50 percent of their effort redistributed, and vessels that had 75 percent or more of their sets in the gear restricted area had none of their effort redistributed. When a vessel’s effort was redistributed, it was redistributed based on the individual vessel’s proportion of effort by area fished outside of the gear restricted area to better reflect what that vessel might do. Also, the vessel’s individual catch rates outside of the gear restricted areas were applied to their redistributed effort to better represent what types of ecological and economic impacts might be associated with redistributing fishing effort outside of the bluefin tuna gear restricted areas.

Draft Amendment 7 also considered conditional access to the gear restricted areas for pelagic longline vessels based on performance metrics, which include the vessel’s ratio of bluefin tuna catch to designated species catch (e.g., swordfish, yellowfin tuna), and compliance with Pelagic

Observer Program and HMS Logbook requirements. The Amendment 7 approach that NMFS is proposing to minimize bluefin tuna catch in the HMS pelagic longline fishery may also be an effective way to reduce mortality on dusky sharks. Because HMS Logbook data show that a few vessels make up a majority of the pelagic longline dusky shark interactions, the alternative to develop conditional access criteria to allow access to the dusky shark hotspot areas is included in this Predraft.

The dusky shark hotspot closed area alternatives included in this Predraft are updated based on additional information, a revised analysis methodology, and public comment. Both alternatives that are included in the Predraft would likely meet the purpose and need of Amendment 5b and are considered reasonable according to the Amendment 5b screening criteria outlined in Chapter 2. Pelagic Observer Program and HMS Logbook data would be used to determine if the proposed dusky shark hotspot closure areas in Draft Amendment 5 are still appropriate. Dusky shark hotspot closure areas could be added, eliminated, or changed in space and time if necessary to reflect new information. Once the potential dusky shark hotspot areas are identified, the redistribution analysis methodology used in Draft Amendment 7 would be applied to determine the ecological and economic impacts associated with the closure areas. This approach may be applied to all vessels that have fished in the dusky shark hotspot areas or just those that would be excluded from entering based on conditional access criteria, depending on the alternative.

Based on public comment, NMFS investigated the impact from non-Atlantic HMS fisheries on dusky shark mortality, which was suggested in public comments on Draft Amendment 5. According to NMFS Northeast Fisheries Observer Program reports from 2005-2012, there were 30 observed dusky shark interactions, with 16 occurring in bottom trawl fisheries and 14 occurring in gillnet fisheries. With an average of fewer than four dusky sharks observed caught in these fisheries annually, NMFS does not consider these fisheries to be a large source of dusky shark mortality and no potential alternatives are included in this Predraft.

## **1.6 Scope and Organization of this Document**

The following two chapters in this document explore 18 alternatives that contain management measures for HMS recreational (eight alternatives) and commercial (ten alternatives) fisheries that are considered reasonable and have been designed to meet the purpose and need of Amendment 5b. All public comments received on the proposed dusky shark management measures included in Draft Amendment 5 were considered in the development of these alternatives. Chapter 2 provides a basis of organization and brief description of the alternatives. Chapter 3 looks at the ecological and socioeconomic impacts that could be associated with each of the alternatives. The initial analyses included in Chapter 3 are not as in-depth as what would be found in a draft EIS, but they do highlight new information that was not available when Draft Amendment 5 was published and discusses how this information could be used in the analysis of the management measures included in this Predraft. It also summarizes expected impacts using general terms (e.g., adverse, beneficial), but does not go into more specifics regarding intensity (e.g., major, minor) or timeframe (e.g., short-term, long-term) of ecological and environmental impacts that may be associated with each alternative.

## 2.0 SUMMARY OF THE ALTERNATIVES

NEPA requires that any Federal agency proposing a major federal action consider all reasonable alternatives, in addition to the proposed action. The evaluation of alternatives in a Predraft assists NMFS in ensuring that any unnecessary impacts are avoided through an assessment of alternative ways to achieve the underlying purpose of the project that may result in less environmental harm.

To warrant detailed evaluation, an alternative must meet the purpose and need as established and discussed in Chapter 1 and be reasonable<sup>1</sup>. The following screening criteria are used in this Predraft to evaluate whether an alternative is reasonable; evaluates various alternatives against the screening criteria (including the proposed measures) and identifies those alternatives found to be reasonable; identifies those alternatives found not to be reasonable; and for the latter, the basis for this finding. Alternatives considered but not reasonable are not evaluated in detail in this Predraft.

Screening Criteria – To be considered “reasonable” for purposes of this Predraft, an alternative must meet the following criteria:

- *An alternative must be consistent with the 10 National Standards set forth in the Magnuson-Stevens Act*
- *An alternative must be administratively feasible. The costs associated with implementing an alternative cannot be prohibitively exorbitant or require unattainable infrastructure.*
- *An alternative cannot violate other laws (e.g., ESA, MMPA).*
- *An alternative must be consistent with the 2006 Consolidated Atlantic HMS FMP and its amendments.*

This chapter includes a full range of reasonable alternatives designed to meet the purpose and need for action described in Chapter 1. These alternatives are separated into two groups, recreational and commercial, for ease of understanding which fisheries each group of alternatives would impact. The environmental, economic, and social impacts of these alternatives are discussed in later chapters.

### 2.1 Recreational Measures

**Alternative A1:** No Action. Do not implement management measures to end overfishing of dusky sharks in the Atlantic recreational shark fishery

This alternative would not implement any management measures in the recreational shark fishery to decrease mortality of dusky sharks. Under Alternative A1, recreational measures for sharks

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<sup>1</sup> “Section 1502.14 (of NEPA) requires an EIS to examine all reasonable alternatives to the proposal. In determining the scope of alternatives to be considered, the emphasis is on what is "reasonable" rather than on whether the proponent or applicant likes or is itself capable of carrying out a particular alternative. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant.” (CEQ, “NEPA’s Forty Most Asked Questions” (available at <http://ceq.hss.doe.gov/nepa/regs/40/40P1.HTM>) (emphasis added))

would remain the same with a bag limit of one shark (any authorized species) greater than 54 inches fork length per vessel per trip and one Atlantic sharpnose and bonnethead shark per person per trip.

**Alternative A2:** Require HMS Angling and Charter/Headboat permit holders to obtain a shark endorsement from NMFS and to have a NMFS-approved shark identification placard on board to retain sharks

Under Alternative A2, HMS Angling and Charter/Headboat permittees who want to retain sharks would be required to obtain a “shark endorsement” from NMFS as a permit condition. Obtaining the shark endorsement would likely be included in the annual HMS Angling and CHB permit application or annual renewal process and would not result in any additional fees. Only recreational anglers fishing from a vessel that has been issued a shark endorsement on a valid permit and that have a NMFS-approved shark identification placard on board would be able to retain authorized shark species, consistent with minimum size and bag limits. All other recreational fishermen would not be able to retain sharks in federal waters. This alternative would limit shark fishing to only those permit holders that indicate they intend to fish for sharks and would increase awareness of current regulations and shark identification, specifically for dusky and sandbar sharks which are prohibited, to help reduce the number of incidental landings of dusky sharks.

**Alternative A3:** Increase public outreach to recreational anglers through the development of additional online shark identification and regulatory outreach materials

Under this Alternative, NMFS would actively engage in an outreach program to educate anglers about recreational shark fishing regulations, stock statuses, and species identification. Particular focus would be given to using the interdorsal ridge to identify ridgeback and non-ridgeback sharks, a key identification characteristic that helps anglers determine which species can be retained. This increase in outreach to the recreational community would increase awareness of current regulations and shark identification, specifically for dusky and sandbar sharks which are prohibited, to help reduce the number of landings of dusky sharks from misidentification of the species and/or misunderstanding of recreational shark fishing regulations.

**Alternative A4:** Prohibit retention of all ridgeback sharks in the Atlantic recreational shark fishery

Currently, recreational fishermen are prohibited from retaining all ridgeback sharks except for oceanic whitetip, tiger, and smoothhound sharks. Under Alternative A5, the prohibition on retention would be extended to include oceanic whitetip and tiger sharks. “Ridgeback sharks” would be defined as sharks that only have an interdorsal ridge and would exclude sharks that, like smoothhound sharks, have a predorsal ridge forward of the first dorsal fin. Widely prohibiting all ridgeback sharks while excluding smoothhound sharks (which, as a group, are easier to identify from the other ridgeback sharks because they have a pre-dorsal ridge), would simplify compliance and reduce complication from dusky sharks being misidentified as other species of sharks. Shark species can be difficult to differentiate, so relying on a single

identification characteristic, in this case the interdorsal ridge, would simplify outreach and compliance to help reduce the number of landings of dusky sharks.

**Alternative A5:** Request that certain states (New Jersey, Delaware, Maryland, and Virginia) and the ASMFC extend the end of the existing shark recreational seasonal closure from July 15 to July 31 to offer additional protection for dusky sharks in nursery areas.

Under Alternative A5, NMFS would seek, through collaboration with the affected states and the ASMFC, to extend the end date of the existing ASMFC state water shark closure from July 15 to July 31. This closure, occurring in the state waters of New Jersey, Delaware, Maryland, and Virginia, was originally finalized through the ASMFC in the Interstate Fishery Management Plan for Atlantic Coastal Sharks in May 2008. During the closure, it is illegal to possess LCS in the affected area, regardless of catch location. Fishing for and possession of smoothhound sharks, SCS, and pelagic sharks is still allowed. This closure was designed to protect sandbar and dusky sharks in nursery areas around the Delaware and Chesapeake Bays.

**Alternative A6:** Increase the recreational minimum size to 89 inches fork length for all sharks.

Under Alternative Suite A6, the minimum recreational size limit for sharks would increase from 54 to 89 inches fork length (FL). The 89 inch FL size limit is based on the best available scientific information for dusky sharks from Natanson et al. (2013), which reported female dusky shark size-at-maturity to be 227 cm fork length (approximately 89 inches). The current recreational size limit of 54 inch FL is based on sandbar sharks, but dusky sharks have been prohibited in the recreational fishery since 1999 and are still landed due to misidentification issues.

**Alternative A7:** Allow only catch and release recreational fishing for all Atlantic HMS managed sharks. Retention of recreationally-caught sharks would be prohibited.

Alternative A7 would prohibit HMS Angling and CHB permit holders from retaining any shark species, although targeting authorized shark species for catch and release would still be allowed. Regulations would be similar to those for Atlantic white sharks. All sharks would be required to be released in a manner that maximizes the chance of survival to help reduce the number of incidental landings of dusky sharks.

**Alternative A8:** Close the Atlantic recreational shark fishery.

This alternative would prohibit recreational targeting and retention of sharks. All Atlantic, Gulf of Mexico, and Caribbean recreational shark fisheries would be closed to help reduce the number of landings of dusky sharks.

## 2.2 Commercial Measures

**Alternative B1:** No Action. Do not implement management measures to end overfishing of dusky sharks in Atlantic commercial HMS fisheries

This alternative would not implement any management measures in commercial HMS fisheries to decrease mortality of dusky sharks. Under Alternative B1, commercial measures for using pelagic longline gear that catch dusky sharks as bycatch would remain the same.

**Alternative B2:** Fishermen with an Atlantic shark commercial permit with pelagic longline gear onboard would be limited to 750 hooks per pelagic longline set with no more than 800 assembled gangions onboard the vessel at any time.

Under Alternative B2, participants holding an Atlantic shark commercial permit (directed or incidental) with pelagic longline gear onboard would be limited to 750 hooks per pelagic longline set, with no more than 800 assembled gangions onboard at any time. Fishermen could have extra components to assemble gangions (e.g., hooks, clips, monofilament line) onboard, as long as the number of assembled gangions does not exceed 800. Capping the number of hooks that can be deployed on pelagic longline gear would be expected to limit interactions with dusky sharks.

**Alternative B3:** Fishermen with an Atlantic shark commercial permit fishing with pelagic longline gear must release all sharks that are not being boarded or retained by using a dehooker, or by cutting the gangion no more than three feet from the hook.

Under this alternative, NMFS would require Atlantic shark commercial permit holders (directed or incidental) fishing with pelagic longline gear to release all sharks that are not being boarded or retained by using a dehooker, or by cutting the gangion no more than three feet from the hook. This release requirement would be applied to all sharks, due to the difficulties in identifying dusky sharks from other shark species. These release techniques would likely increase the chance of post-release survival of all sharks, including dusky sharks.

**Alternative B4:** Require the use of weak hooks in HMS pelagic longline fishery.

Currently, commercial fishermen using pelagic longline gear are required to use weak hooks in the Gulf of Mexico region. Under Alternative B4, fishermen who hold an Atlantic shark commercial permit (directed or incidental) would be required to use weak hooks when deploying pelagic longline fishing gear in the Gulf of Mexico and Atlantic regions. Weak hooks are more likely to bend when a large fish is hooked and are defined in the regulations as circle hooks constructed of corrodible round wire stock that is no larger than 3.65 mm in diameter. Using weak hooks may decrease the number of mature dusky sharks that are caught on pelagic longline gear.

**Alternative B5:** Develop dusky shark hotspot closure areas for HMS vessels fishing with pelagic longline gear.

Under Alternative B5, NMFS would develop dusky shark hotspot closures for vessels fishing with pelagic longline gear. The hotspot closures would be areas in time and space where recent HMS logbook and observer data has shown high levels of interactions with dusky sharks on pelagic longline gear. During the closures, Atlantic shark commercial permit holders (directed or incidental) would not be able to fish with pelagic longline in these areas.

**Alternative B6:** Allow conditional access to dusky shark hotspot closure areas for HMS vessels fishing with pelagic longline gear.

Under Alternative B6, NMFS would allow conditional access to dusky shark hotspot closure areas for some vessels fishing with pelagic longline gear. The principal objective of conditional access would be to provide strong incentives to avoid dusky sharks and to reduce interactions by modifying fishing behavior. The secondary objective would be to balance reducing dusky shark interactions with providing reasonable fishing opportunity. This approach would address the fact that, according to HMS logbook data, relatively few vessels have consistently been responsible for the majority of the dusky shark interactions. NMFS would review pelagic longline vessels using performance metrics and, based on that review, authorize some vessels fishing with pelagic longline gear to have access to the dusky shark hotspot closed areas. Performance metrics could include level of dusky shark interactions/avoidance, compliance with the observer program, and logbook submissions.

**Alternative B7:** Fishermen holding an Atlantic shark commercial permit (directed or incidental) would be prohibited from fishing with pelagic longline gear in waters with a depth shallower than 100 fathoms.

Alternative B7 would prohibit Atlantic shark commercial permit holders (directed or incidental) from fishing with pelagic longline gear in waters with a depth shallower than 100 fathoms. This restriction would apply to fishermen in both the Atlantic and Gulf of Mexico regions. This restriction could reduce the number of dusky sharks caught by pelagic longline gear.

**Alternative B8:** Increase dusky shark outreach and awareness through the development of additional outreach materials, requiring that all vessels with an Atlantic shark commercial permit have a NMFS-approved shark identification placard on board and that they abide by a dusky shark fleet communication and relocation protocol following dusky shark interactions.

NMFS would develop additional outreach materials for commercial fisheries regarding shark identification and dusky sharks. Alternative B8 would require that all vessels with an Atlantic shark commercial permit have a NMFS-approved shark identification placard on board and abide by a dusky shark fleet communication and relocation protocol, similar to the Pelagic Longline Take Reduction Team communication protocols. Vessels that interact with dusky sharks would have to report the interaction according to a dusky shark fleet communication protocol and

subsequent fishing sets on that fishing trip could be no closer than 1 nautical mile (nm) from where the encounter took place to reduce bycatch of dusky sharks.

**Alternative B9:** Request the states and/or ASMFC to consider extending the shark commercial seasonal closure from July 15 to July 31.

This alternative would request the states (VA, MD, DE, and NJ) and/or ASMFC to consider extending the shark commercial seasonal closure from July 15 to July 31 to offer additional protection for dusky sharks in nursery areas. Currently, NMFS has a Mid-Atlantic shark time/area closure off North Carolina, which serves as nursery and pupping areas for sandbar and dusky sharks. The area is closed to vessels using bottom longline gear from January 1 to July 31 each year. Extending the state closures to July 31 would provide additional protection for dusky sharks.

**Alternative B10:** Remove pelagic longline as authorized gear for commercial Atlantic shark permit holders.

Alternative B10 would prohibit pelagic longline as an authorized gear for commercial Atlantic shark permit holders in the Atlantic, Gulf of Mexico, and Caribbean to reduce bycatch of dusky sharks.

### **3.0 ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES OF THE RECREATIONAL ALTERNATIVES**

NMFS presents in this Predraft several recreational alternatives that would reduce dusky shark mortality in order to rebuild and end overfishing of dusky sharks in a manner that maximizes sustainability, while minimizing, to the greatest extent possible, the social and economic impacts on affected fisheries. The alternatives to reduce dusky shark mortality range from maintaining the status quo under the No Action alternative to closing the recreational shark fishery.

As described in Chapter 2, the recreational alternatives presented in this Predraft for reducing dusky shark mortality in the recreational shark fishery are:

- Alternative A1: No Action. Do not implement management measures to end overfishing of dusky sharks in the recreational fishery.
- Alternative A2: Require HMS Angling and CHB permit holders to obtain a shark endorsement and to have a NMFS-approved shark identification placard on board to retain sharks.
- Alternative A3: Increase public outreach to recreational anglers through the development of additional online shark identification and regulatory outreach materials.
- Alternative A4: Prohibit retention of all ridgeback sharks in the recreational shark fishery.
- Alternative A5: Request that certain states (New Jersey, Delaware, Maryland, and Virginia) and the ASMFC extend the end of the existing shark recreational seasonal closure from July 15 to July 31 to offer additional protection for dusky sharks in nursery areas.
- Alternative A6: Increase the recreational minimum size to 89 inches fork length for all sharks.
- Alternative A7: Allow only catch and release recreational fishing for all Atlantic HMS managed sharks. Retention of recreationally-caught sharks would be prohibited.
- Alternative A8: Close the recreational shark fishery.

#### **3.1 Ecological Alternatives**

##### ***Alternative A1***

Under Alternative A1, NMFS would not implement any measures to reduce dusky shark mortality in the recreational shark fishery. Based on results of the 2011 SEDAR 21 stock assessment, NMFS has determined that dusky sharks are overfished and experiencing overfishing. If no management measures are implemented to reduce dusky shark mortality in the recreational shark fishery, adverse ecological impacts would likely occur since overfishing would continue.

##### ***Alternative A2***

Under Alternative A2, participants in the federal recreational shark fishery would be required to obtain a shark endorsement when they obtain or renew either an HMS Angling permit or CHB permit, and have a NMFS-approved shark identification placard on board to retain sharks. Despite its prohibited status since 2000, dusky sharks are still sometimes caught and retained by

recreational anglers likely because the species is either misidentified or the fisherman is unaware of its prohibited status. This alternative would address both of these possible causes, likely resulting in beneficial ecological impacts. First, the shark endorsement would help NMFS better identify the universe of federally permitted recreational and CHB permit holders that plan to target and/or retain sharks by requiring fishermen to actively identify themselves as intending to retain sharks by choosing to have a shark endorsement when they obtain or renew their HMS Angling or CHB permit. Identifying this universe of fishermen would provide insight on total effort by regions, allowing for more effective future management. In the short-term, identifying the universe of shark anglers would facilitate targeted outreach on recreational shark fishery regulations, including the prohibition on targeting and retaining dusky sharks, directly addressing the concern that some fishermen do not know shark fishing regulations. To address species misidentification, this alternative would also require anglers to carry a NMFS-approved shark identification placard on board in order to retain sharks. The placard would provide a readily-available resource to identify sharks brought on the vessel, allowing for better reporting accuracy and, more importantly in the context of this action, a resource to identify dusky sharks which could then be released in a manner that maximizes the chance of survival.

### ***Alternative A3***

Under Alternative A3, NMFS would actively engage in an outreach program to educate anglers about recreational shark fishing regulations, stock statuses, and species identification. Particular focus would be given to using the interdorsal ridge to identify ridgeback and non-ridgeback sharks, a key identification characteristic that helps anglers determine which species can be retained. As noted in the impact discussion for Alternative A2, unfamiliarity with recreational shark fishing regulations is one of two likely causes of dusky shark retention in the recreational fishery. Alternative A3 would address that shortcoming through direct, targeted outreach. Through communication with the recreational shark fishing community, NMFS could increase awareness of regulations, including prohibited species, and engage the community to assist with reaching management goals. Thus, this alternative would have beneficial ecological impacts.

### ***Alternative A4***

Under Alternative A4, NMFS would extend the prohibition on retention of ridgeback sharks to include oceanic whitetip and tiger sharks, both of which are currently excluded from the prohibition. The prohibition on most ridgeback sharks in the recreational fishery was originally implemented in 2008 (73 FR 40658) to provide a simple way to tell if a shark could be retained. Sharks with an interdorsal ridge, or “ridgeback,” are easily identifiable, often at distance. When first implemented, oceanic whitetip and tiger sharks were excluded because both species have very distinct color markings; however, there is still some apparent misidentification so simplifying the ridgeback prohibition could be beneficial. Ridgeback sharks are not currently defined in the regulations. Under this alternative, they would be defined as sharks that only have an interdorsal ridge and would exclude sharks that, like smoothhound sharks, have a predorsal ridge forward of the first dorsal fin. Widely prohibiting all ridgeback sharks would simplify compliance and reduce species misidentification. Shark species can be difficult to differentiate, so relying on a single identification characteristic, in this case the interdorsal ridge, would simplify outreach and compliance. Under this alternative, in concert with outreach to promote the ridgeback prohibition, NMFS expects that retention of dusky sharks in the recreational fishery could be reduced, likely providing beneficial ecological impacts.

### ***Alternative A5***

Under Alternative A5, NMFS would seek, through collaboration with the affected states and the ASMFC, to extend the end date of the existing Mid-Atlantic recreational LCS closure from July 15 to July 31. This closure, occurring in the state waters of New Jersey, Delaware, Maryland, and Virginia, was originally finalized through the ASMFC in the IFMP for Atlantic Coastal Sharks in May 2008. During the closure, it is illegal to possess LCS in the affected area, regardless of catch location. Fishing for and possession of smoothhound sharks, SCS, and pelagic sharks is still allowed. This closure was designed to protect sandbar and dusky sharks in nursery areas around the Delaware and Chesapeake Bays. Furthermore, the length of the closure would be extended by 25 percent (from 62 days to 78 days), providing additional protection for sandbar sharks, and more importantly in the context of this action, dusky sharks. NMFS expects that extending the length of the Mid-Atlantic recreational LCS closure would result in beneficial ecological impacts.

### ***Alternative A6***

Under Alternative Suite A6, the minimum recreational size limit for authorized shark species, except for Atlantic sharpnose, bonnethead, and hammerhead (great, scalloped, and smooth) sharks, would increase from the current 54 inch fork length (FL) minimum size to 89 inches FL. The 89 inch FL size limit is based on the best available scientific information for dusky sharks from Natanson et al. (2013), which reported female dusky shark size-at-maturity to be 227 cm fork length (approximately 89 inches). The current recreational size limit of 54 inch FL for authorized shark species, except for Atlantic sharpnose, bonnethead, and hammerhead (great, scalloped, and smooth) sharks, is based on sandbar sharks, but dusky sharks have been prohibited in the recreational fishery since 1999 and are still landed due to misidentification issues or lack of understanding current regulations. Based on the misidentification issues, NMFS would increase outreach to the recreational community to enhance awareness of current regulations and shark identification, specifically for dusky and sandbar sharks which are prohibited, to help reduce the number of landings of dusky sharks due to misidentification issues. This alternative would likely have beneficial ecological impacts for dusky sharks since, according to NMFS survey data, the majority of those caught recreationally are smaller than 89 inches FL (Salz, 2013). Further ecological benefits would be expected for most other recreationally caught shark species since most do not reach or are rarely caught with lengths exceeding 89 inches FL and, consequently, the fishing mortality from the recreational fishery would be reduced.

### ***Alternative A7***

Alternative A7 would prohibit HMS Angling and CHB permit holders from retaining any shark species, although targeting authorized shark species for catch and release would still be authorized. Although some post-release mortality would be expected, Alternative A7 would greatly decrease fishing mortality, providing beneficial ecological impacts.

### ***Alternative A8***

Alternative A8 would prohibit recreational targeting and retention of sharks. All Atlantic, Gulf of Mexico, and Caribbean recreational shark fisheries would be closed, greatly reducing fishing mortality, and likely providing beneficial ecological impacts.

## **3.2 Socioeconomic Impacts**

### ***Alternative A1***

Under Alternative A1, NMFS would not implement any measures to reduce dusky shark mortality in the recreational shark fishery. If no management measures are implemented, no socioeconomic impacts are expected. Even if dusky sharks continue to experience overfishing, they are a prohibited species and are not available for harvest. Thus, even if dusky sharks continue to experience overfishing and the abundance declines as a result of this alternative, there would not be any socioeconomic impacts on the fishery in the short-term. If more restrictive measures are required in the long-term under MSA or other statutes such as the Endangered Species Act, socioeconomic impacts may occur.

### ***Alternative A2***

Under Alternative A2, participants in the federal recreational shark fishery would be required to obtain a shark endorsement when they obtain either an HMS Angling permit or CHB permit, and have a NMFS-approved shark identification placard on board to retain sharks. Although preparations and permitting for fishing would change somewhat under this alternative, NMFS does not expect that any economic impacts would occur. The process to apply for a shark endorsement would likely require a short additional step in the HMS Angling or CHB permit application process, likely a simple check box, and would not have an additional cost. Carrying a NMFS-approved shark identification placard would not have an economic impact, as free copies would be available through NMFS or could be printed from the NMFS website.

### ***Alternative A3***

Under Alternative A3, NMFS would actively engage in an outreach program to educate anglers about recreational shark fishing regulations, stock statuses, and species identification. This alternative would likely result in an economic benefit to the affected community since it would reduce violations and subsequent fines, and encourage a greater number of fishermen to fish in a sustainable manner, which could prevent more economically adverse measures (e.g., closing the recreational shark fishery) from being implemented to protect dusky sharks.

### ***Alternative A4***

Under Alternative A4, NMFS would extend the prohibition on retention of ridgeback sharks to include oceanic whitetip and tiger sharks, both of which are currently allowed to be retained. This alternative would simplify compliance for the majority of fishermen targeting sharks, although a small subset of fishermen that target oceanic whitetip and tiger sharks could experience adverse socioeconomic impacts. These adverse impacts would be quite small, however. Based on Marine Recreational Information Program (MRIP) data, from 2008-2012, 1,831 tiger sharks and 0 oceanic whitetip sharks were estimated to be landed in the Atlantic and Gulf of Mexico by recreational fisherman, compared to 90,938 blacktip sharks, a more commonly targeted non-ridgeback species.

### ***Alternative A5***

Under Alternative A5, NMFS would seek, through collaboration with the affected states and the ASMFC, to extend the end date of the existing Mid-Atlantic recreational shark closure from July

15 to July 31. This extension would reduce recreational fishing opportunity, likely resulting in adverse socioeconomic impacts. Data sources for recreational fishing effort, including MRIP and LPS, are not estimated at a fine enough time scale to calculate the number of trips or level of catch total that would be precluded during those 16 days, however, there is likely a large number of trips taken during this time period. The extension coincides with warmer summer months when shark coastal populations in the area are high and fishing activities in the area are increased. Despite a high number of trips during this time period, 16 days out of the entire recreational shark fishing season is not a large number, thus, adverse impacts would be mitigated.

#### ***Alternative A6***

Under Alternative Suite A6, the minimum recreational size limit for authorized shark species, except for Atlantic sharpnose, bonnethead, and hammerhead (great, scalloped, and smooth) sharks, would increase from 54 to 89 inches FL and would result in adverse socioeconomic impacts for recreational fishermen due to the reduced incentive to fish recreationally for sharks, because many species, (e.g., blacktip sharks) do not grow large enough to reach the new minimum size for retention. Impacts on tournaments awarding points for pelagic sharks implementing the 89 inch FL minimum size may be lessened because these tournament participants target larger sharks, such as shortfin mako, blue, and thresher, that grow to larger than 89 inches FL. Tournaments that target smaller sharks, especially those that target sharks that do not grow larger than 89 inches FL such as blacktip sharks, may be heavily impacted by this alternative. Implementation of this management measure could significantly alter the way some tournaments and charter vessels operate, or reduce opportunity and demand for recreational shark fishing, which could create adverse socioeconomic impacts.

#### ***Alternative A7***

Alternative A7 would prohibit HMS Angling and CHB permit holders from retaining any shark species, although targeting authorized shark species for catch and release would still be authorized. Many fishermen already practice catch and release, and would not be impacted by this alternative. There are also some catch and release shark fishing tournaments already currently operating that would not be impacted by this alternative. Fishermen that do retain sharks recreationally and tournaments that award points for landing sharks would be impacted, and because this alternative would alter the nature of recreational shark fishing, it would likely result in decreased incentives to fish for sharks and adverse socioeconomic impacts.

#### ***Alternative A8***

Alternative A8 would prohibit recreational targeting and retention of sharks. This alternative would end recreational shark fishing, likely resulting in adverse socioeconomic impacts.

**Table 3.1 Summary Table of Recreational Alternatives**

<b>Recreational Alternative</b>	<b>Ecological Impact</b>	<b>Social/Economic Impact</b>
Alternative A1: No Action	Adverse	Neutral
Alternative A2: Recreational permit shark endorsement and NMFS-approved shark placard requirement	Beneficial	Neutral
Alternative A3: Angler education and outreach	Beneficial	Beneficial
Alternative A4: Retention prohibition on all ridgeback sharks	Beneficial	Adverse
Alternative A5: Work with ASMFC to extend state shark closure to July 31	Beneficial	Adverse
Alternative A6: Increase recreational minimum for most authorized sharks to 89 inches FL	Beneficial	Adverse
Alternative A7: Catch and release shark fishing	Beneficial	Adverse
Alternative A8: Prohibit targeting and retention of sharks	Beneficial	Adverse

#### **4.0 ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES OF THE COMMERCIAL ALTERNATIVES**

NMFS is considering several commercial alternatives that would reduce dusky shark mortality in order to rebuild and end overfishing of dusky sharks in a manner that maximizes sustainability, while minimizing, to the greatest extent possible, the social and economic impacts on affected fisheries. The alternatives to reduce dusky shark mortality range from maintaining the status quo under the No Action alternative to removing pelagic longline gear as an authorized gear to retain Atlantic HMS.

As described in Chapter 2, the commercial alternatives considered in this Predraft for reducing dusky shark mortality in the recreational shark fishery are:

- Alternative B1: No Action. Do not implement management measures to end overfishing of dusky sharks in Atlantic commercial HMS fisheries.
- Alternative B2: Fishermen with an Atlantic shark commercial permit with pelagic longline gear onboard would be limited to 750 hooks per pelagic longline set with no more than 800 assembled gangions onboard the vessel at any time.
- Alternative B3: Fishermen with an Atlantic shark commercial permit fishing with pelagic longline gear must release all sharks that are not being boarded or retained by using a dehooker, or by cutting the gangion no more than three feet from the hook.
- Alternative B4: Require the use of weak hooks in HMS pelagic longline fishery.
- Alternative B5: Develop dusky shark hotspot closure areas for HMS vessels fishing with pelagic longline gear.
- Alternative B6: Allow conditional access to dusky shark hotspot closure areas for HMS vessels fishing with pelagic longline gear.
- Alternative B7: Fishermen holding an Atlantic shark commercial permit (directed or incidental) would be prohibited from fishing with pelagic longline gear in waters with a depth shallower than 100 fathoms.
- Alternative B8: Increase dusky shark outreach and awareness through the development of additional outreach materials, requiring that all vessels with an Atlantic shark commercial permit have a NMFS-approved shark identification placard on board and that they abide by a dusky shark fleet communication and relocation protocol following dusky shark interactions.
- Alternative B9: Request the states and/or ASMFC to consider extending the shark commercial seasonal closure from July 15 to July 31.
- Alternative B10: Remove pelagic longline as authorized gear for commercial Atlantic shark permit holders.

## 4.1 Ecological Impacts

### *Alternative B1*

Under Alternative B1, NMFS would not implement any management measures to reduce dusky shark mortality in the Atlantic commercial HMS fisheries. NMFS has determined that dusky sharks are overfished and experiencing overfishing. If no management measures are implemented to reduce dusky shark mortality in the Atlantic commercial HMS fisheries, adverse ecological impacts would likely occur since overfishing would continue.

### *Alternative B2*

Under Alternative B2, fishermen with an Atlantic shark commercial permit (directed or incidental) that have pelagic longline gear onboard would be limited to 750 hooks per pelagic longline set with no more than 800 assembled gangions onboard the vessel at any time. Overall, limiting the number of hooks could have beneficial ecological impacts, because the hook restriction has the potential to reduce or cap interactions with dusky sharks caught on pelagic longline gear. As shown in Table 4.1, the number of hooks per pelagic longline set varied based on the target species. The average number of hooks used on pelagic longline sets targeting swordfish, yellowfin tuna, shark, and other species falls below the potential hook restriction of 750, but the restriction puts a cap on the number of hooks that can be used, which could be beneficial in the future if fishing practices change. This alternative would be a reduction of hooks per set when compared to the average number of hooks used on pelagic longline sets targeting bigeye tuna, mixed tuna species, dolphin, and mix species and could be beneficial for the dusky shark stock.

**Table 4.1 Average Number of Hooks per Pelagic Longline Set (2008-2012); Source: 2013 Atlantic HMS SAFE Report.**

<b>Target Species</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>Average</b>
Swordfish	708	687	759	728	683	713
Bigeye tuna	751	755	653	802	865	765
Yellowfin tuna	678	689	687	645	628	665
Mix of tuna species	747	744	837	786	728	768
Shark	377	354	455	348	525	411
Dolphin	989	1,033	1,131	1,082	1,129	1,072
Other species	NA	NA	467	400	300	389
Mix of species	749	781	761	749	758	759

### *Alternative B3*

Under Alternative B3, fishermen with an Atlantic shark commercial permit fishing with pelagic longline gear would be required to release all sharks that are not being boarded or retained by using a dehooker, or by cutting the gangion no more than three feet from the hook. Currently, pelagic longline fishermen are required to use a dehooking device to release marine mammals and sea turtles safely and with minimum harm. Fishermen are also required to release all HMS that are not retained in a manner that will ensure maximum probability of survival without removing the fish from the water. Under this alternative, if a shark is caught on pelagic longline

gear and not retained, fishermen would be required to release the shark by cutting the line no more than three feet from the hook or by using a dehooking device, in either case without removing the shark from the water. This release requirement would be applied to all sharks, due to the difficulties in identifying dusky sharks from other shark species. This alternative could have beneficial ecological impacts since using a dehooker or cutting the gangion could reduce post-release mortality of sharks.

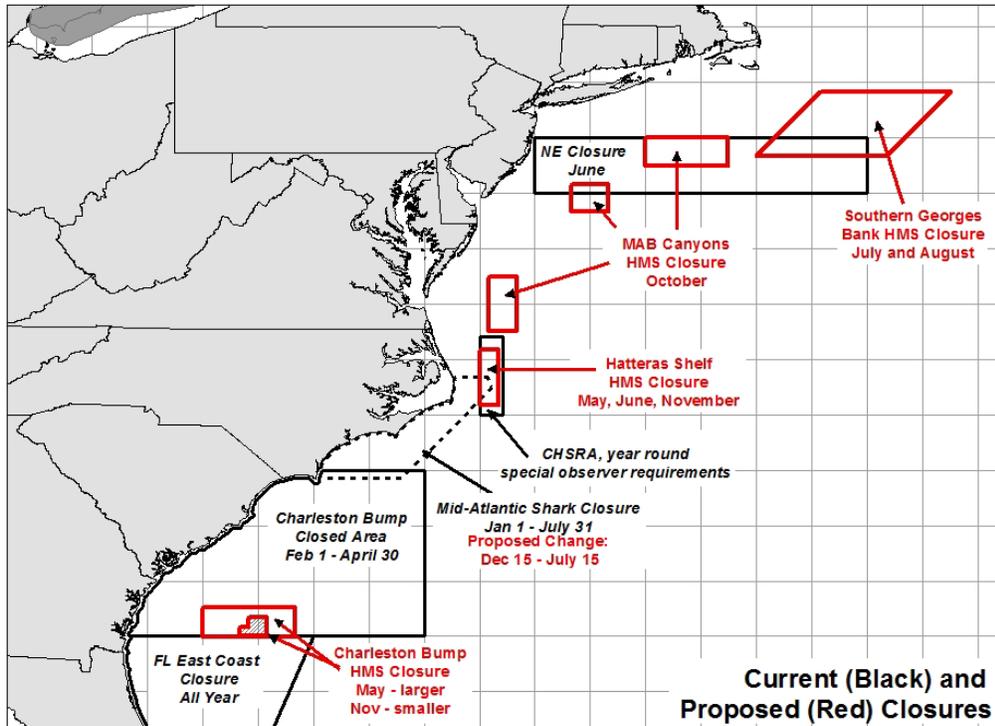
#### ***Alternative B4***

Under Alternative B4, NMFS would require the use of weak hooks in HMS pelagic longline fishery. Currently, commercial fishermen using pelagic longline gear are required to use weak hooks in the Gulf of Mexico region to reduce bycatch of bluefin tuna. This alternative would require all fishermen who hold an Atlantic shark commercial permit (directed or incidental) to use weak hooks when deploying pelagic longline fishing gear in the Gulf of Mexico, Atlantic, and Caribbean regions. Preliminary pelagic longline gear weak hook studies suggest fewer dusky sharks may be caught on weak hooks, although sample sizes are low. Weak hooks are more likely to bend when a large fish (e.g., dusky sharks) are hooked and the captured fish could escape. Requiring weak hooks for all vessels fishing for HMS with pelagic longline gear could have beneficial ecological impacts on the dusky shark population because weak hooks may provide a greater opportunity for large dusky sharks to escape capture on pelagic longline gear.

#### ***Alternative B5***

Under Alternative B5, NMFS would develop dusky shark hotspot closures for vessels fishing with pelagic longline gear that would reduce interactions and subsequent fishing mortality. The goal of these pelagic longline hotspot closures would be to maximize the reduction of bycatch (i.e., dusky sharks); minimize the reduction of target catch (i.e., swordfish, yellowfin tuna, dolphin, bigeye tuna); and where possible, to consider and minimize the impacts on non-target HMS (e.g., bluefin tuna, marlins, sea turtles). These hotspot closures would be designed using data from vessels using pelagic longline gear. Specifically, the hotspot closures would encompass areas in time and space where recent HMS logbook and observer data have shown high levels of interactions with dusky sharks on pelagic longline gear. During the closures, Atlantic shark commercial permit holders (directed or incidental) would not be able to fish with pelagic longline in these areas.

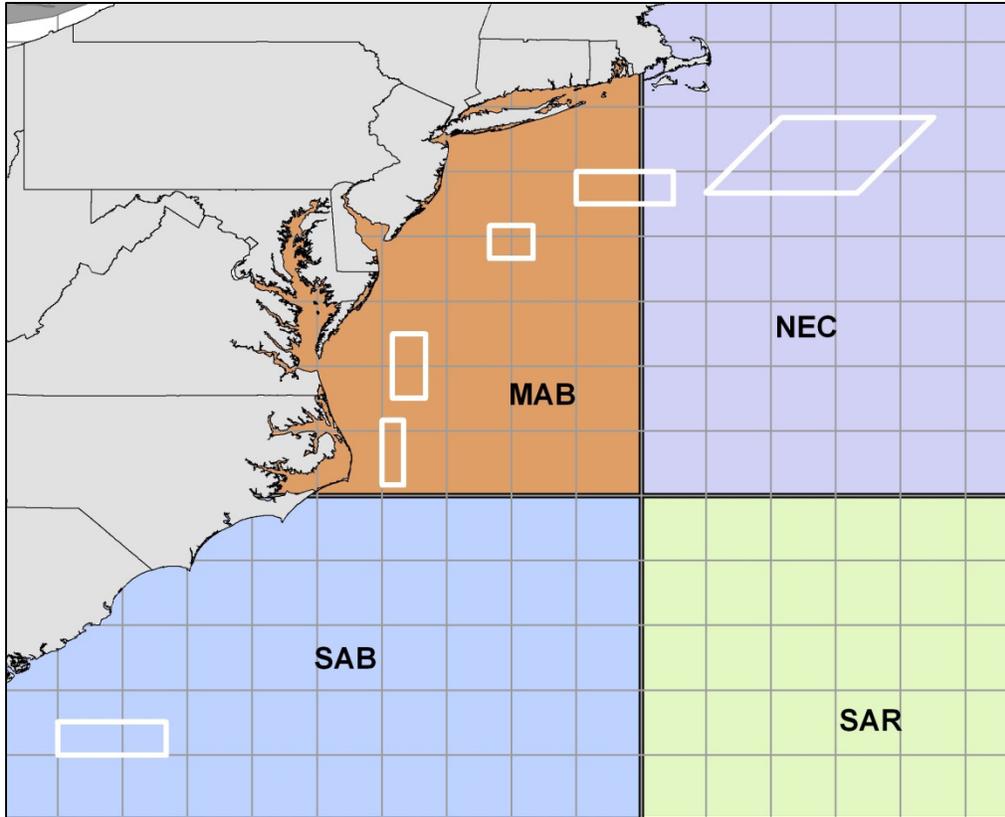
NMFS proposed a set of nine dusky shark pelagic longline hotspot closures in Draft Amendment 5 (77 FR 70552). Since little fishery independent data on dusky shark distribution are available, NMFS assumed that these sites were either potential aggregation sites or were locations where larger numbers of dusky sharks were susceptible to interactions with fishing gear. The Draft Amendment 5 proposed closures reflected areas where at least 10 dusky shark interactions were reported in the logbooks between 2008 and 2010. The hotspot closures were designed to be as small as possible while still meeting the objectives of the rulemaking. The proposed dusky shark hotspot closure alternatives from Draft Amendment 5 are shown in Figure 4.1.



**Figure 4.1** Location and timing of Draft Amendment 5 proposed dusky shark hotspot closures. Source: NMFS 2012.

Since Draft Amendment 5 originally published, NMFS has received new fishery-dependent data and suggestions from the public that should be taken into consideration in the identification and delineation of dusky shark hotspot closures. In particular, NMFS was asked to review observer program data and consider both interactions and CPUE when delineating dusky hotspot closures. In addition, the agency used public comment to further refine some analysis methodologies used to evaluate ecological and socioeconomic effects.

NMFS previously assessed ecological effects using a redistribution model that assumed fishermen would be able to relocate effort within delineated hotspot closures to the domestic fishing region within which the hotspot was located (Figure 4.2). In other words, all hooks from all vessels fishing a particular hotspot closure were assumed to redistribute to one region. Based on public comment for Draft Amendment 5 and Draft Amendment 7, NMFS has changed its approach to redistribution modeling. Fishing effort is now redistributed on an individual basis, and effort is assumed to be redistributed only to those locations that are adjacent to the proposed closures. If a vessel fishes in two or more domestic management areas, its total redistributed effort is as a function of its proportion of effort in each area. For example, if a vessel affected by the Hatteras Shelf June dusky hotspot closure fishes 30 percent of the time in the Mid-Atlantic Bight (MAB) and 70 percent of the time in the South Atlantic Bight (SAB), then 30 percent and 70 percent of the redistributed hooks would be assigned to adjacent portions of the MAB and SAB, respectively. In addition, NMFS assumed that the ability to redistribute will vary by vessel. For example, vessels that fish a small percentage of the time in a proposed hotspot are assumed to be more capable of redistribution than a vessel that spends 90 percent of its time within a particular hotspot.



**Figure 4.2 Draft Amendment 5 proposed closures and the domestic fishing regions used for redistribution analyses.**

New data received by NMFS includes both logbook and observer data. Table 4.2 and Table 4.3 show logbook interactions by year and month. Table 4.4 shows a summary of observer data and dusky shark interactions from 2008 to 2012. Approximately 1,456 interactions were reported in the HMS logbook in 2011 and 2012; most of the sharks were reported as being discarded alive. Most of these interactions occurred in the months that were previously selected for dusky hotspot closures (Table 4.3). Approximately 61 dusky sharks were observed on trips in 2011 and 2012, with the majority of these sharks being discarded alive.

**Table 4.2 Reported dusky shark interactions for U.S. pelagic longline vessels. Data Source: HMS logbook database, 2008-2012. Date of data query: October 2013**

Set Year	2008	2009	2010	2011	2012
# Sets	8,951	9,457	7,555	8,215	10,760
Dusky Kept	4	0	0	0	1
Dusky Discarded Alive	372	560	702	535	794
Dusky Discarded Dead	35	68	35	12	114
Total Interactions	411	628	737	547	909
# Hooks Set	6,559,457	7,061,732	5,762,066	6,069,253	7,823,035

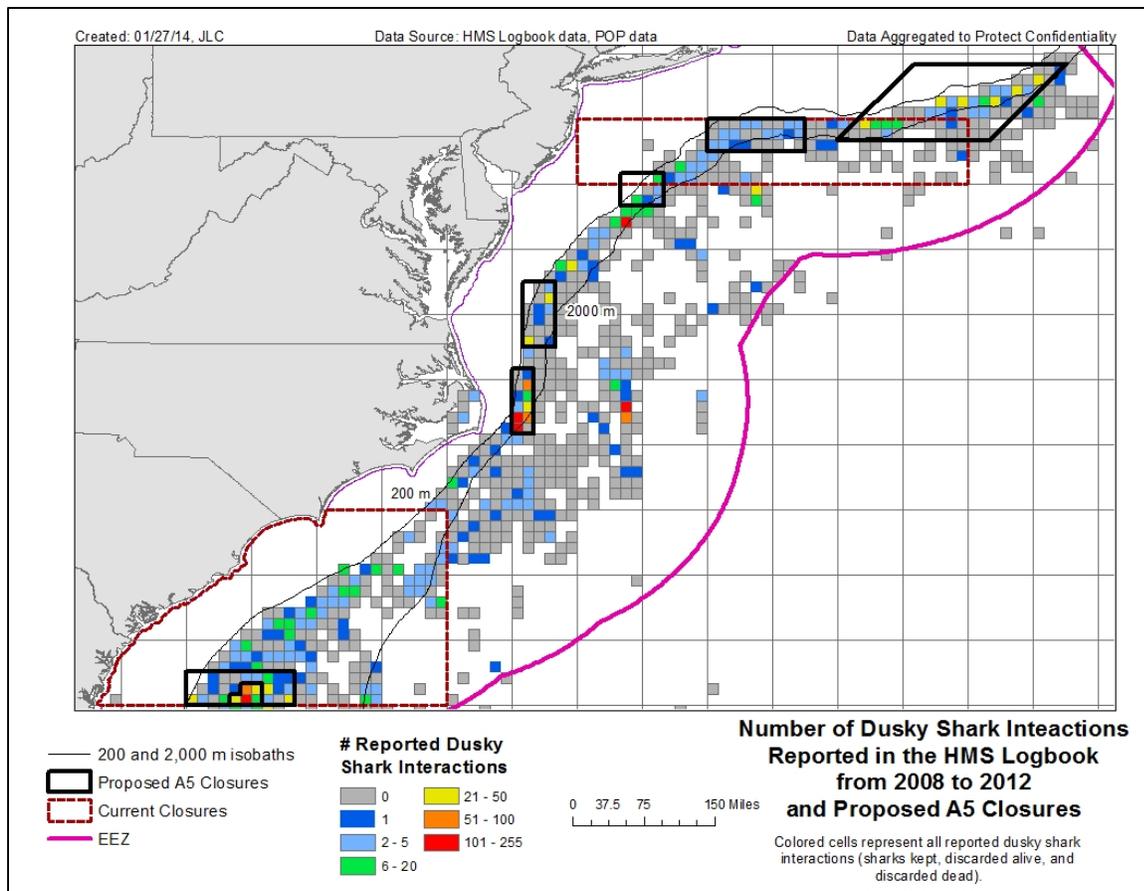
**Table 4.3 Reported dusky shark interactions for U.S. pelagic longline vessels. Data Source: HMS Logbook database, 2008-2012. Date of data query: October 2013**

Month	Dusky Disc Alive	Dusky Disc Dead	Dusky Kept	Total Dusky Interactions
1	72	7	0	79
2	74	7	1	82
3	240	59	0	299
4	76	7	0	83
5	500	84	0	584
6	902	50	1	953
7	301	9	1	311
8	219	10	0	229
9	154	7	0	161
10	213	7	2	222
11	169	16	0	185
12	24	2	1	27

**Table 4.4 Summary of pelagic observer data and observed dusky shark interactions. Data Source: Pelagic Observer Program (POP) database, 2008-2012. Data queried: December 2013.**

Dusky POP Data Summary by Year	2008	2009	2010	2011	2012
Total # Observed Dusky:	34	63	31	36	25
Total # Observed Discarded Alive:	26	38	20	27	17
Total # Observed Discarded Dead:	8	25	11	9	8
# Hauls Observed:	1314	1597	1050	902	1070
# Trips Observed:	162	194	137	126	143
Total # Observed Hooks	993,169	1,206,916	782,447	608,580	738,910
# Observed Hauls w/at least 1 Dusky:	20	41	22	25	22
# Observed Trips w/ at least 1 Dusky:	13	27	18	17	17

Given the new information, redistribution methodology, and analysis requests, NMFS is considering: whether the previously proposed dusky shark hotspot closures are still adequate for reducing dusky shark mortality to meet the purpose and need of Amendment 5b; if some should be adjusted or removed; or if new hotspot closures be considered in order to meet the ecological objectives of the rulemaking. The location of Draft Amendment 5 proposed dusky shark hotspot closures and total dusky shark interactions reported between 2008 and 2012 is shown in Table 4.3. However, because the dusky shark hotspot closures are delineated by month, maps depicting logbook interactions, logbook CPUE, observed interactions, and observed CPUE of dusky sharks by month are presented in Appendix I of this Predraft for further consideration of the timing and location of hotspot closures.



**Figure 4.3 Total reported dusky shark interactions from 2008 to 2012 compared to the location of Draft Amendment 5 dusky shark hotspot closures. Data Source: HMS Logbook database, 2008 - 2012; NMFS 2012.**

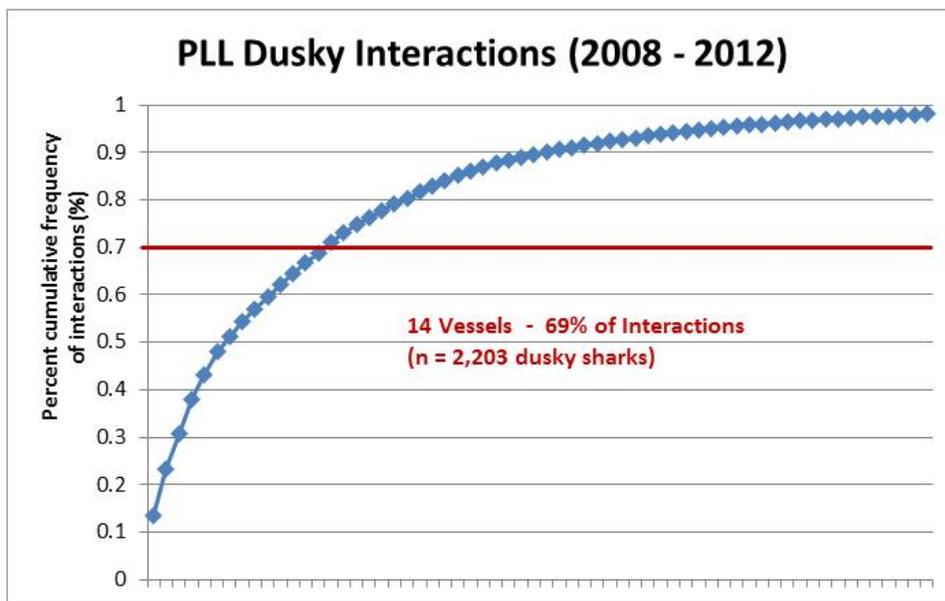
NMFS anticipates that dusky shark pelagic longline hotspot closures would likely result in beneficial ecological effects for the dusky shark stock. These hotspot closures would restrict effort in areas with high numbers of interactions, and reduce total dusky shark interactions and incidental mortality. However, this assumption has several caveats, which include, but are not limited to, the following:

- The concentration of fishery interactions with dusky sharks is an appropriate proxy to represent where the dusky shark population aggregates and is distributed.
- Variable environmental conditions could result in minor to major shifts in the distribution patterns of dusky sharks. In particular, many of these pelagic longline hotspot closures are located adjacent to or within the Gulf Stream, which exhibits seasonal and annual changes in strength and location of both the main current and warm- and cold-core eddies. Fishermen tend to fish along the current and eddy boundaries. If major changes in the strength or position of the Gulf Stream or its eddies occurs, some of the hotspots of fishery interactions may shift out of the delineated areas as fishing behavior is adjusted to maximize opportunity.

- There may be misidentification issues with logbook and observer data, and potential misreporting issues with logbook data.
- Displacement of effort would not result in large numbers of dusky sharks being caught elsewhere.

**Alternative B6**

Under Alternative B6, NMFS would allow conditional access to dusky shark pelagic longline hotspot closure areas for some vessels fishing with pelagic longline gear. The principal objective of conditional access would be to provide strong incentives to avoid dusky sharks and to reduce interactions by modifying fishing behavior. The secondary objective would be to balance reducing dusky shark interactions with providing reasonable fishing opportunity to participants in the pelagic longline fleet that have demonstrated an ability to avoid dusky sharks. Participants in the pelagic longline fleet have requested increased individual accountability within the fishery in light of several management problems facing the fishery (e.g., bluefin tuna, dusky sharks). NMFS used the conditional access concept under Draft Amendment 7 to the 2006 Consolidated HMS FMP, in part due to the public comments and feedback received regarding the original dusky hotspot closures proposed in Draft Amendment 5. This approach would address the fact that, according to HMS logbook data, relatively few vessels have consistently been responsible for the majority of the dusky shark interactions. For example, logbook data from 2008 to 2012 indicate that 14 vessels (out of 159 that self-reported in the HMS logbook between 2008 and 2012) had close to 70 percent of the self-reported dusky shark interactions that occurred during this time period (Figure 4.4). The pelagic observer program data also suggest a relatively small number (n = 21 out of 124) of vessels had most of the fleet’s observed interactions (Figure 4.5).



**Figure 4.4** Percent contribution of individual vessels towards total dusky shark interactions, based on self-reported logbook data. Data Source: HMS logbook database, 2008-2012.

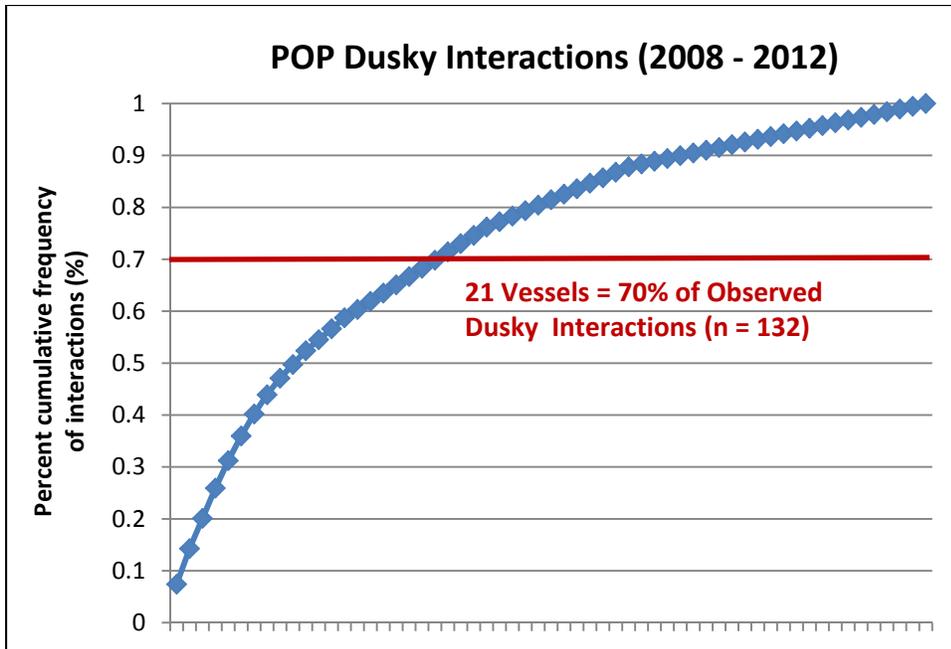


Figure 4.5 Percent contribution of individual vessels towards total dusky interactions, based on observer data. Data Source: NMFS Pelagic Observer Program data, 2008 - 2012.

Table 4.5 Summary of cumulative frequency analysis to determine the number of vessels contributing to a large proportion of dusky shark interactions (up to 70% of the interactions). Vessels were sorted each year and overall from highest to lowest in terms of number of dusky shark interactions, and a cumulative frequency was derived. Data Source: HMS Logbook Data, 2008 - 2012.

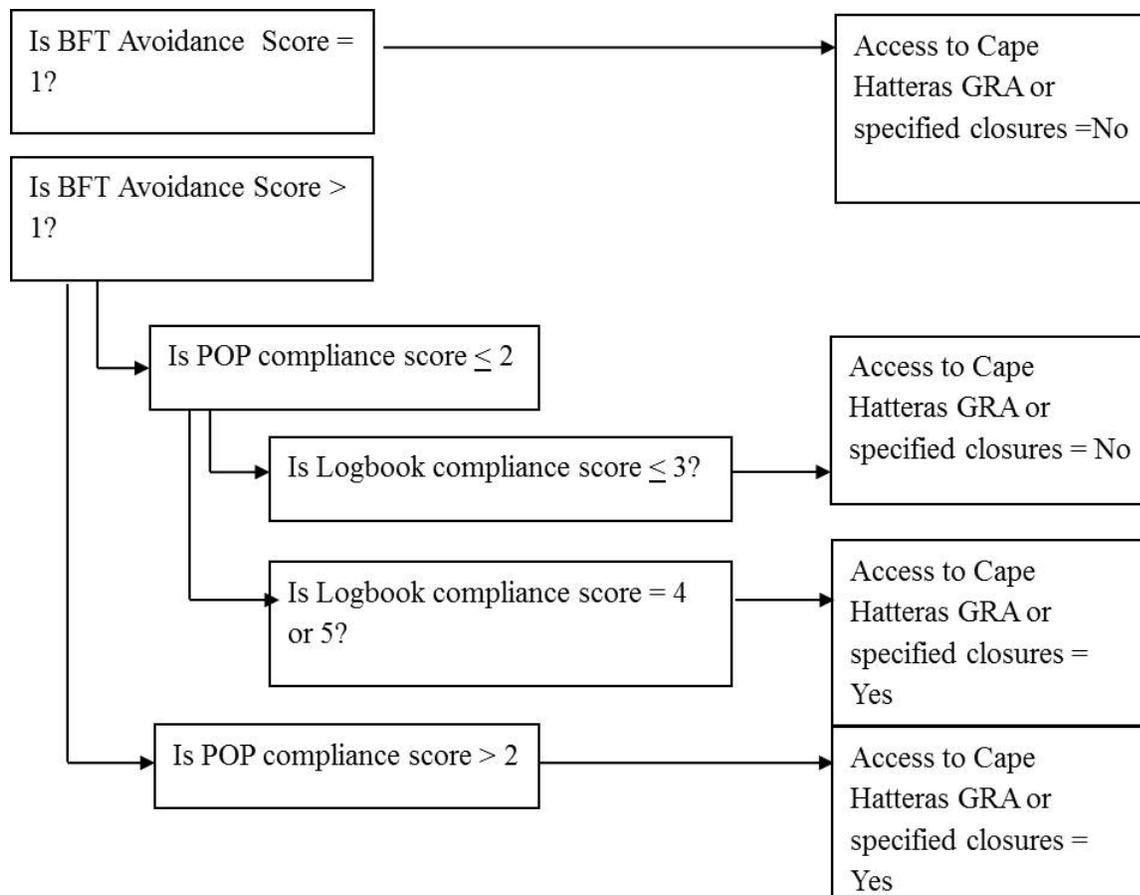
Year	Number of Vessels with a Dusky Shark Interaction	Total Number of Vessels	Percentage of Vessels with a Dusky Shark Interaction	Number of Vessels With Up to 70 Percent of Dusky Interactions	Percentage of Vessels without a Dusky Shark Interaction
2008	47	121	38.8	12	61.2
2009	40	115	34.8	6	65.2
2010	41	116	35.3	4	64.7
2011	29	117	24.7	4	75.3
2012	45	122	36.9	5	63.1
08-12	92	159	57.9	14	42.1

Between 2008 and 2012, between 4 and 11 vessels accounted for up to 70 percent of the dusky shark interactions (i.e., in 2012, the top 5 vessels accounted for 67.5 percent of dusky shark interactions, while the top 6 vessels accounted for 72 percent of the dusky shark interactions) (Table 4.5). Collectively, these vessels accounted for approximately 2,203 dusky shark interactions (Table 4.6).

**Table 4.6 The total number of dusky shark interactions attributed to the vessels comprising up to 70% of the dusky shark interactions. Data Source: HMS Logbook Data, 2008 - 2012.**

Year	# Vessels Accounting for Up To 70 % of Dusky Shark Interactions	# of Dusky Sharks
2008	12	275
2009	6	433
2010	4	514
2011	4	369
2012	5	612
08-12	14	2203

NMFS would review pelagic longline vessel performance using performance metrics and, based on that review, authorize some vessels fishing with pelagic longline gear to have access to the dusky shark hotspot closed areas. Performance metrics could include level of dusky shark interactions/avoidance, compliance with the observer program, and logbook submissions. The system of performance metrics currently under evaluation for Draft Amendment 7 that would allow conditional access to bluefin tuna gear restricted areas (GRA) is presented in Figure 4.6. Similar to the bluefin tuna avoidance score, vessels could be ranked based on their respective abilities to avoid dusky sharks. If a vessel has a high enough dusky shark avoidance score, the vessel would be permitted to fish in a dusky shark pelagic longline hotspot closure provided the vessel is also compliant with the monitoring and reporting mechanisms within the fishery (e.g., logbook reporting and observer compliance). It is important to note that the monitoring and reporting requirements for the pelagic longline fishery could change with the finalization of Amendment 7 to the 2006 Consolidated HMS FMP. Therefore, the performance metrics could be adjusted to reflect any new reporting or monitoring requirements for the fishery.



**Figure 4.6** Example of how performance metrics were used to determine access to gear restricted areas and closures under Draft Amendment 7. A similar system would be set up to allow condition access to dusky shark hotspot closures under Amendment 5b.

NMFS anticipates that the implementation of Alternative B6 could result in beneficial ecological impacts on the dusky shark stock. Conditional access would prohibit access to the regions where the greatest numbers of dusky shark interactions are observed to consistently occur by the vessels that have demonstrated an inability to avoid dusky sharks. This alternative could reduce dusky shark interactions with pelagic longline gear and subsequent incidental mortality. In addition, the performance metrics would incentivize vessels to report logbook data in a timely manner and be compliant with the observer program. These data streams are critical for management and stock assessment purposes. Alternatives that promote the timely return of accurate data are anticipated to result in positive ecological benefits for the stock.

***Alternative B7***

Alternative B7 would prohibit vessels that hold an Atlantic shark commercial permit (directed or incidental) from fishing with pelagic longline gear in depths shallower than 100 fathoms. This alternative was developed from public comments, which suggested that reductions in dusky shark mortality rates could be achieved by not allowing pelagic longline fishing in shallower areas. Commenters suggested a 100 fathom limit, as well as other depths (e.g., 150, 200 fathoms). Table 4.7 shows all pelagic longline sets observed by the pelagic observer program binned in depths of 50 fathoms, and contains the number of sets in each depth bin, their

percentage of the total number of observed sets, the number of dusky sharks observed, the number of hooks observed, and a general calculation of CPUE (number of observed dusky sharks / number of observed hooks \* 10,000). According to the observer data, sets that were fished at depths up to 4,000 fathoms encountered dusky sharks, with depth bins from 0 to 250 fathoms having the highest dusky shark CPUEs (Table 4.7).

The ecological impacts of a 100 fathom pelagic longline closure would be dependent on how vessels effort would be redistributed. If all of the effort is redistributed into areas with lower CPUE or if all vessels do not redistribute effort, beneficial ecological impacts would be anticipated for the dusky shark stock. If all of the effort is redistributed to areas with higher CPUEs, then adverse ecological impacts would be anticipated for the dusky shark stock. It is likely that a combination of these three redistribution scenarios would occur from restricting pelagic longline fishing in depths less than 100 fathoms, which could result in beneficial ecological impacts. Restricting pelagic longline fishing in depths less than 250 fathoms would eliminate the opportunity for effort to be redistributed into areas with higher dusky shark CPUEs, as all of the binned areas with the highest CPUEs would be included in the closure. This would have beneficial ecological impacts.

**Table 4.7 Dusky shark interactions recorded by the pelagic observer program by depth from 2008-2012**

Depth Fathoms	# Sets	% of Total Obs Sets	#Dusky Obs	# Hooks	CPUE (Dusky/hooks x10k)
0 - 50	40	0.68	3	23,217	1.29
51 - 100	102	1.74	6	56,263	1.07
101 - 150	175	2.99	13	118,860	1.09
151 - 200	239	4.09	26	160,761	1.62
201 - 250	331	5.66	31	212,562	1.46
251 - 300	395	6.76	17	267,858	0.63
301 - 400	757	12.95	25	555,235	0.45
401 - 500	689	11.79	19	533,728	0.36
501 - 600	412	7.05	11	303,371	0.36
601 - 700	518	8.86	5	405,763	0.12
701 - 800	432	7.39	3	325,557	0.09
801 - 900	686	11.73	3	480,649	0.06
901-1000	520	8.89	23	341,319	0.67
1001-2000	475	8.13	2	412,329	0.05
2001-3000	71	1.21	0	59,491	0
3001-4000	4	0.07	0	3,130	0
4001-5000	0	0.00	0	0	0

Data Source: Pelagic Observer Program Data, 2008-2012

**Alternative B8**

In Alternative B8, management measures would consist of a number of efforts to increase awareness regarding dusky sharks by the pelagic longline fishing fleet and the need to reduce fishing mortality on the dusky shark stock. Vessels would be required to have a NMFS-approved shark identification placard onboard when fishing with pelagic longline gear, and

would have to abide by a pelagic longline dusky shark protocol after interacting with a dusky shark, which would include communicating with other pelagic longline vessels in the area and changing the location of subsequent fishing sets. The communication protocol would be modeled after the one included in the Pelagic Longline Take Reduction Plan final rule (74 FR 23349; May 19, 2009). The objective would be for vessel operators (i.e., captains) to maintain daily communication with other local vessel operators regarding dusky shark interactions throughout the pelagic longline fishery with the goal of identifying and exchanging information relevant to avoiding dusky shark bycatch. For this communication strategy to be effective, the exchange of information must be timely, the entire fleet in a region must cooperate, and it must result in an action being taken to either avoid or reduce bycatch. After interacting with a dusky shark, fishermen would have to notify other pelagic longline fishermen regarding where the interaction occurred. After interacting with a dusky shark, subsequent fishing sets could be no closer than 1 nm from the location of the dusky shark interaction, with the intent to avoid future interactions. Improving pelagic longline fishermen's ability to identify dusky sharks should help in determining if they are interacting with dusky sharks and allow them to change fishing practices or locations to avoid future interactions. Developing better lines of communication between fishermen regarding where dusky sharks are at certain times could allow fishermen to become more efficient in avoiding dusky sharks. Similar communication approaches have been used in other U.S. fisheries to avoid bycatch (e.g., Atlantic herring and mackerel fishery, Atlantic sea scallop fishery) and have contributed to the reduction of bycatch of certain species (e.g., river herring and American shad, and yellowtail flounder, respectively) in those fisheries (Bethoney et al, 2013, Okeefe 2013). An effective outreach and communication program for dusky shark avoidance could reduce dusky shark bycatch in the pelagic longline fishery, which would have beneficial impacts on the stock.

#### ***Alternative B9***

Under Alternative B9, NMFS would work and collaborate with the affected states and the ASMFC, to extend the end date of the existing state shark closure from July 15 to July 31. As described in Alternative A5, the states of New Jersey, Delaware, Maryland, and Virginia prohibits the commercial possession of LCS species from May 15 to July 15. This closure is to protect the essential fishing habitat for sandbar and dusky sharks. Extending the closure to July 31 would coincide with the federal Mid-Atlantic shark time/area closure off North Carolina. Extending the closure should provide additional protection for dusky sharks would have beneficial ecological impacts on the dusky shark stock.

#### ***Alternative B10***

Under Alternative B10, NMFS would remove pelagic longline gear as authorized gear for Atlantic HMS. All commercial fishing with pelagic longline gear for HMS in the Atlantic, Gulf of Mexico, and Caribbean would be prohibited, therefore, fishing mortality from pelagic longline gear on dusky sharks would be eliminated, which would have beneficial ecological impacts on the dusky shark stock.

## 4.2 Socioeconomic Impacts

### *Alternative B1*

Under Alternative B1, NMFS would not implement any measures to reduce dusky shark mortality in the commercial shark or HMS fisheries. Since no management measures would be implemented under this alternative, NMFS would expect fishing practices to remain the same and socioeconomic impacts to be neutral in the short-term. Dusky sharks are a prohibited species and fishermen are not allowed to harvest this species. Thus, even if dusky sharks continue to experience overfishing and the abundance declines as a result of this alternative, there would not be any socioeconomic impacts on the fishery in the short-term. If more restrictive measures are required in the long-term under MSA or other statutes such as the Endangered Species Act, socioeconomic impacts may occur.

### *Alternative B2*

Under Alternative B2, fishermen with an Atlantic shark commercial permit with pelagic longline gear onboard would be limited to 750 hooks per pelagic longline set with no more than 800 assembled gangions onboard the vessel at any time. Based on average number of hooks per pelagic longline set data shown above in Table 4.1, the hook restriction in this alternative could have neutral socioeconomic impacts on fishermen targeting bigeye tuna, mixed tuna species, and mix species, because the average number of hooks used on pelagic longline sets targeting these species is slightly above the limit considered in this alternative. This alternative would likely have adverse socioeconomic impacts on fishermen targeting dolphin fish, because these fishermen on average use 1,072 hooks per set (Table 4.1). If NMFS implemented this alternative, fishermen targeting dolphin fish with pelagic longline gear would have to reduce their number of hooks by approximately 30 percent per set, which may come with a similar percent reduction in set revenue. Overall, Alternative B2 would be expected to have adverse socioeconomic impacts on the pelagic longline fishery.

### *Alternative B3*

Under Alternative B3, fishermen with an Atlantic shark commercial permit fishing with pelagic longline gear must release all sharks that are not being boarded or retained by using a dehooker, or by cutting the gangion no more than three feet from the hook. This alternative would have neutral to adverse socioeconomic impacts on commercial shark fishermen using pelagic longline gear. Currently, fishermen are required to use a dehooking device if a protected species is caught. This alternative would require this procedure to be used on all sharks that would not be retained, or fishermen would have to cut the gangion to release the shark. Currently, it is common practice in the pelagic longline fishery to release sharks that are not going to be retained (especially larger sharks) by cutting the gangion, so the socioeconomic impacts associated with cutting the gangion to release sharks in this alternative would be neutral. Using a dehooker to release sharks in the pelagic longline fishery is a less common practice, therefore, there may be a learning curve that would make using this technique more time consuming and making fishing operations less efficient. Although this may be an initial issue, NMFS expects that these inefficiencies would be minimal and that fishermen would become more adept in using a dehooker to release sharks over time. Thus, Alternative B3 would be expected to have neutral socioeconomic impacts on the pelagic longline fishery.

#### ***Alternative B4***

Under Alternative B4, NMFS would require the use of weak hooks in the HMS pelagic longline fishery. As shown in Table 4.8, this alternative could impact approximately 80 pelagic longline vessels in the Atlantic and Caribbean region, which would have to become equipped with weak hooks. This could have adverse socioeconomic impacts on these fishermen because they could be required to reconfigure their pelagic longline gear with weak hooks, and the use of weak hooks could impact target catch (e.g., swordfish, yellowfin tuna) composition, which could decrease set revenue.

**Table 4.8 Number of Active Pelagic Longline Vessels by Region (2008-2012); Source: Fisheries Logbook System.**

<b>Area</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>Average</b>
Gulf of Mexico	43	38	37	34	40	38
Caribbean	1	3	0	0	0	1
Atlantic	78	75	80	83	82	79

#### ***Alternative B5***

Under Alternative B5, NMFS would develop dusky shark hotspot closures for vessels fishing with pelagic longline gear that would reduce interactions and subsequent fishing mortality. During the closures, Atlantic shark commercial permit holders (directed or incidental) would not be able to fish with pelagic longline in these areas. To analyze the socioeconomic impacts of implementing dusky shark hotspot closure areas, NMFS would use a redistribution approach similar to the one used in Draft Amendment 7, which makes redistribution estimates on an individual vessel basis (see Chapter 1), rather than the more fleet-wide approach that was taken in Draft Amendment 5. Using this updated redistribution approach, NMFS assumes that some vessels would be able to redistribute and others would not and would stop fishing, rather than the Draft Amendment 5 redistribution assumption that all vessels would be able to redistribute their fishing effort and would continue to fish.

Implementation of any dusky shark pelagic longline hotspot closures are likely to result in adverse socioeconomic impacts for affected fishermen. Fishermen generally select fishing grounds that minimize costs and maximize returns, and are often limited in suitable locations to deploy gear due to weather; oceanographic or geophysical conditions (e.g., current boundaries, shelf break, depth, anthropogenic pollution); presence of protected or prohibited species (e.g., whales); avoidance of undesirable or nuisance species; or a variety of other reasons. Requiring fishermen to relocate to less optimal locations could reduce trip revenues to the point where fishing no longer becomes profitable. Specific impacts would vary by size and duration of hotspot area closures and individual vessels.

#### ***Alternative B6***

Under Alternative B6, NMFS would allow conditional access to dusky shark hotspot closure areas for some vessels fishing with pelagic longline gear. This alternative would provide strong incentives to avoid dusky sharks and to reduce interactions by modifying fishing behavior. Participants in the pelagic longline fleet have requested increased individual accountability within the fishery in light of several management issues facing the fishery (e.g., bluefin tuna, dusky sharks). NMFS first developed the use of conditional access under Draft Amendment 7,

in part due to the public comments and feedback received regarding the original dusky hotspot closures proposed in Draft Amendment 5. This approach would address the fact that, according to HMS logbook data, relatively few vessels have consistently accounted for the majority of the dusky shark interactions. Conditional access would not impact the entire fleet for interactions made by a relatively small proportion of vessels. Therefore, depending on the metrics selected and fishery participant behavior, this alternative could have adverse socioeconomic effects on certain vessels that are both poor avoiders of dusky sharks and are non-compliant with the regulations. NMFS would analyze the socioeconomic impact by using similar fishing effort redistribution proposed in Draft Amendment 7 and described in Alternative B5. Overall, the adverse socioeconomic effects of dusky shark hotspot closures are expected to be less if a conditional access alternative is implemented because some vessels would still be able to access and fish the hotspot closures. This alternative would have neutral to beneficial effects for vessels that are still authorized to fish in these regions, as they would not be held accountable for the behavior of other individuals and would not have to change their current fishing operations.

#### ***Alternative B7***

Alternative B7 would prohibit vessels that hold an Atlantic shark commercial permit (directed or incidental) from fishing with pelagic longline gear in depths shallower than 100 fathoms. This alternative was developed from public comments, which suggested that reductions in dusky shark mortality rates could be achieved by not allowing pelagic longline fishing in shallower areas. Commenters suggested a one hundred fathom limit, as well as other depths (e.g., 150, 200 fathoms). Limiting where pelagic longline fisherman can fish could cause adverse socioeconomic impacts, especially when considering this restriction would alter normal fishing operations. Implementing a pelagic longline restriction by depth would likely result in fishermen relocating to different areas or to stop fishing altogether. Redistributing fishing effort to deeper areas may have factors such as additional costs (e.g., fuel), and limited resource availability (e.g., lack of viable fishing grounds) that may not make trips to these areas profitable and could reduce safety at sea. These increased costs and reduced fishing opportunities could result in vessels ceasing fishing operations rather than redistributing effort. NMFS assumes that these changes resulting from restricting pelagic longline fishing inside a depth of 100 fathoms would lead to adverse socioeconomic impacts on pelagic longline fishermen. The magnitude of this impact would be analyzed in greater detail in the A5b DEIS and the redistribution analysis could use the same approach that would be used for the dusky shark hotspot closure area alternative and that was used to analyze the impacts of gear restricted areas in the A7 DEIS.

#### ***Alternative B8***

The socioeconomic impacts associated with Alternative B8, which would include requiring vessels engaged in pelagic longline fishing to have a NMFS-approved shark placard onboard, and establishing a communication and fishing set relocation protocol following interactions with dusky sharks, are anticipated to be neutral. Copies of identification placards would be provided to pelagic longline vessels by NMFS at no additional cost to the vessel. These requirements would not cause a substantial change to current fishing operations, but have the potential to help fishermen become more adept in avoiding dusky sharks. If fishermen become better at avoiding dusky sharks, there is the possibility that target catch could increase. On the other hand, the requirement to move the subsequent fishing set one nm from where a previous dusky shark interaction occurred could move fishermen away from areas where they would prefer to fish.

**Alternative B9**

Under Alternative B9, NMFS would seek, through collaboration with the affected states and the ASMFC, to extend the end date of the existing state shark closure from July 15 to July 31. Currently, the states of Virginia, Maryland, Delaware, and New Jersey have a state-water commercial shark closure from May 15 to July 15. In 2013, 5,228 lb dw of aggregated LCS were landed by commercial fishermen in Virginia and New Jersey from July 15 to July 31. Based on 2012 ex-vessel price, this could be a \$6,374 loss to the regional fleet in revenues due to changed closure date (Table 4.9). Extending this closure by 16 days could cause a reduction of commercial fishing opportunity, likely resulting in adverse socioeconomic impacts due to reduced opportunities to harvest aggregated LCS.

**Table 4.9 2012 Ex-vessel prices and annual gross revenues on aggregated LCS landings from July 15 through July 31. Shark fins are assumed to be 5 percent of the carcass weight; Source: 2013 SAFE Report.**

<b>Species</b>	<b>Landings (lb dw)</b>	<b>2012 Ex-Vessel Price</b>	<b>Annual Gross Revenues</b>
<i>Atlantic Region</i>			
Aggregated LCS	5,228	\$0.67	\$3,503
Fins	261	\$11	\$2,871
Total			\$6,374

**Alternative B10**

Under Alternative B10, NMFS would remove pelagic longline gear as authorized gear for Atlantic HMS. All commercial fishing with pelagic longline gear for HMS in the Atlantic, Gulf of Mexico, and Caribbean would be prohibited. This would greatly reduce fishing opportunities, and would be expected to result in adverse socioeconomic impacts. The 2012 value of PLL landings for all HMS is estimated to be approximately \$44 million (Fisheries Logbook System and Bluefin Dealer Report Database).

**Table 4.10 Summary Table of Commercial Alternatives**

<b>Commercial Alternative</b>	<b>Ecological Impact</b>	<b>Socioeconomic Impact</b>
Alternative B1: No Action	Adverse	Neutral
Alternative B2: 750 hook limit per pelagic longline set, limit of 800 gangions onboard at one time	Beneficial	Adverse
Alternative B3: Requirement to release sharks with a dehooker or by cutting the ganglion no more than 3 feet from the hook	Beneficial	Neutral
Alternative B4: Mandatory use of week hooks on all pelagic longline sets	Beneficial	Adverse
Alternative B5: Dusky shark hotspot closure areas for pelagic longline gear	Beneficial	Adverse
Alternative B6: Conditional access to dusky shark hotspot closure areas with pelagic longline gear	Beneficial	Adverse
Alternative B7: Prohibit pelagic longline gear in depths less than 100 fathoms	Beneficial	Adverse
Alternative B8: Pelagic longline shark placard, and communication and fishing set relocation protocol requirements	Beneficial	Neutral
Alternative B9: Work with ASMFC to extend shark closure to July 31	Beneficial	Adverse
Alternative B10: Remove pelagic longline gear as authorized gear for Atlantic HMS	Beneficial	Adverse

## 5.0 LITERATURE CITED

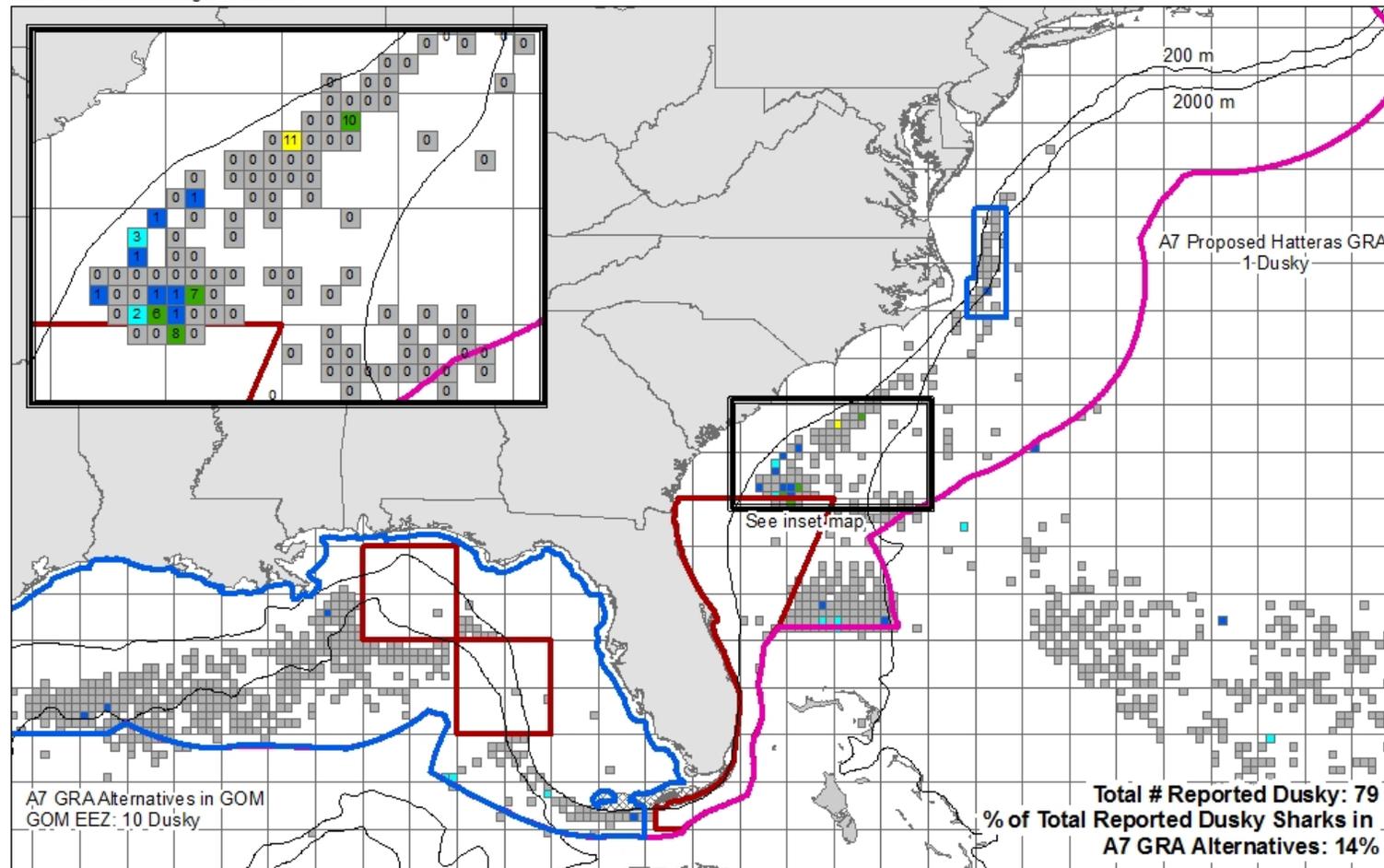
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## **6.0 APPENDIX I. HMS LOGBOOK AND PELAGIC OBSERVER PROGRAM DATA**

The following 48 maps depict total interactions self-reported by industry participants and reported as observed in the HMS logbook database and the Pelagic Observer Program database, respectively. Data from 2008 and 2012 were extracted from each database and imported into ArcGIS 10.1. The data was then queried by month (i.e., the January maps were created using all data from January 2008, January 2009, January 2010, January 2011, and January 2012) and plotted as a point file. The point file was then joined (using geographic location) to a polygon grid shapefile. This function summed, for all points that fell within a particular grid cell, the total number of dusky shark interactions that occurred within each grid cell. This process also allowed NMFS to calculate the total number of hooks that were deployed in each grid cell. To derive CPUE per grid cell, NMFS divided the sum of dusky interactions per grid cell by the sum of hooks deployed per grid cell.

Data Source: HMS Logbook Data

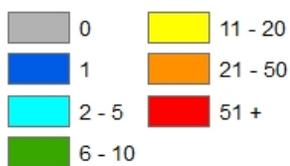


- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26

0 250 500  
Kilometers

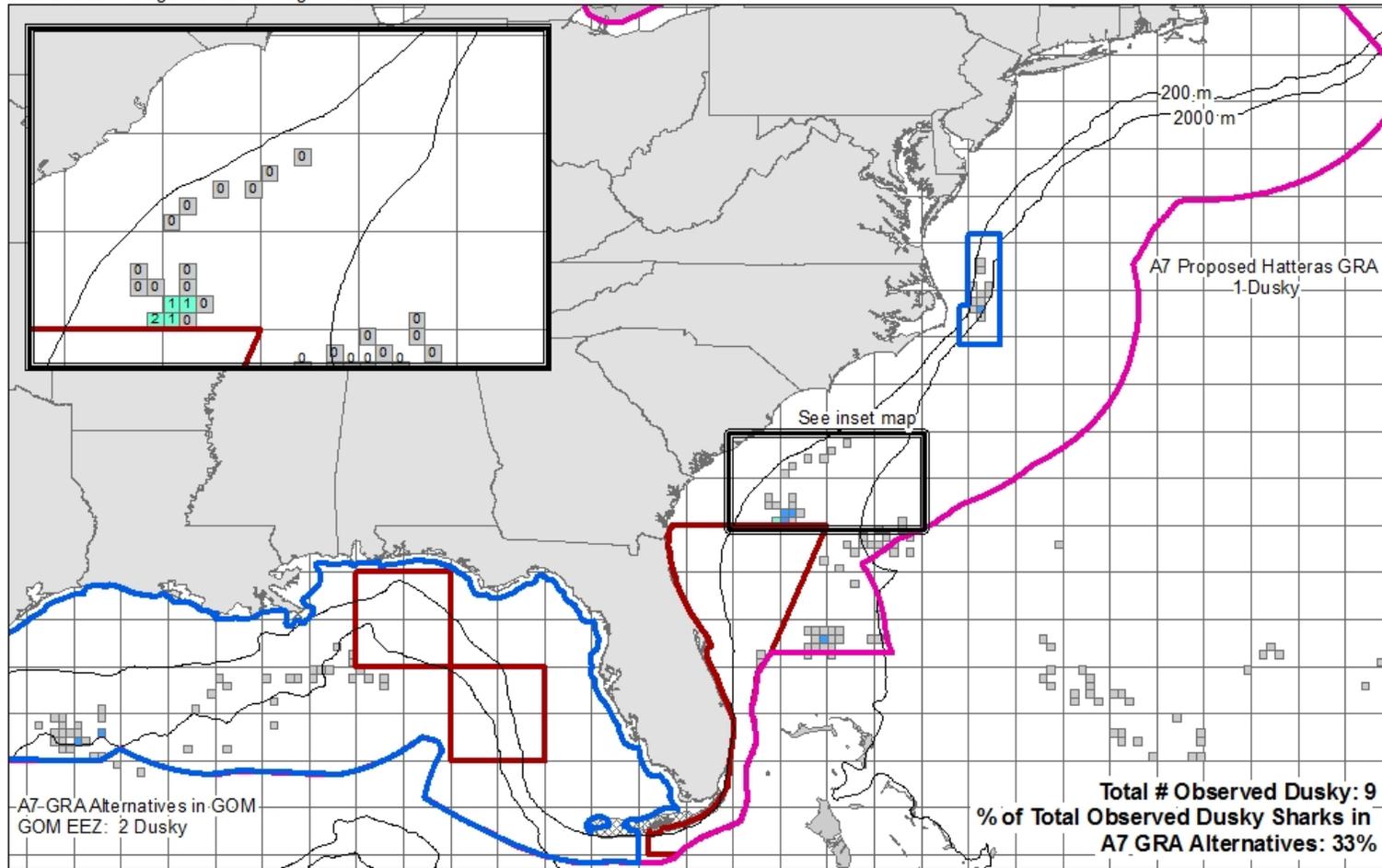
**Total Dusky Shark Interactions  
(10' latitude x 10' longitude)**



**Total Dusky Shark Interactions  
Reported in the HMS Logbook  
from 2008 to 2012  
Month: January**

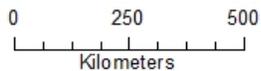
Colored cells reflect all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: Pelagic Observer Program data



-  A7 GRA Alternatives
-  EEZ
-  Current Closures
-  Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semi-major Axis: 6378137.0  
Semi-minor Axis: 6356752.3  
Inverse Flattening: 298.26



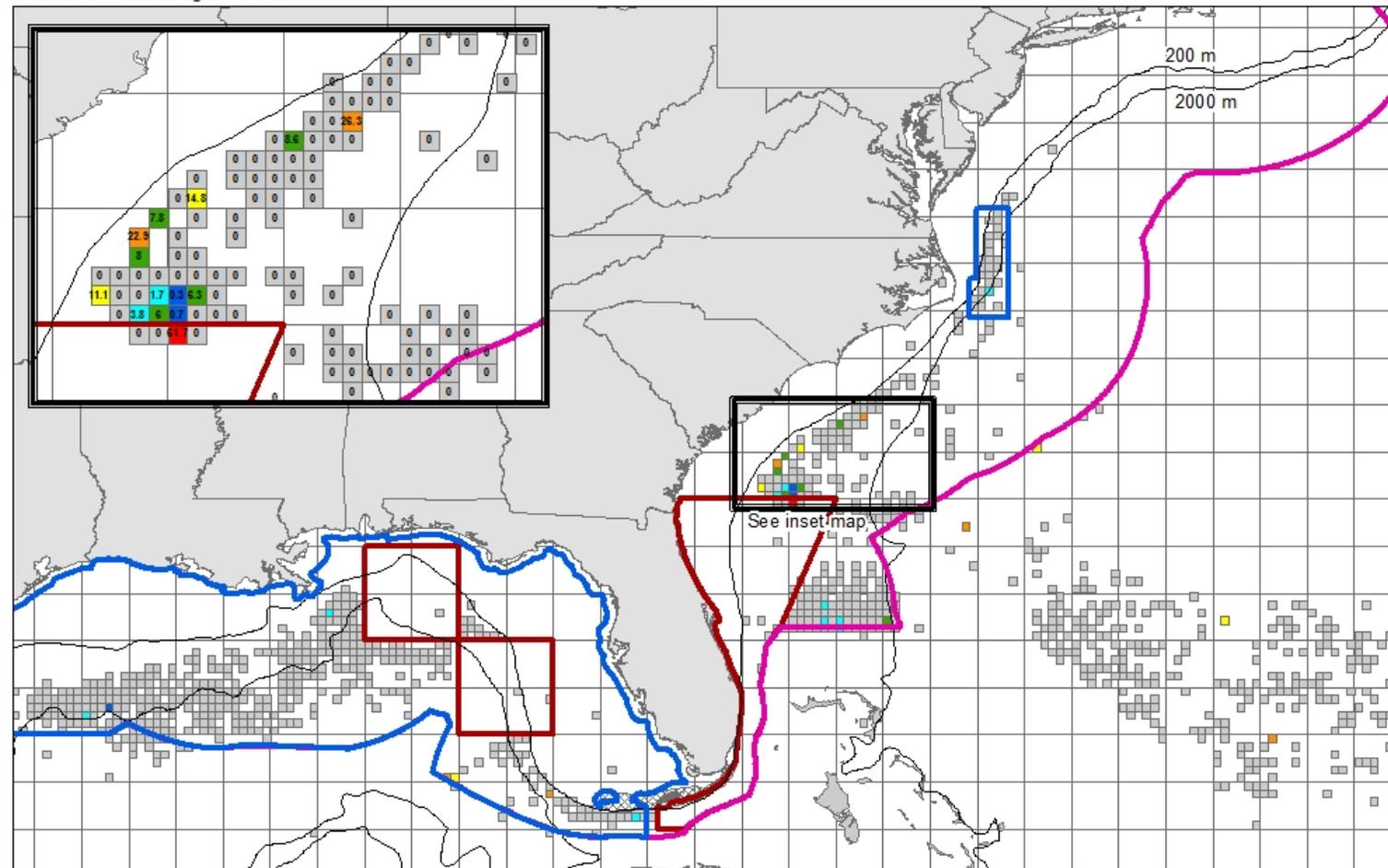
**Observed # Dusky Sharks  
(10' latitude x 10' longitude)**



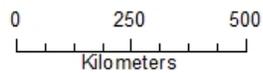
**Observed Dusky Shark Interactions  
from 2008 to 2012  
Month: January**

Colored cells reflect all dusky shark interactions (sharks kept, discarded alive, and discarded dead) observed by the POP in each grid cell.

Data Source: HMS Logbook Data

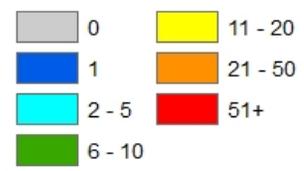


- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS



Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semi-major Axis: 6378137.0  
 Semi-minor Axis: 6356752.3  
 Inverse Flattening: 298.26  
 Created: 02/27/14

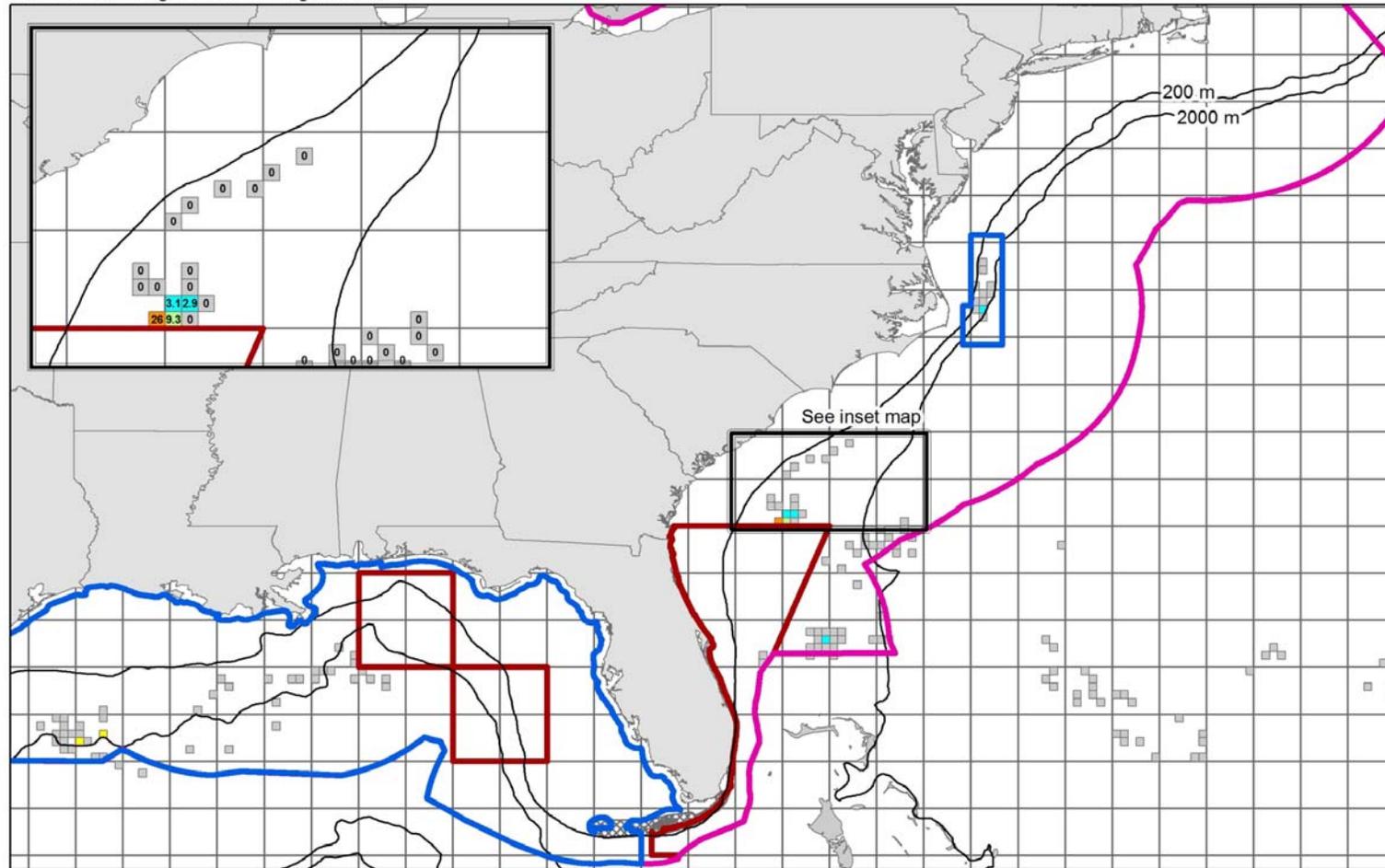
**CPUE (Dusky Sharks / 10,000 Hooks)  
 (10' latitude x 10' longitude)**



**Dusky Shark CPUE per Data  
 Reported in the HMS Logbook  
 from 2008 to 2012  
 Month: January**

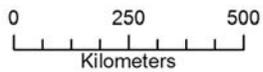
Colored cells reflect CPUE calculations on all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).  
 $CPUE(dusky/10,000 \text{ hooks}) = (\text{Sum dusky} / \text{sum hooks}) * 10,000$

Data Source: Pelagic Observer Program data

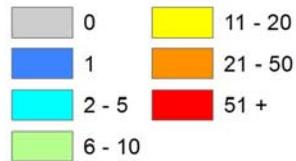


-  A7 GRA Alternatives
-  EEZ
-  Current Closures
-  Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26



**CPUE (# Dusky / 10,000 Hooks)  
 (10' latitude x 10' longitude)**



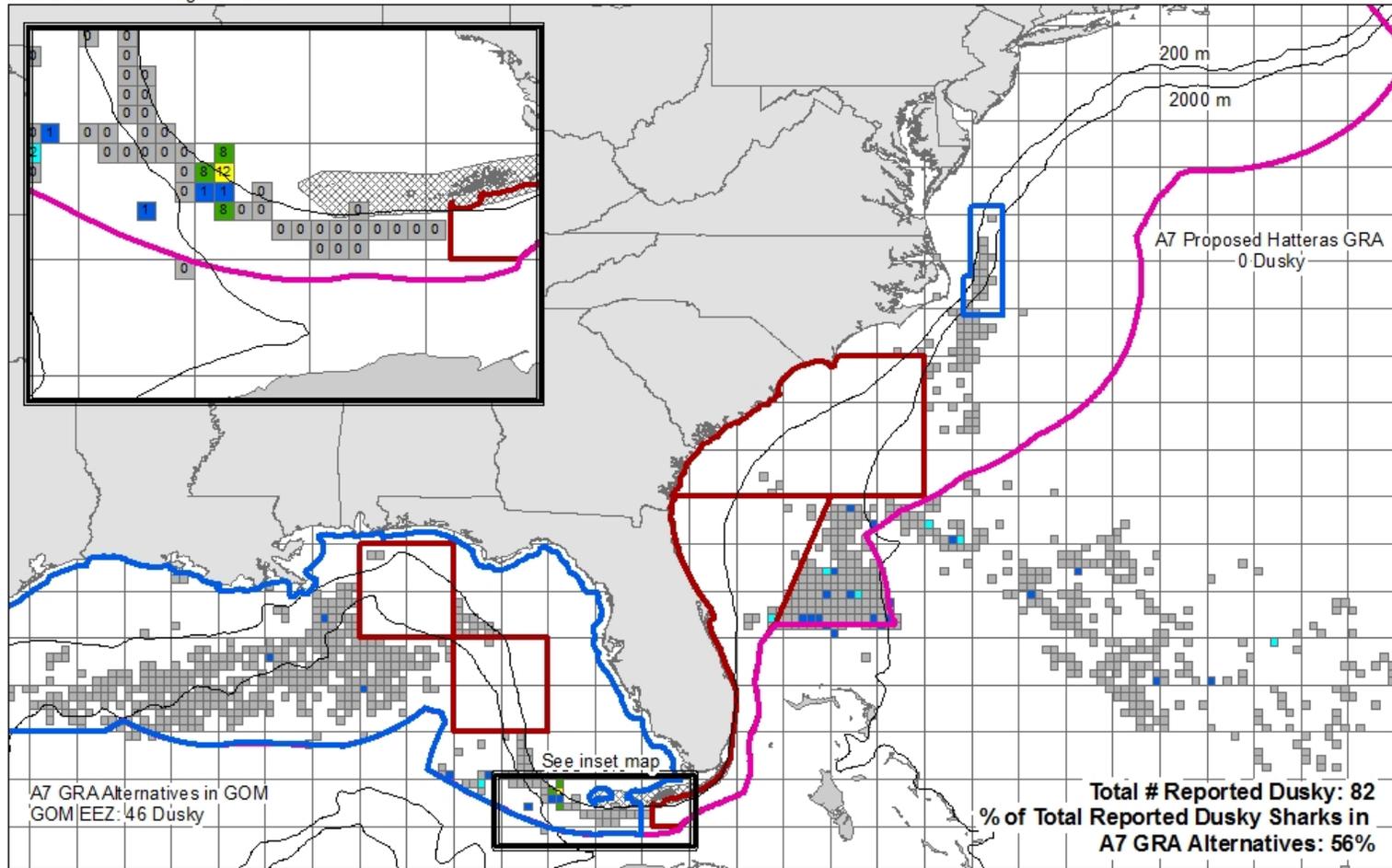
**Observed Dusky Shark CPUE  
 from 2008 to 2012  
 Month: January**

Colored cells reflect CPUE calculations based on  
 observed dusky shark interactions (sharks kept,  
 discarded alive, and discarded dead).

For each grid cell:

$$\text{CPUE (dusky/10,000 hooks)} = (\text{sum dusky} / \text{sum hooks}) * 10,000$$

Data Source: HMS Logbook Data

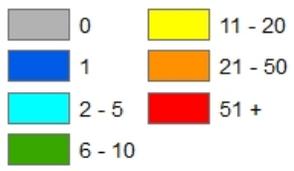


- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26

0 250 500  
 Kilometers

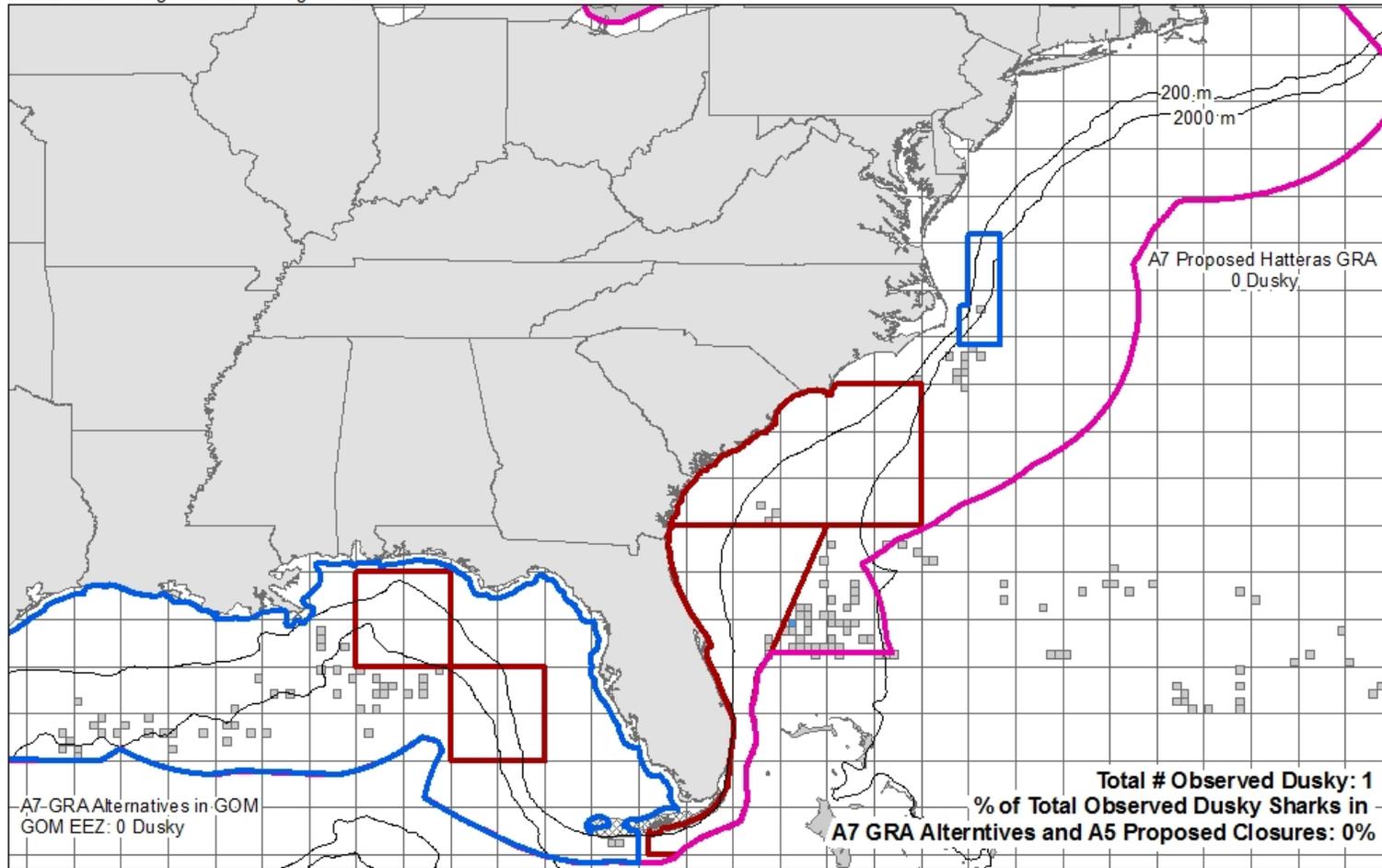
**Total Dusky Shark Interactions  
 (10' latitude x 10' longitude)**



**Total Dusky Shark Interactions  
 Reported in the HMS Logbook  
 from 2008 to 2012  
 Month: February**

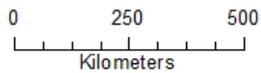
Colored cells reflect all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: Pelagic Observer Program data



-  A7 GRA Alternatives
-  EEZ
-  Current Closures
-  Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semi-major Axis: 6378137.0  
Semi-minor Axis: 6356752.3  
Inverse Flattening: 298.26



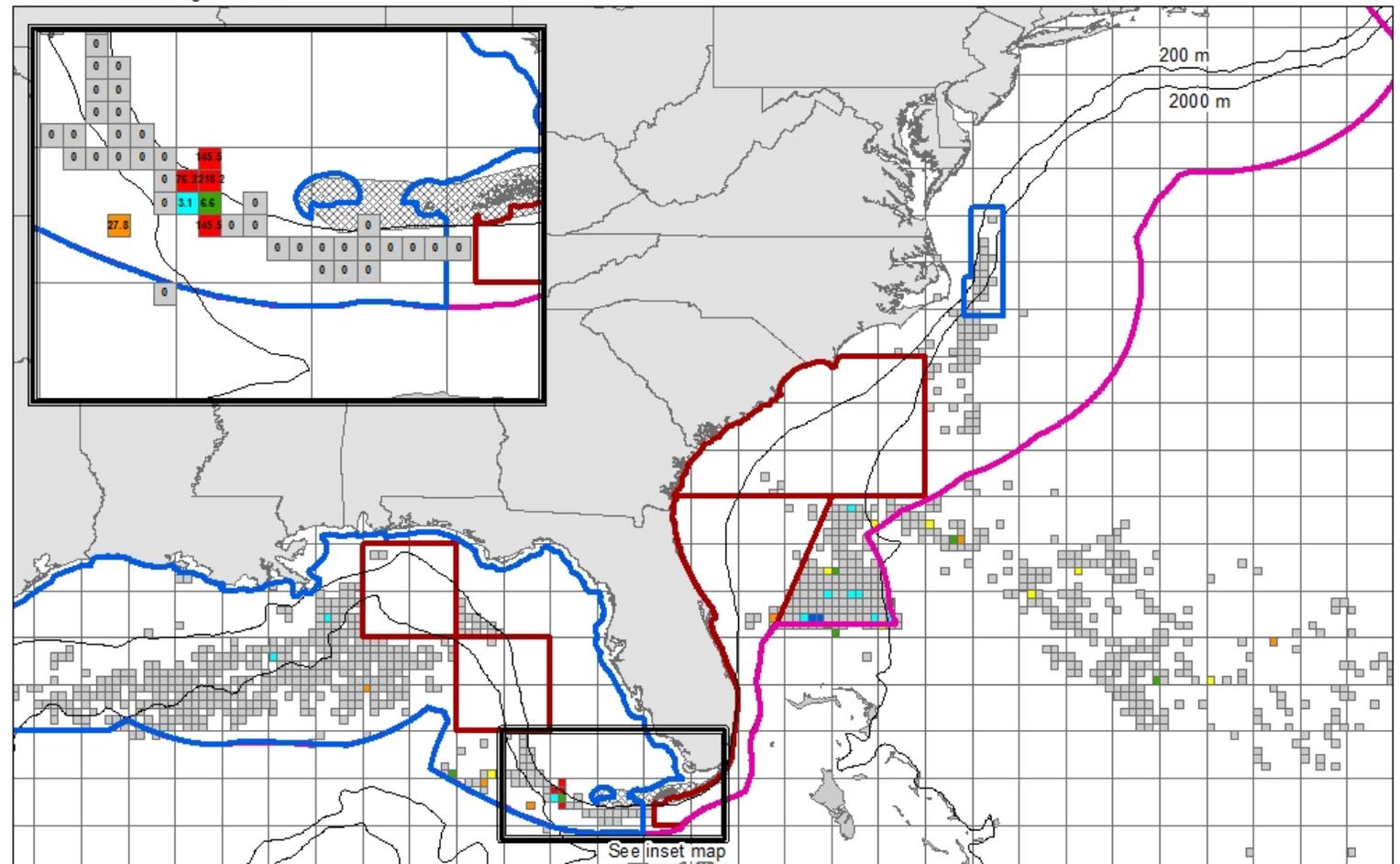
**Observed # Dusky Sharks  
(10' latitude x 10' longitude)**



**Observed Dusky Shark Interactions  
from 2008 to 2012  
Month: February**

Colored cells reflect all dusky shark interactions  
(sharks kept, discarded alive, and discarded dead)  
observed by the POP in each grid cell.

Data Source: HMS Logbook Data



- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semi-major Axis: 6378137.0  
 Semi-minor Axis: 6356752.3  
 Inverse Flattening: 298.26  
 Created: 02/27/14

0 250 500  
 Kilometers

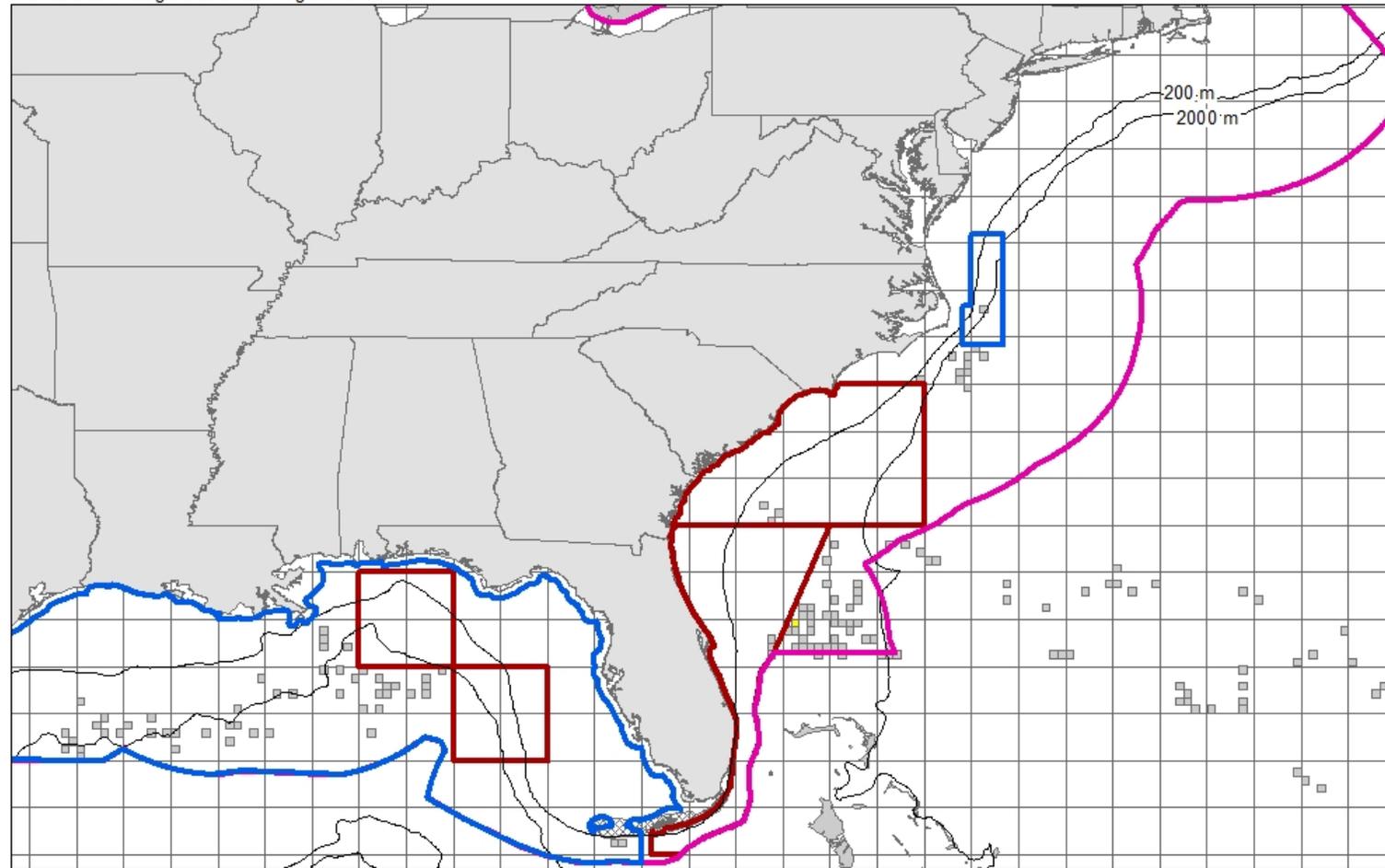
**CPUE (Dusky Sharks / 10,000 Hooks)  
 (10' latitude x 10' longitude)**

- |   |   |
|---|---|
| <span style="background-color: gray; width: 15px; height: 15px; display: inline-block;"></span> 0       | <span style="background-color: yellow; width: 15px; height: 15px; display: inline-block;"></span> 11 - 20 |
| <span style="background-color: blue; width: 15px; height: 15px; display: inline-block;"></span> 1       | <span style="background-color: orange; width: 15px; height: 15px; display: inline-block;"></span> 21 - 50 |
| <span style="background-color: cyan; width: 15px; height: 15px; display: inline-block;"></span> 2 - 5   | <span style="background-color: red; width: 15px; height: 15px; display: inline-block;"></span> 51 +       |
| <span style="background-color: green; width: 15px; height: 15px; display: inline-block;"></span> 6 - 10 |   |

**Dusky Shark CPUE per Data  
 Reported in the HMS Logbook  
 from 2008 to 2012  
 Month: February**

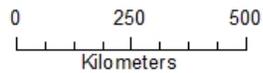
Colored cells reflect CPUE calculations on all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).  
 $CPUE(dusky/10,000 \text{ hooks}) = (\text{Sum dusky} / \text{sum hooks}) * 10,000$

Data Source: Pelagic Observer Program Data

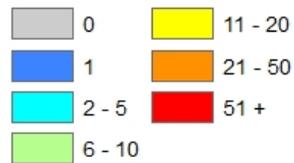


-  A7 GRA Alternatives
-  EEZ
-  Current Closures
-  Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semi-major Axis: 6378137.0  
Semi-minor Axis: 6356752.3  
Inverse Flattening: 298.26



**CPUE (# Dusky / 10,000 Hooks)  
(10' latitude x 10' longitude)**

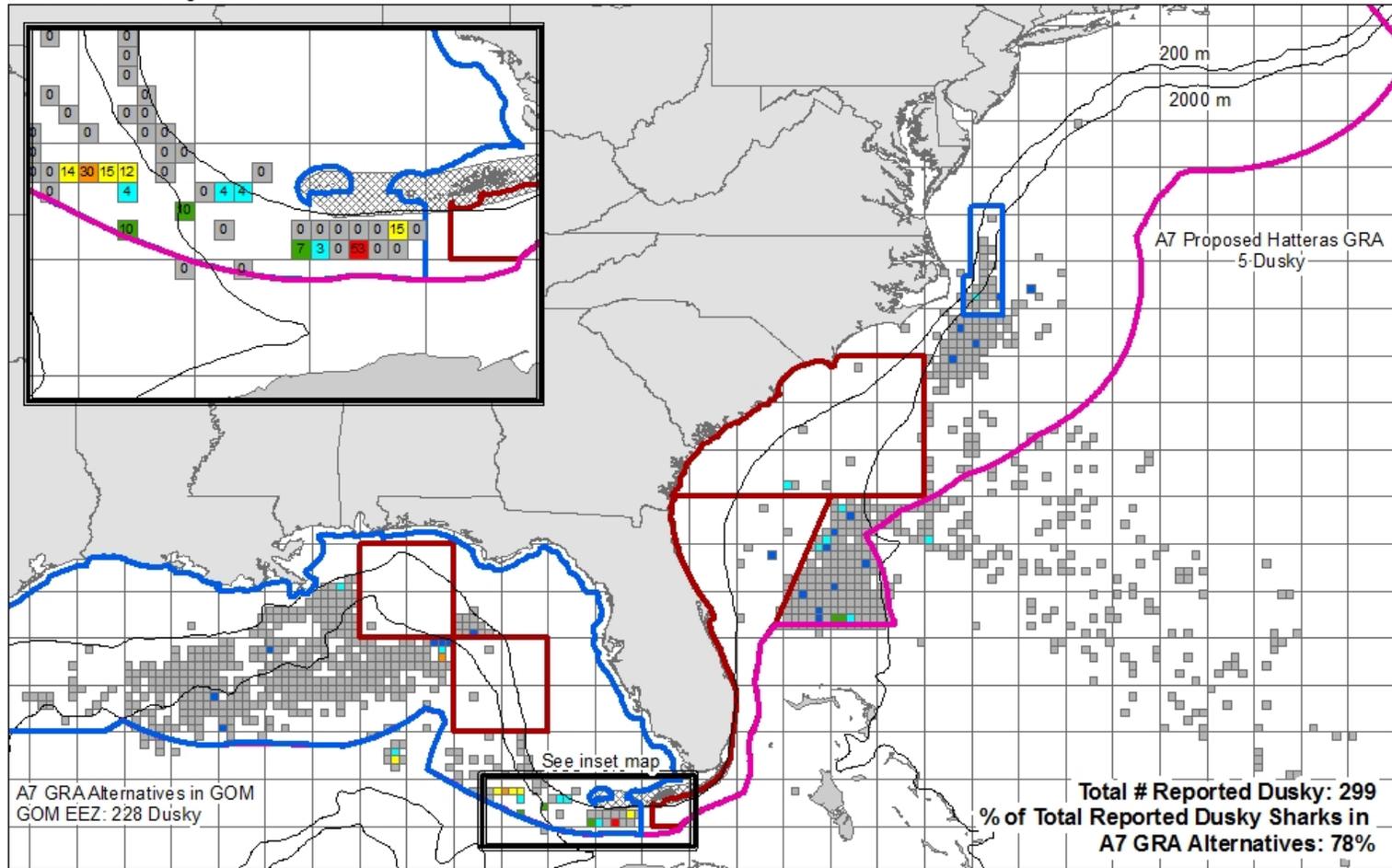


**Observed Dusky Shark CPUE  
from 2008 to 2012  
Month: February**

Colored cells reflect CPUE calculations based on observed dusky shark interactions (sharks kept, discarded alive, and discarded dead).

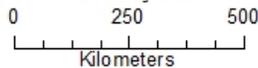
For each grid cell:  
CPUE (dusky/10,000 hooks) = (sum dusky/sum hooks)\*10,000

Data Source: HMS Logbook Data

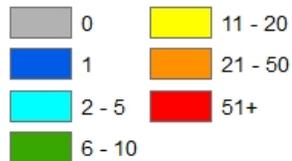


- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



**Total Dusky Shark Interactions  
(10' latitude x 10' longitude)**

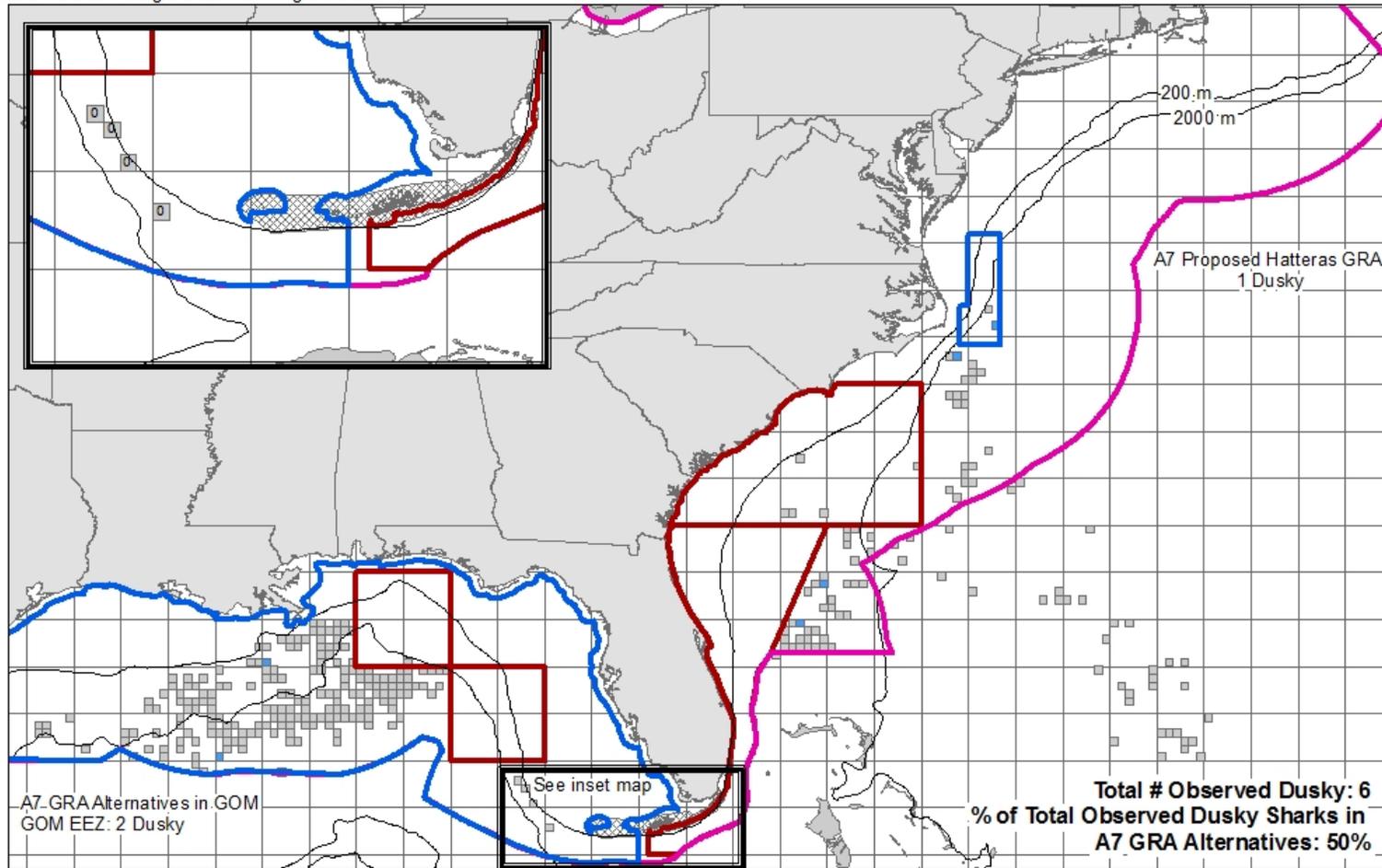


**Total Dusky Shark Interactions  
Reported in the HMS Logbook  
from 2008 to 2012**

**Month: March**

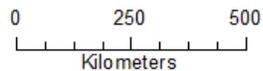
Colored cells reflect all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: Pelagic Observer Program Data



- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



**Observed # Dusky Sharks  
(10' latitude x 10' longitude)**

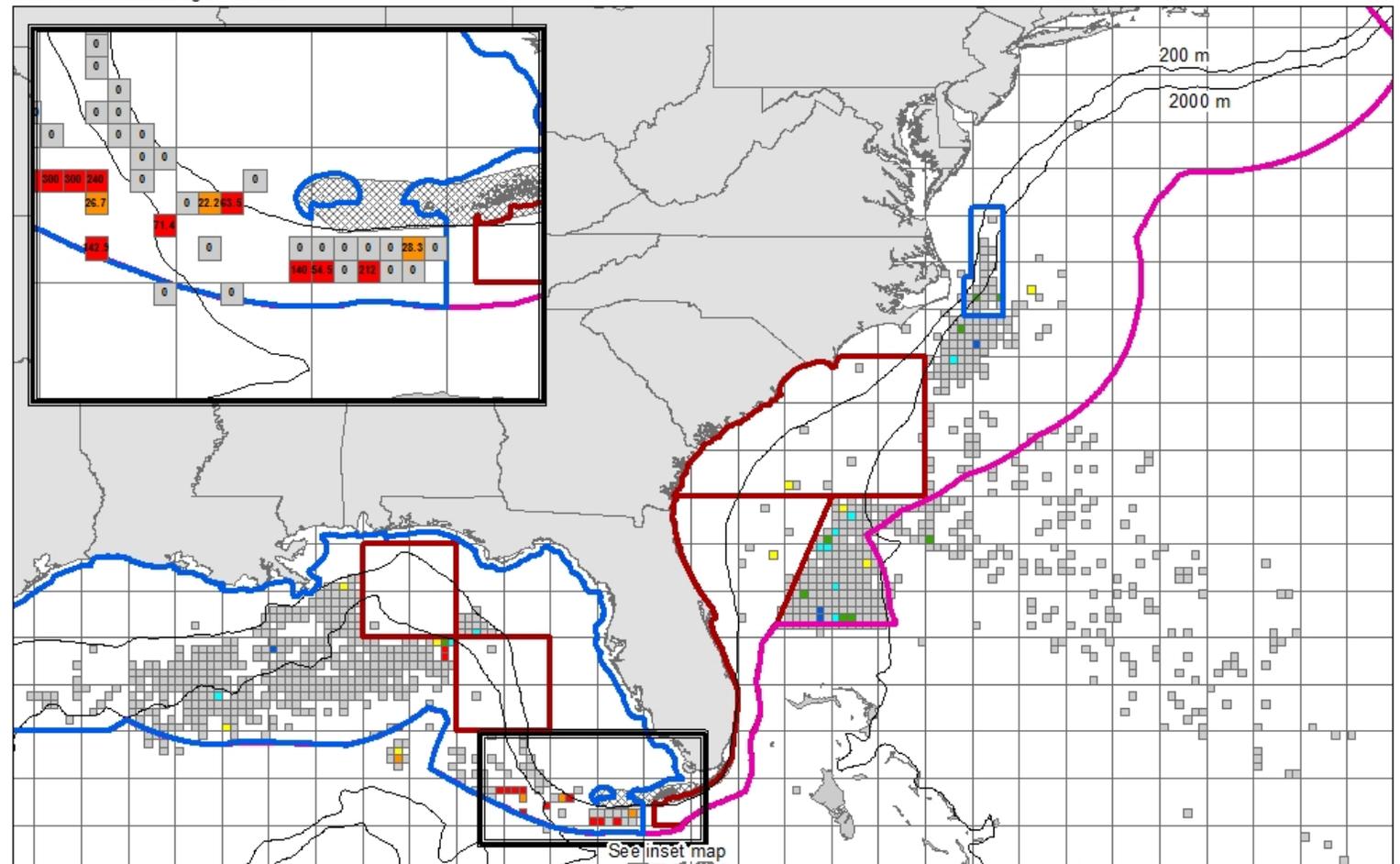


**Observed Dusky Shark Interactions  
from 2008 to 2012**

**Month: March**

Colored cells reflect all dusky shark interactions (sharks kept, discarded alive, and discarded dead) observed by the POP in each grid cell.

Data Source: HMS Logbook Data



-  A7 GRA Alternatives
-  Current Closures
-  EEZ
-  Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semi-major Axis: 6378137.0  
 Semi-minor Axis: 6356752.3  
 Inverse Flattening: 298.26  
 Created: 02/27/14

0 250 500  
 Kilometers

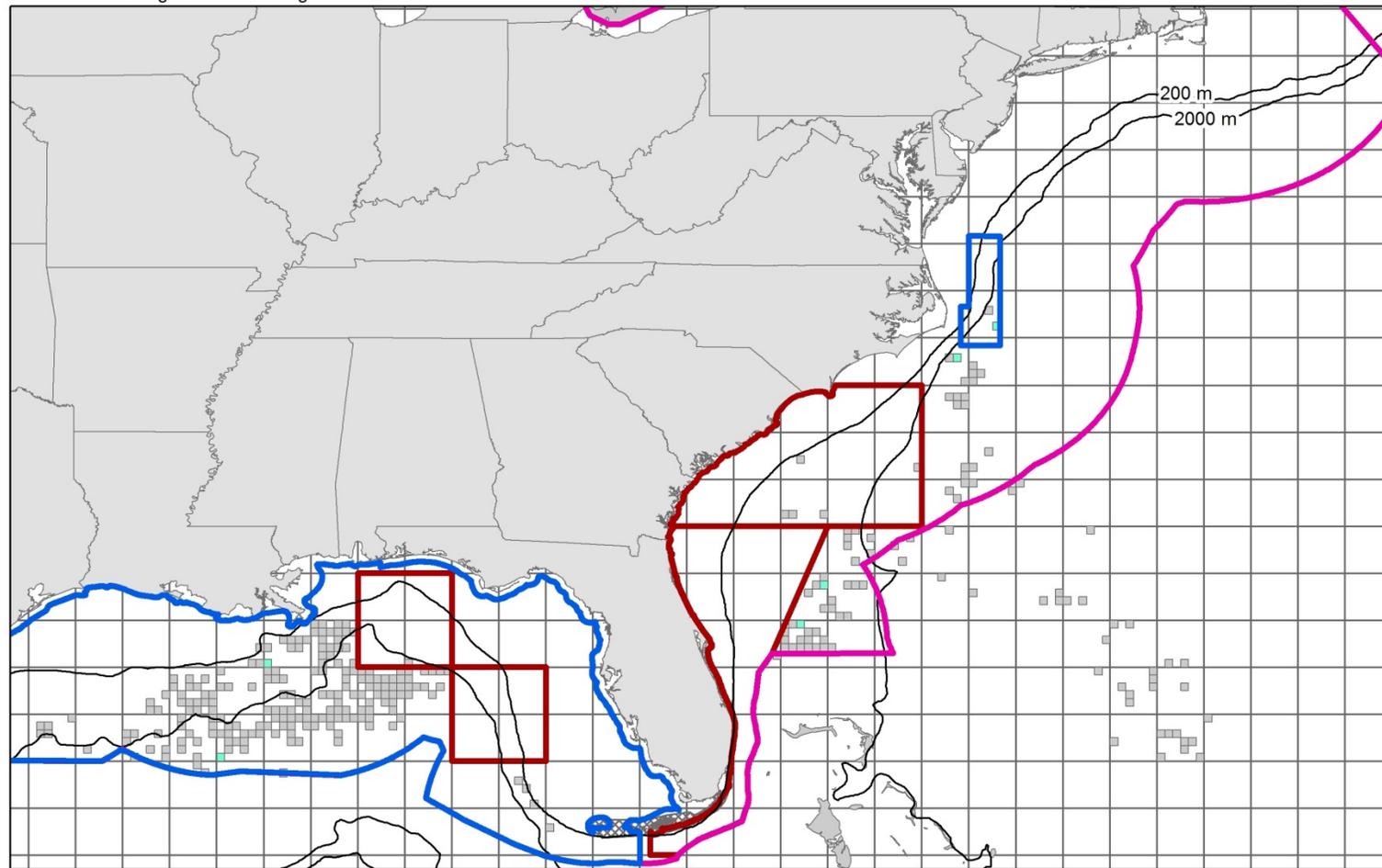
**CPUE (Dusky Sharks / 10,000 Hooks)  
 (10' latitude x 10' longitude)**

- |  |  |
|--|--|
|  0      |  11 - 20 |
|  1      |  21 - 50 |
|  2 - 5  |  51+     |
|  6 - 10 |  |

**Dusky Shark CPUE per Data  
 Reported in the HMS Logbook  
 from 2008 to 2012  
 Month: March**

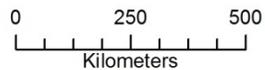
Colored cells reflect CPUE calculations on all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).  
 $CPUE(dusky/10,000 \text{ hooks}) = (\text{Sum dusky} / \text{sum hooks}) * 10,000$

Data Source: Pelagic Observer Program data



-  A7 GRA Alternatives
-  EEZ
-  Current Closures
-  Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26



**CPUE (# Dusky/ 10,000 Hooks)  
 (10' latitude x 10' longitude)**



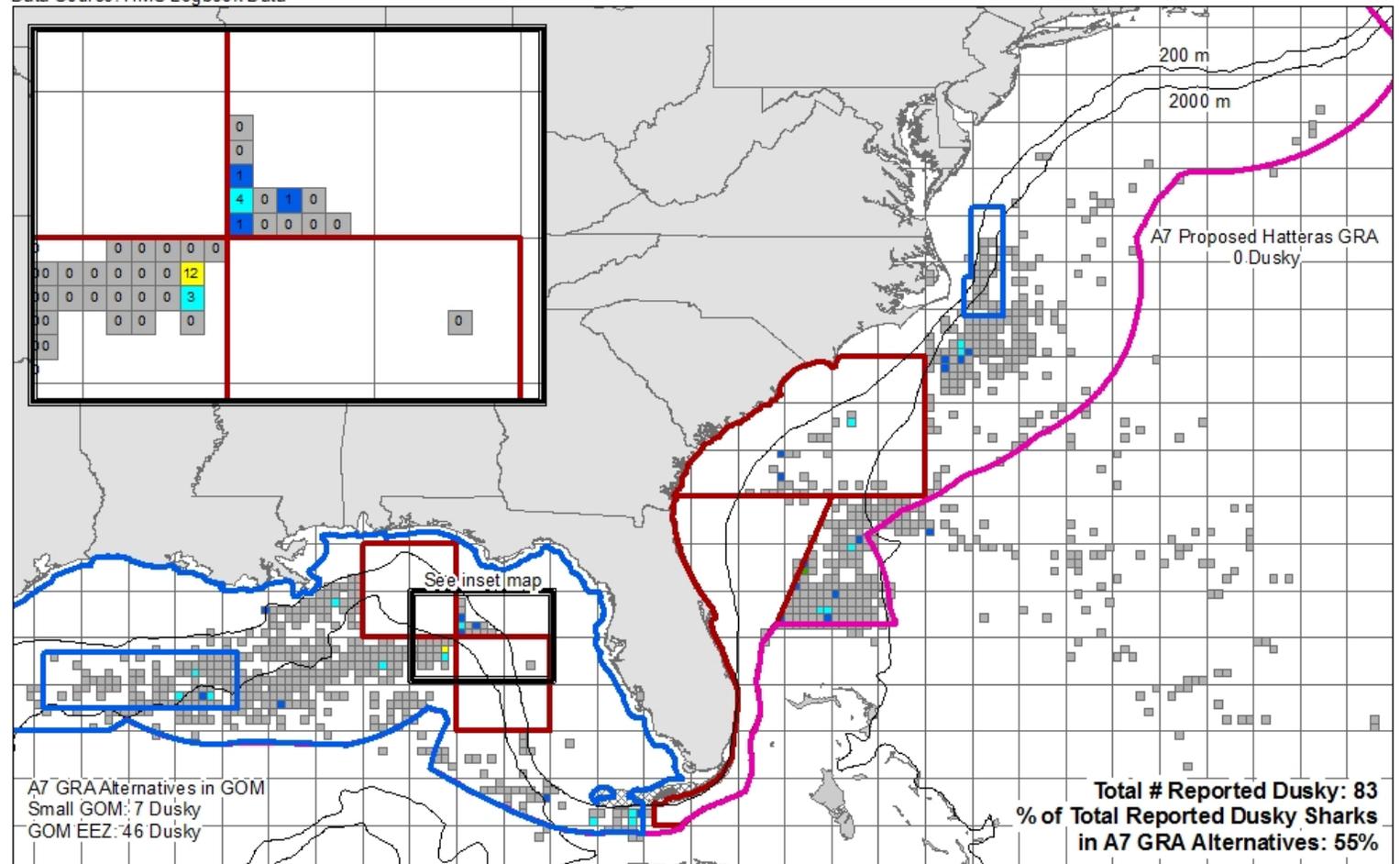
**Observed Dusky Shark CPUE  
 from 2008 to 2012  
 Month: March**

Colored cells reflect CPUE calculations based on observed dusky shark interactions (sharks kept, discarded alive, and discarded dead).

For each grid cell:

$$\text{CPUE (dusky/10,000 hooks)} = (\text{sum dusky}/\text{sum hooks}) * 10,000$$

Data Source: HMS Logbook Data



A7 GRA Alternatives in GOM  
 Small GOM: 7 Dusky  
 GOM EEZ: 46 Dusky

Total # Reported Dusky: 83  
 % of Total Reported Dusky Sharks  
 in A7 GRA Alternatives: 55%

- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26

0 250 500  
 Kilometers

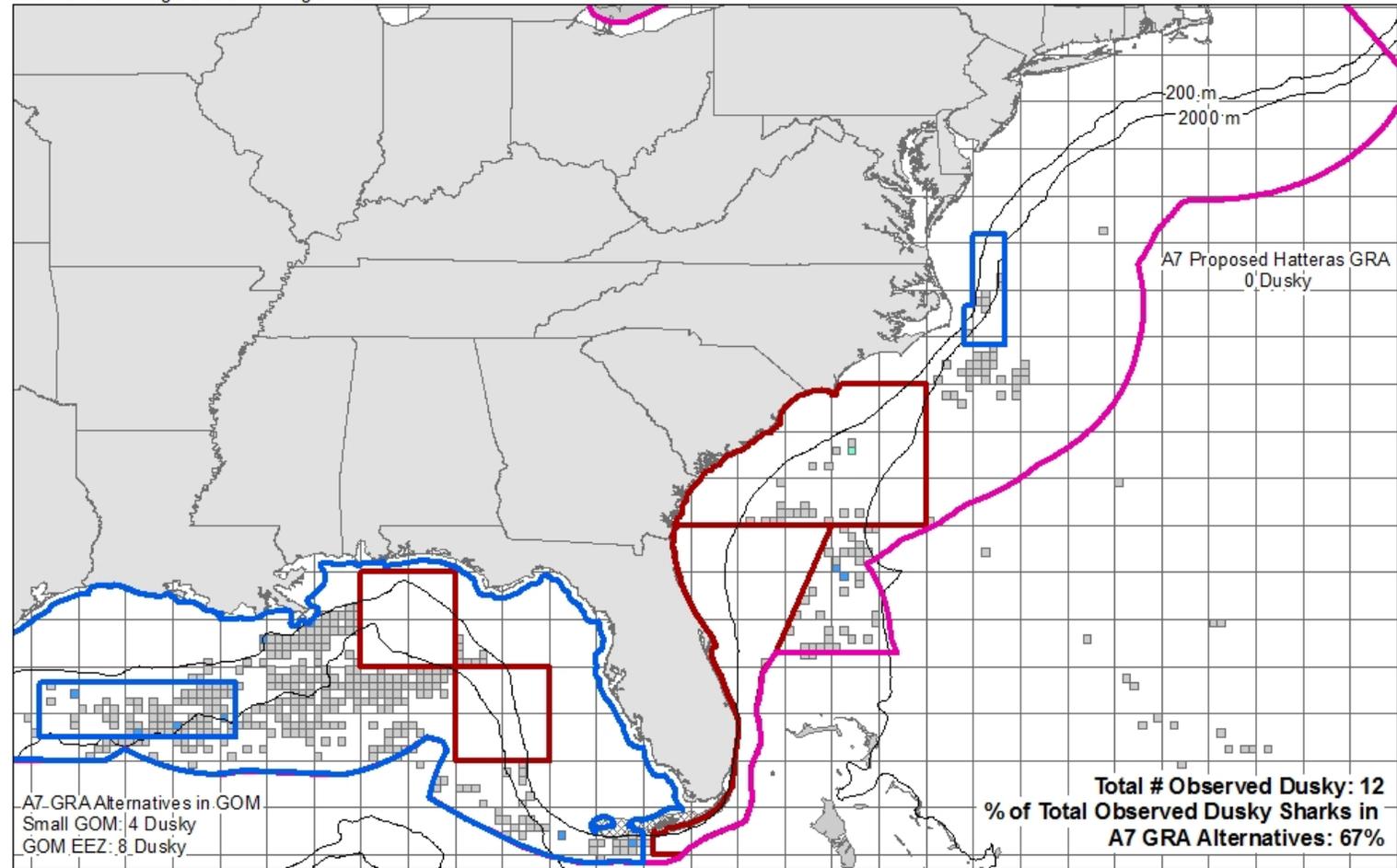
**Total Dusky Shark Interactions  
 (10' latitude x 10' longitude)**

- 0
- 1
- 2 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- 51+

**Total Dusky Shark Interactions  
 Reported in the HMS Logbook  
 from 2008 to 2012  
 Month: April**

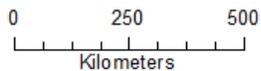
Colored cells reflect all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: Pelagic Observer Program data



- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semi-major Axis: 6378137.0  
Semi-minor Axis: 6356752.3  
Inverse Flattening: 298.26



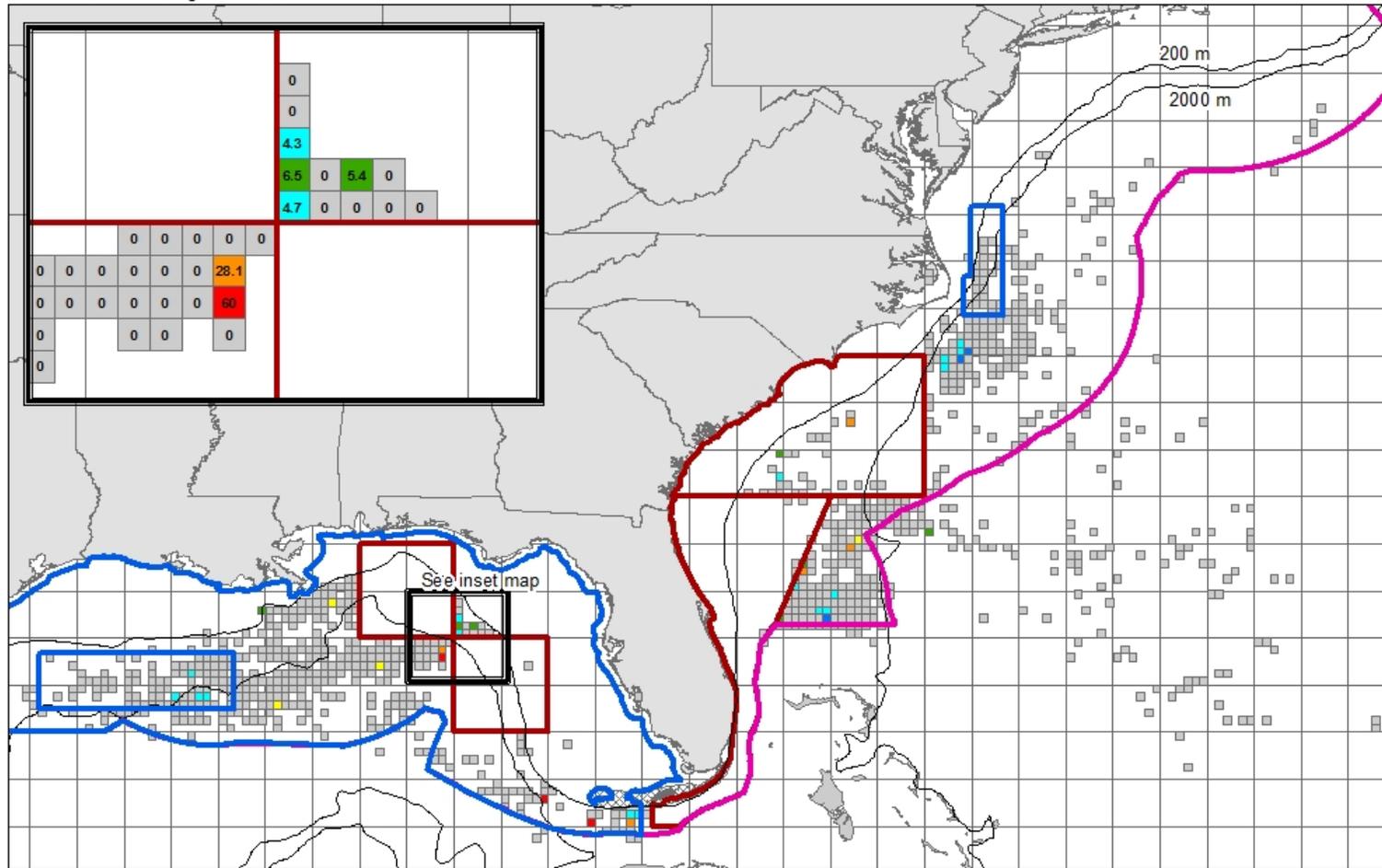
**Observed # Dusky Sharks  
(10' latitude x 10' longitude)**



**Observed Dusky Shark Interactions  
from 2008 to 2012  
Month: April**

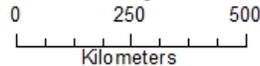
Colored cells reflect all dusky shark interactions (sharks kept, discarded alive, and discarded dead) observed by the POP in each grid cell.

Data Source: HMS Logbook Data

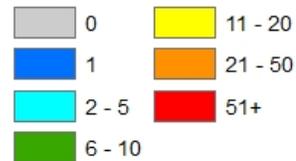


-  A7 GRA Alternatives
-  Current Closures
-  EEZ
-  Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



**CPUE (# Dusky / 10,000 Hooks)  
(10' latitude x 10' longitude)**

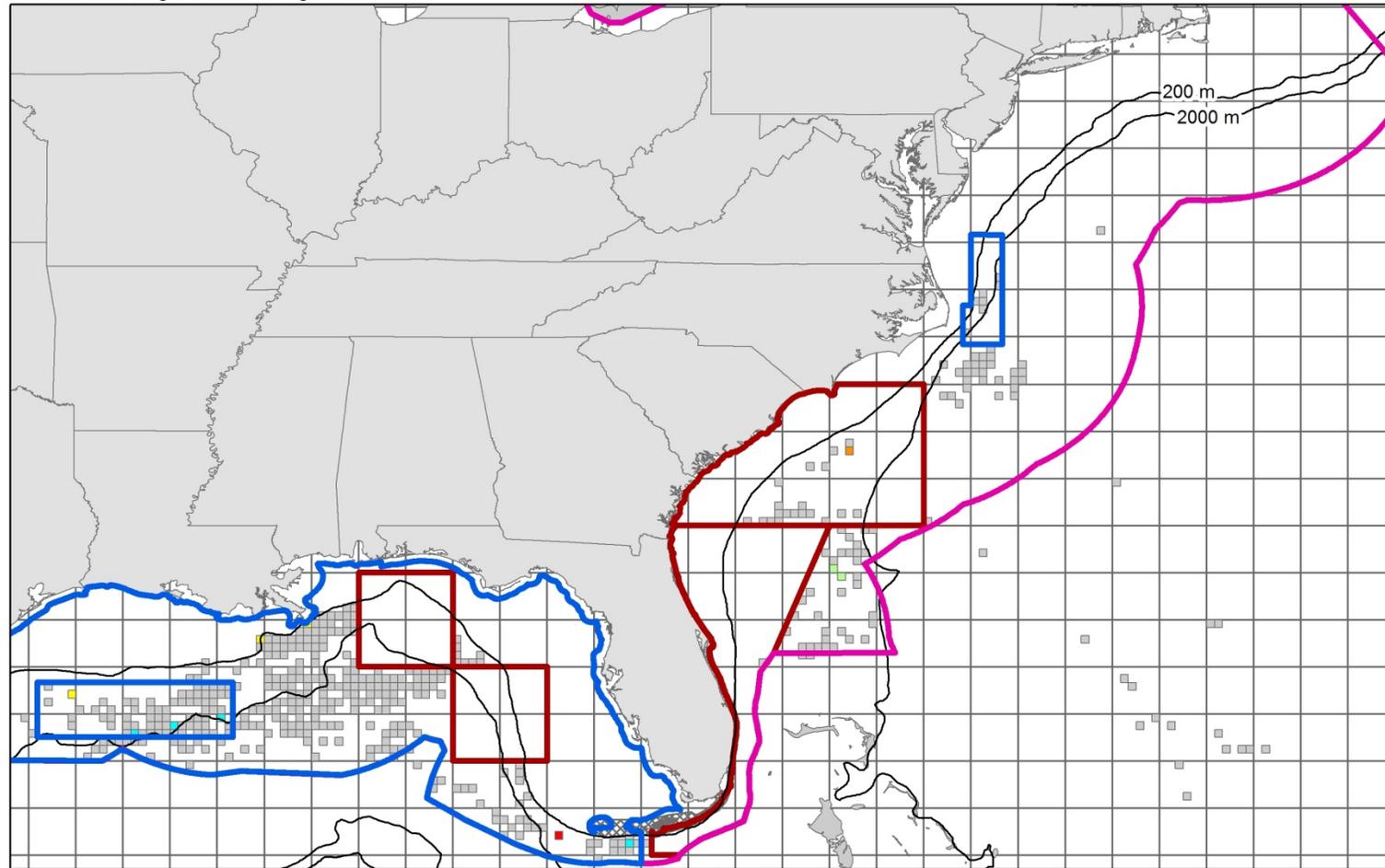


**Dusky Shark CPUE per Data  
Reported in the HMS Logbook  
from 2008 to 2012  
Month: April**

Colored cells reflect CPUE calculations on all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

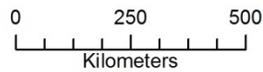
$$CPUE (\text{dusky} / 10,000 \text{ hooks}) = (\text{Sum dusky} / \text{sum hooks}) * 10,000$$

Data Source: Pelagic Observer Program data

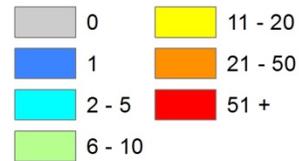


- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26



**CPUE (# Dusky/ 10,000 Hooks)  
 (10' latitude x 10' longitude)**



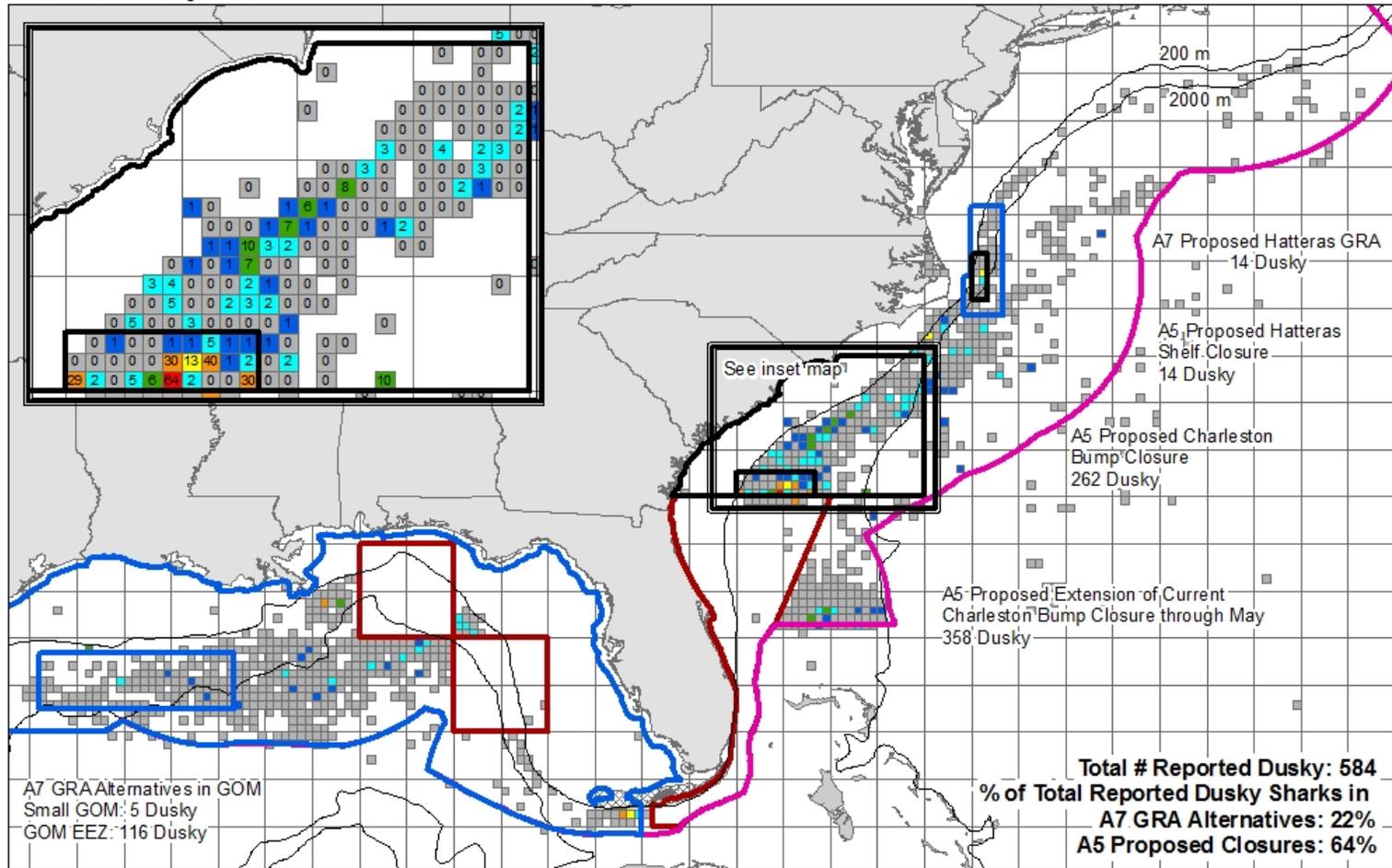
**Observed Dusky Shark CPUE  
 from 2008 to 2012  
 Month: April**

Colored cells reflect CPUE calculations based on observed dusky shark interactions (sharks kept, discarded alive, and discarded dead).

For each grid cell:

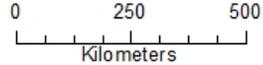
$$\text{CPUE (dusky/10,000 hooks)} = (\text{sum dusky}/\text{sum hooks}) * 10,000$$

Data Source: HMS Logbook Data

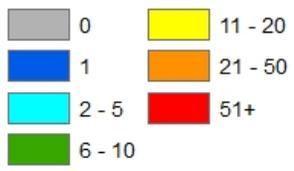


- A5 Proposed Closures
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



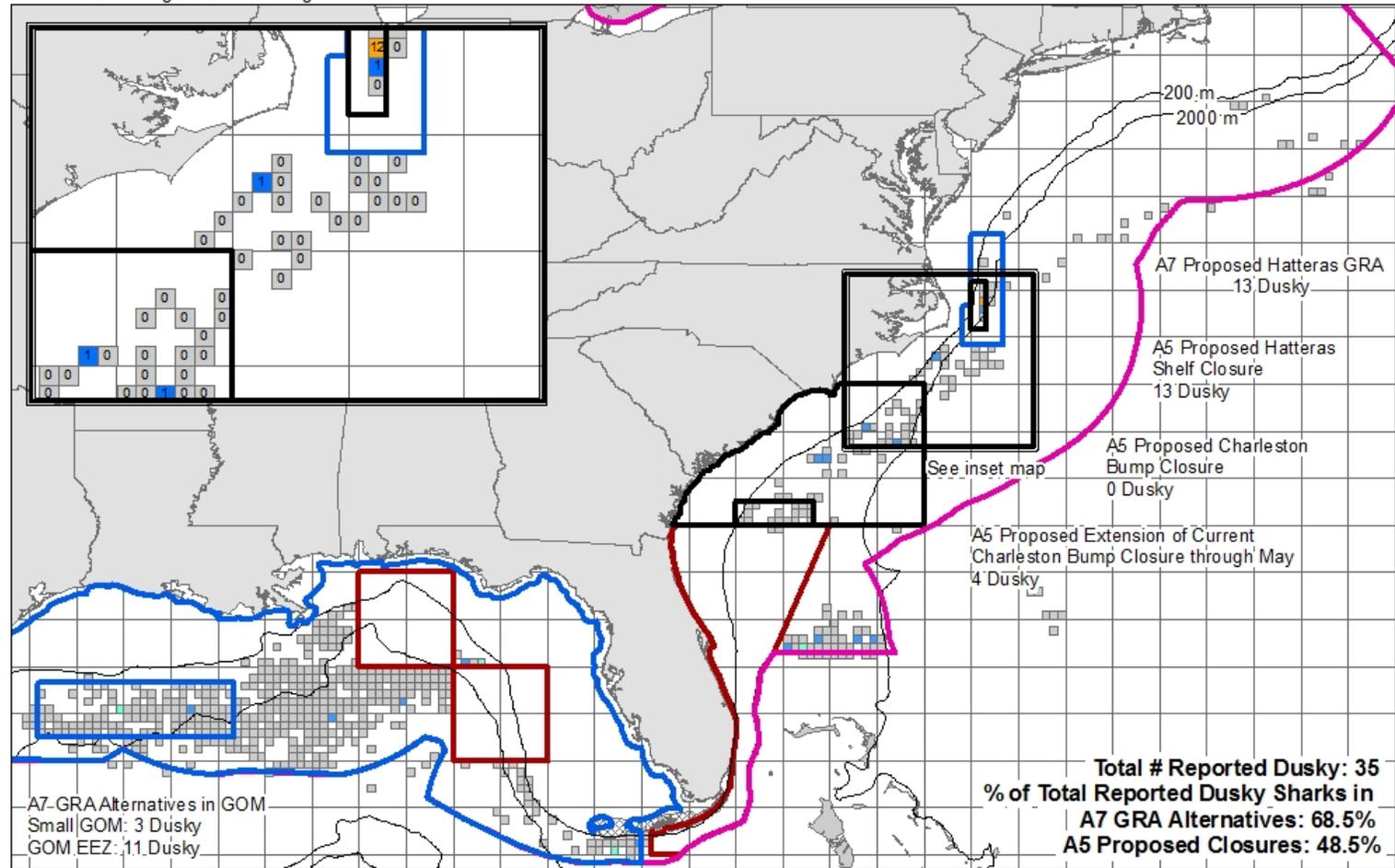
**Total Dusky Shark Interactions (10' latitude x 10' longitude)**



**Total Dusky Shark Interactions Reported in the HMS Logbook from 2008 to 2012**  
**Month: May**

Colored cells reflect all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: Pelagic Observer Program Data



**Total # Reported Dusky: 35**  
**% of Total Reported Dusky Sharks in**  
**A7 GRA Alternatives: 68.5%**  
**A5 Proposed Closures: 48.5%**

A5 Proposed Closures  
 A7 GRA Alternatives  
 EEZ  
 Current Closures  
 Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26

0      250      500  
 Kilometers

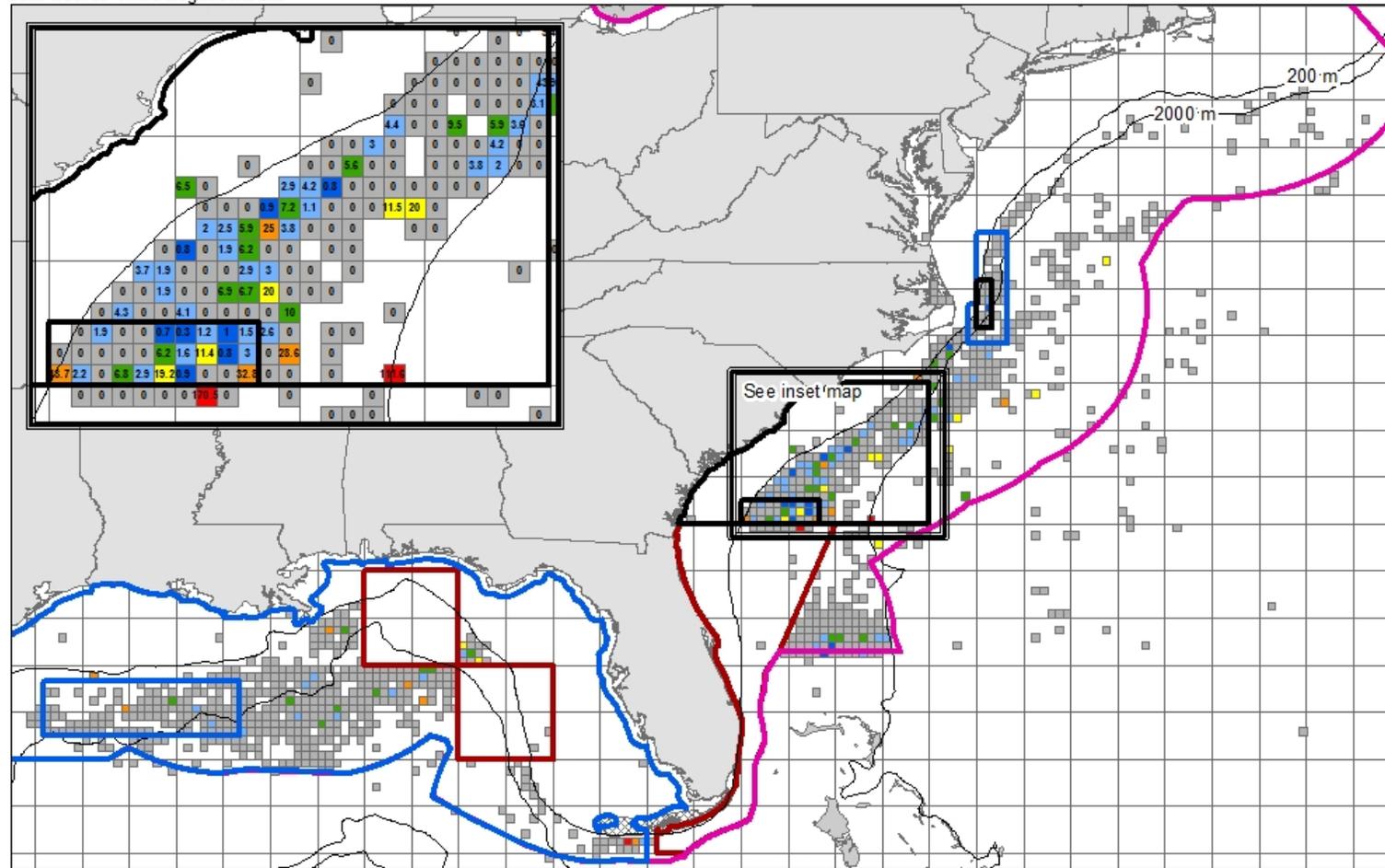
**Observed # Dusky Sharks  
(10' latitude x 10' longitude)**

	0		6 - 10
	1		11 - 20
	2 - 5		21+

**Observed Dusky Shark Interactions  
from 2008 to 2012  
Month: May**

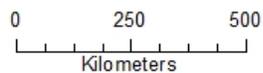
Colored cells reflect all observed dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: HMS Logbook Data

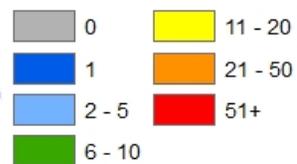


- A5 Proposed Closures
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



**CPUE (# Dusky / 10,000 Hooks)  
(10' latitude x 10' longitude)**



**Dusky Shark CPUE per Data  
Reported in the HMS Logbook  
from 2008 to 2012**

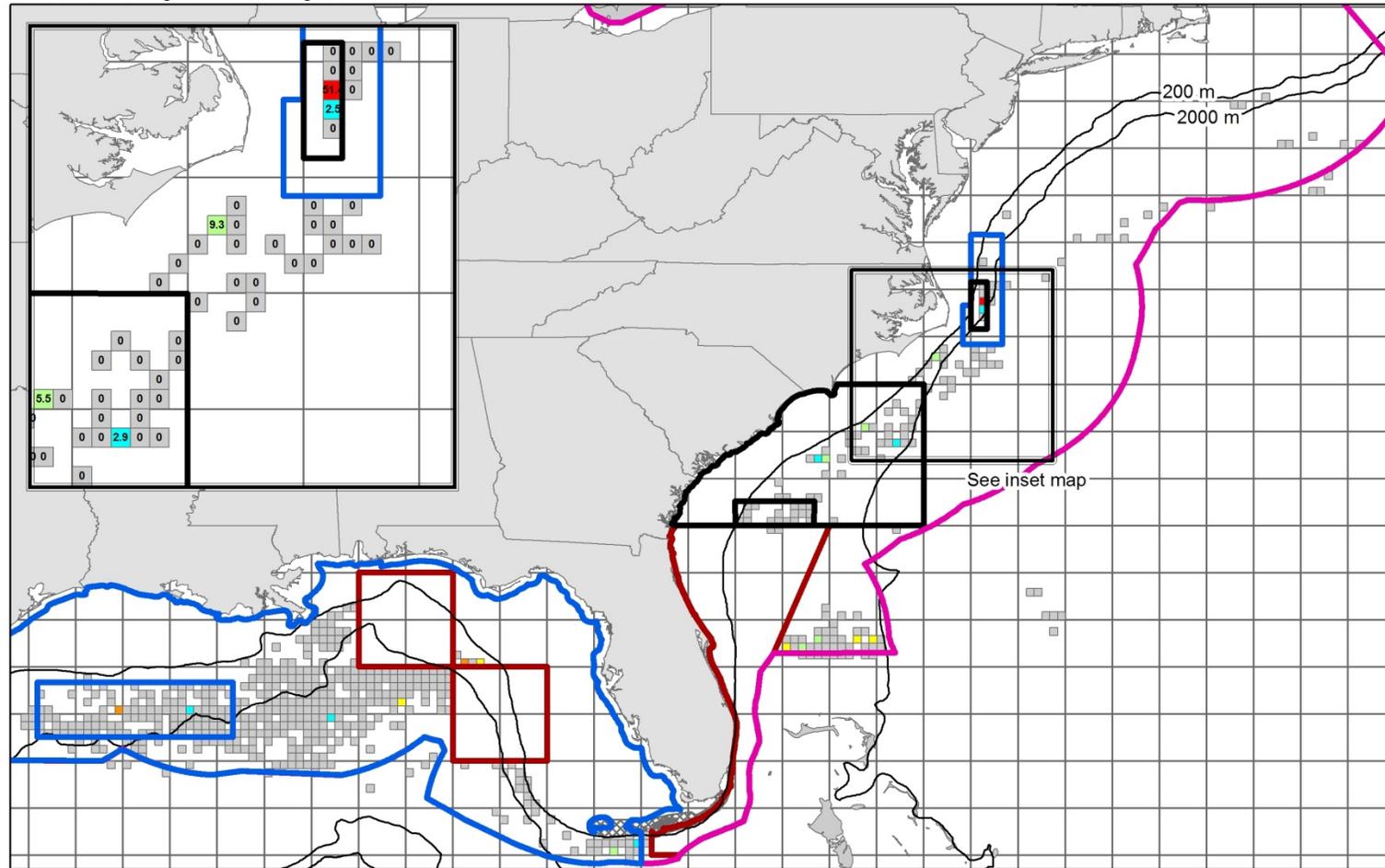
**Month: May**

Colored cells reflect CPUE calculations on all dusky shark interactions (sharks kept, discarded alive, and discarded dead).

For each cell:

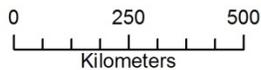
$$\text{CPUE (dusky sharks/10,000 hooks)} = (\text{Sum Dusky/Sum Hooks}) * 10,000$$

Data Source: Pelagic Observer Program data

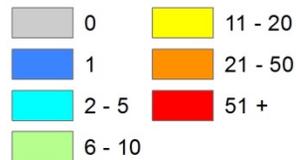


- A5 Proposed Closures
- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26



**CPUE (# Dusky / 10,000 Hooks)  
 (10' latitude x 10' longitude)**



**Observed Dusky Shark CPUE  
 from 2008 to 2012**

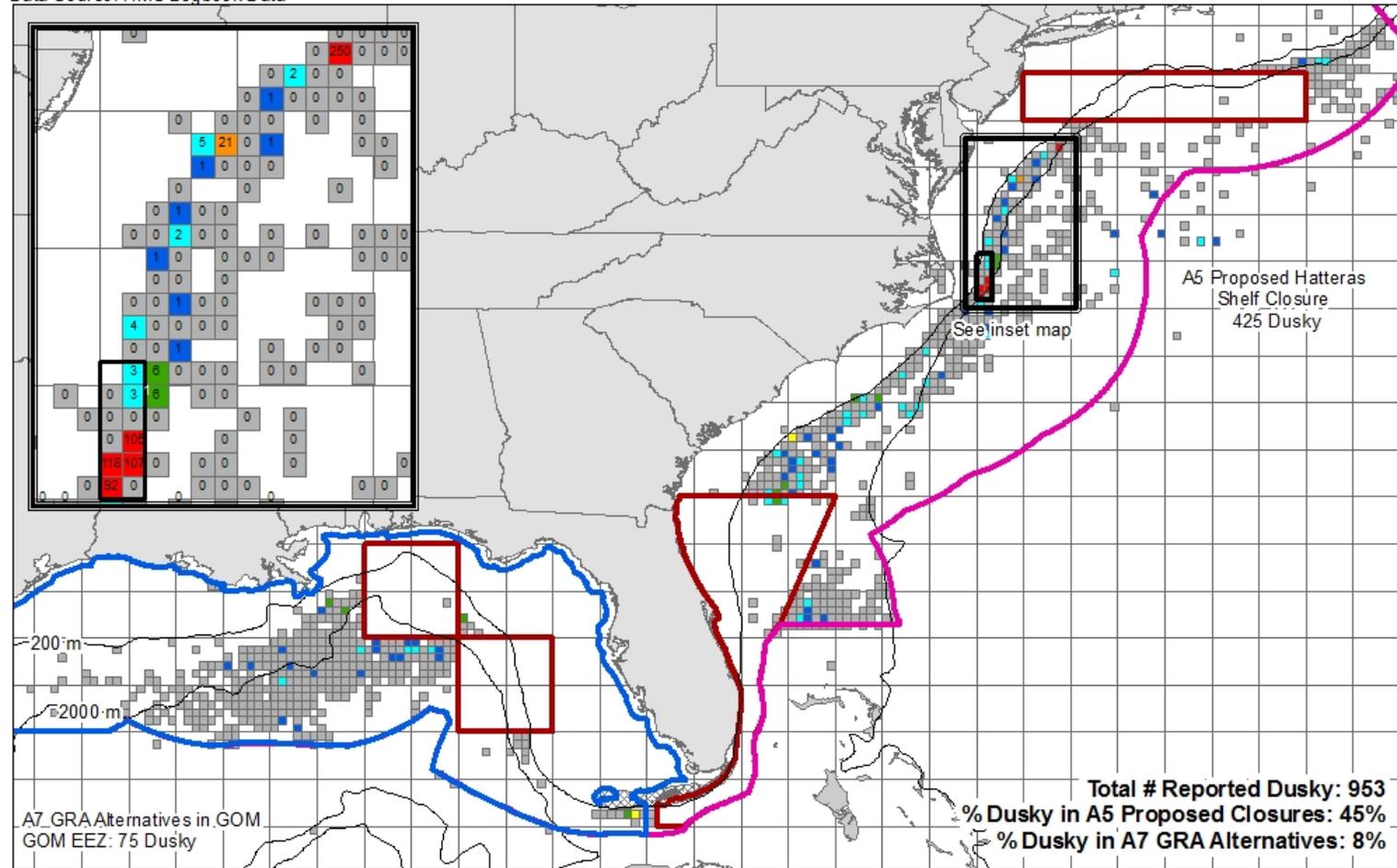
**Month: May**

Colored cells reflect CPUE calculations based on all dusky shark interactions (sharks kept, discarded alive, and discarded dead) per grid cell.

For each grid cell:

$$\text{CPUE (dusky/10,000 hooks)} = (\text{sum dusky}/\text{sum hooks}) * 10,000$$

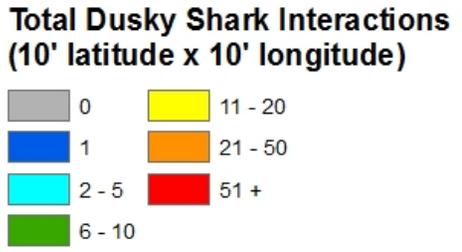
Data Source: HMS Logbook Data



- A5 Proposed Closures
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26

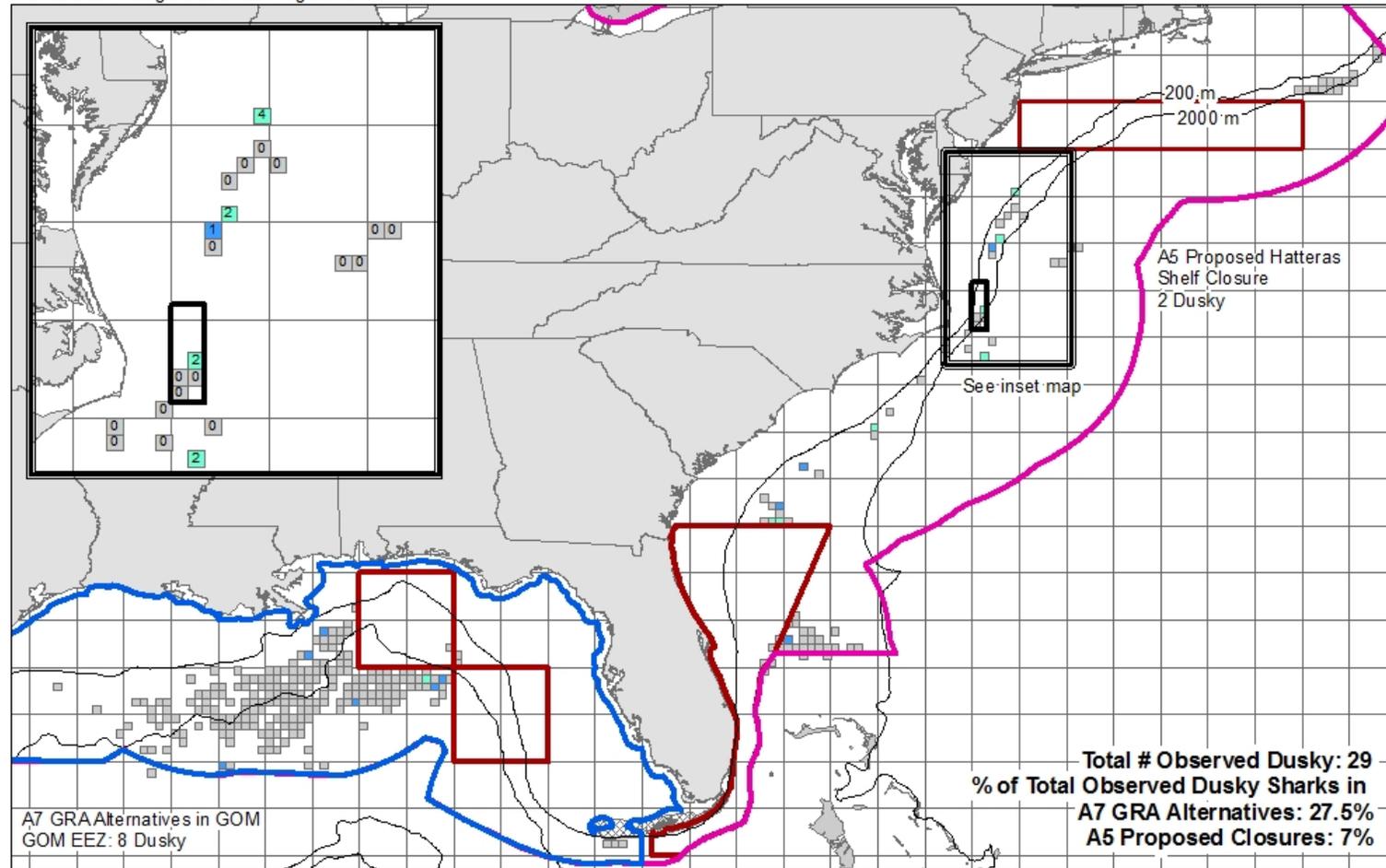
0 250 500  
 Kilometers



**Total Dusky Shark Interactions  
 Reported in the HMS Logbook  
 from 2008 to 2012  
 Month: June**

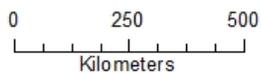
Colored cells reflect all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: Pelagic Observer Program Data



- A5 Proposed Closures
- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semi-major Axis: 6378137.0  
Semi-minor Axis: 6356752.3  
Inverse Flattening: 298.26



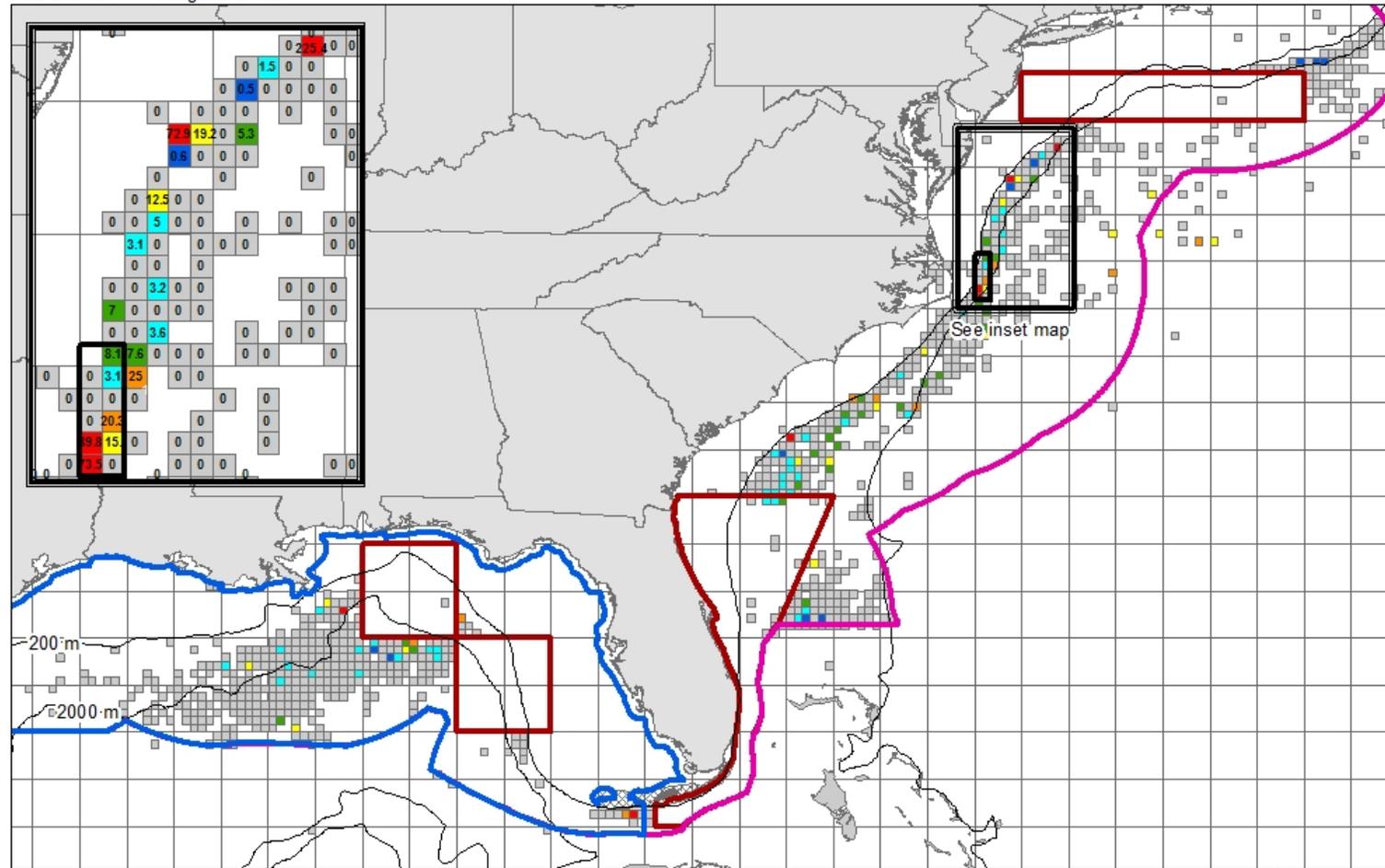
**Total Dusky Shark Interactions  
(10' latitude x 10' longitude)**



**Observed Dusky Shark Interactions  
from 2008 to 2012  
Month: June**

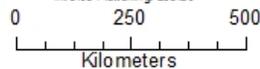
Colored cells reflect all dusky shark interactions (sharks kept, discarded alive, and discarded dead) observed by the POP in each grid cell.

Data Source: HMS Logbook Data

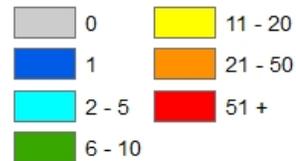


- A5 Proposed Closures
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



**CPUE (# Dusky / 10,000 Hooks)  
(10' latitude x 10' longitude)**



**Dusky Shark CPUE per Data  
Reported in the HMS Logbook  
from 2008 to 2012**

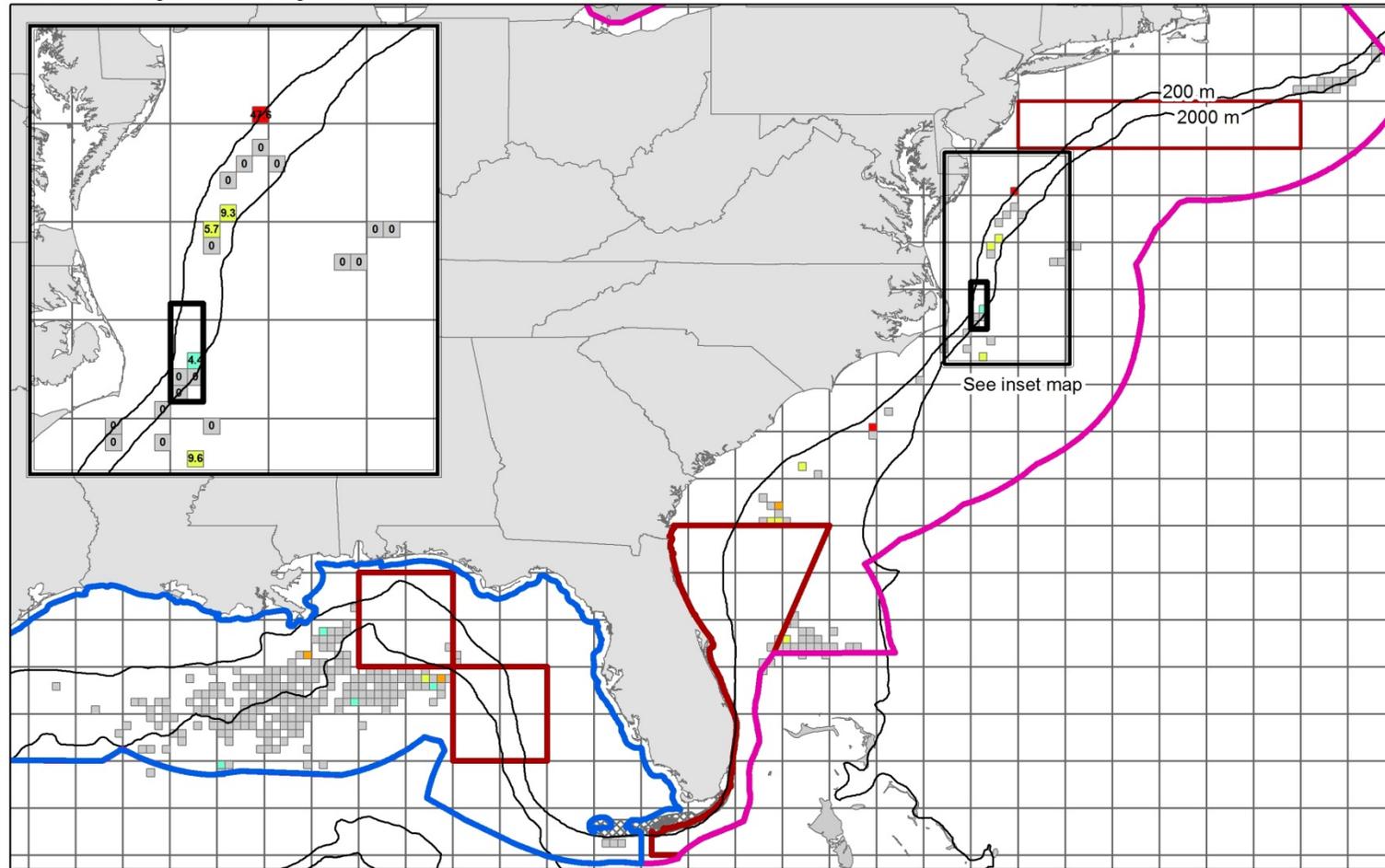
**Month: June**

Colored cells reflect CPUE calculations on all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

For each cell:

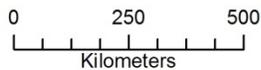
$$\text{CPUE (dusky / 10,000 hooks)} = (\text{sum dusky} / \text{sum hooks}) * 10,000$$

Data Source: Pelagic Observer Program Data



- A5 Proposed Closures
- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26



**Dusky Shark CPUE  
 (10' latitude x 10' longitude)**



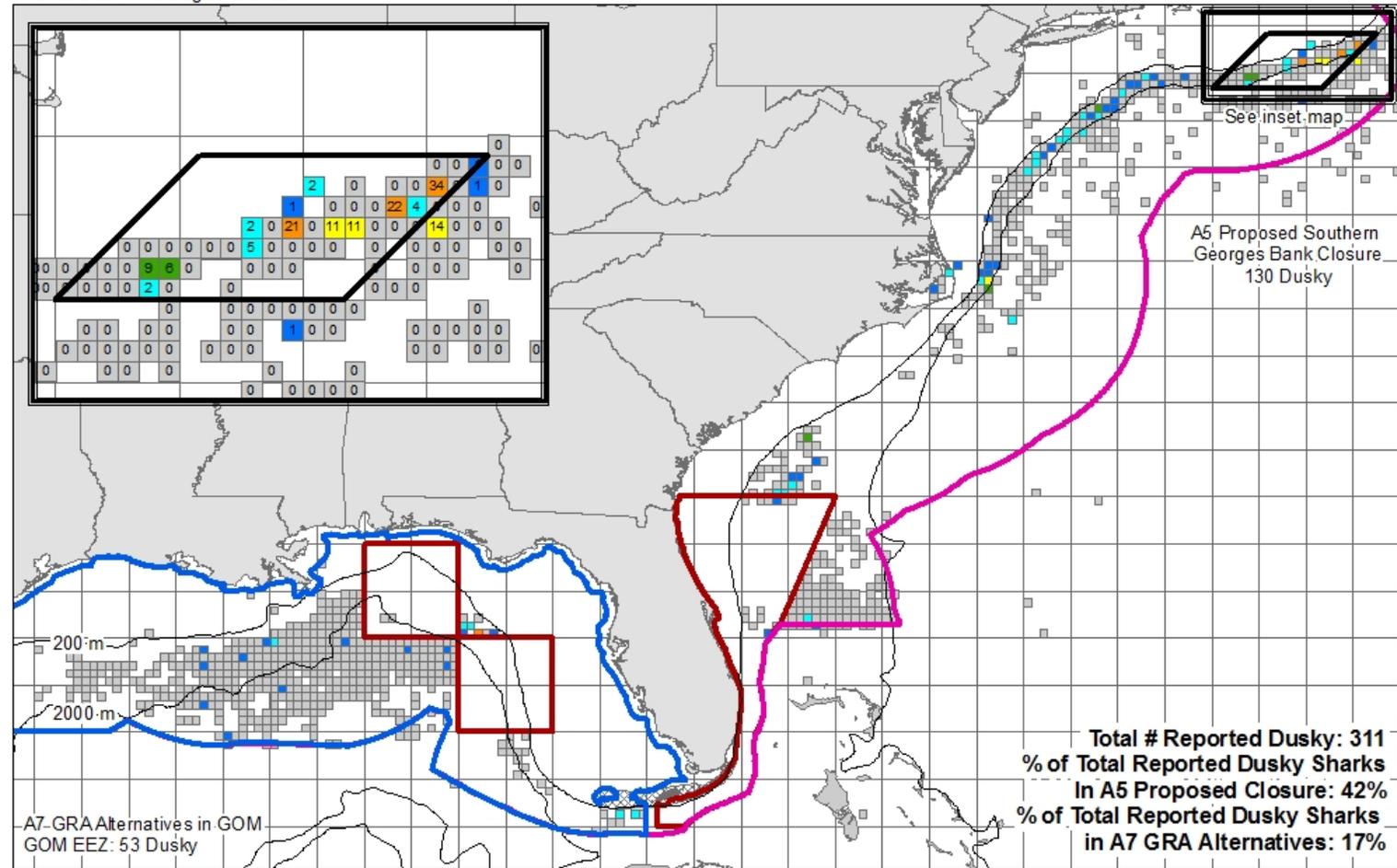
**Observed Dusky Shark CPUE  
 from 2008 to 2012  
 Month: June**

Colored cells reflect CPUE calculations based on observed dusky shark interactions (sharks kept, discarded alive, and discarded dead).

For each grid cell:

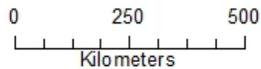
$$\text{CPUE (dusky/10,000 hooks)} = (\text{sum dusky}/\text{sum hooks}) * 10,000$$

Data Source: HMS Logbook Data



- A5 Proposed Closure
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1960  
 Semi-major Axis: 6378137.0  
 Semi-minor Axis: 6356752.3  
 Inverse Flattening: 298.26



**Total Dusky Shark Interactions  
 (10' latitude x 10' longitude)**

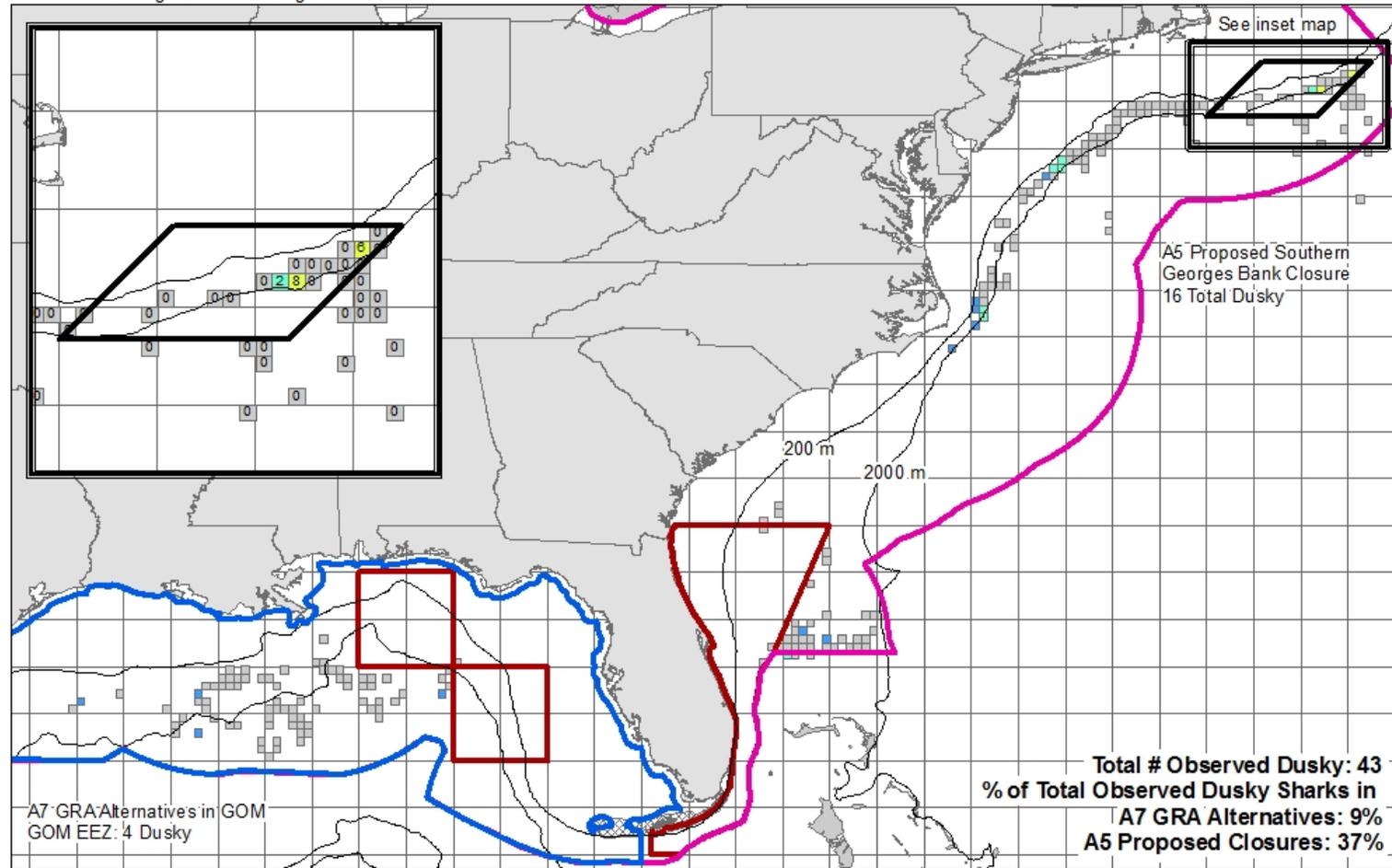
- 0
- 1
- 2 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- 51 +

**Total Dusky Shark Interactions  
 Reported in the HMS Logbook  
 from 2008 to 2012**

**Month: July**

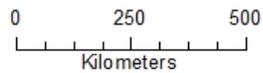
Colored cells reflect all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: Pelagic Observer Program Data



- A5 Proposed Closures
- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



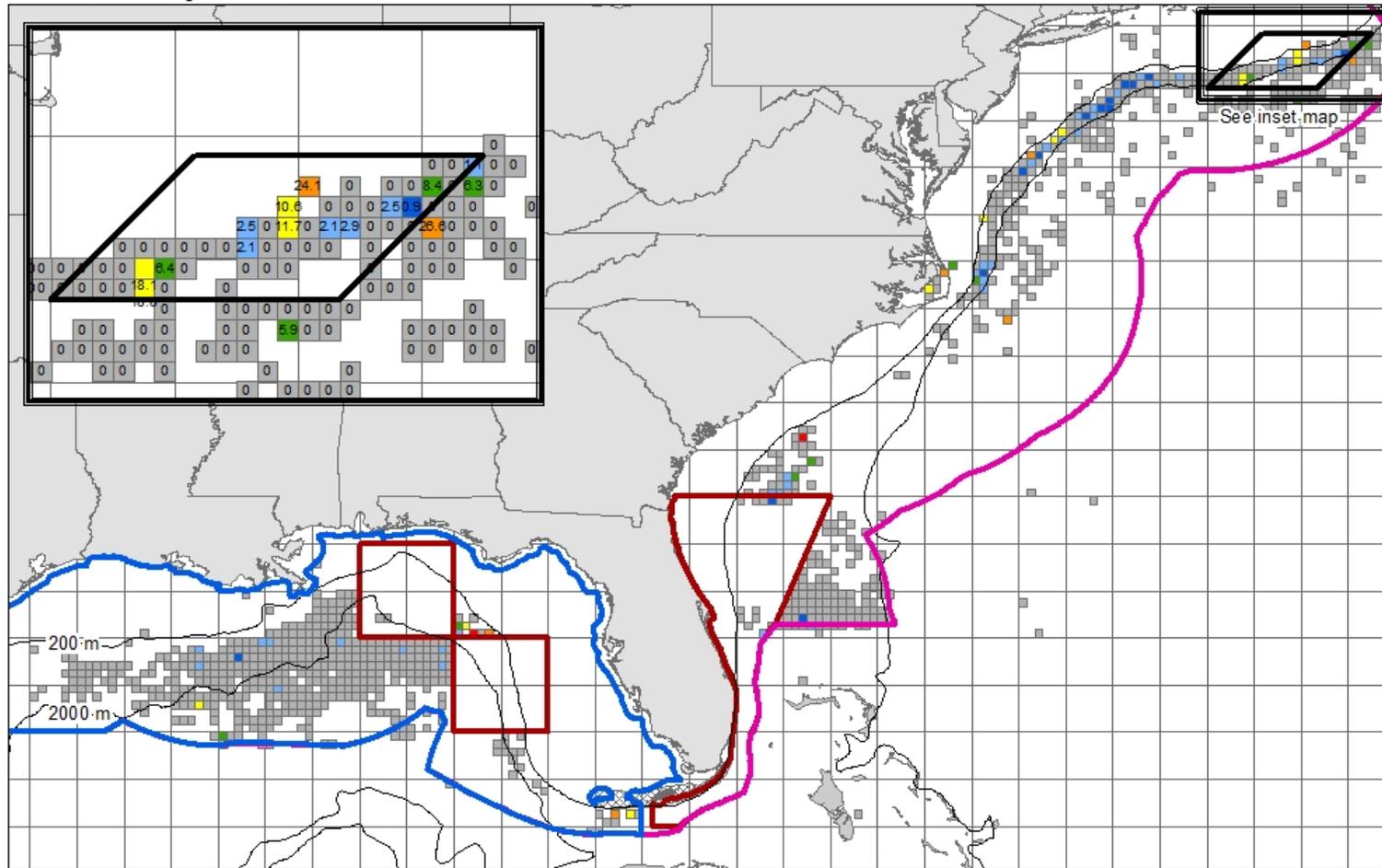
**Observed # Dusky Shark  
(10' latitude x 10' longitude)**



**Observed Dusky Shark Interactions  
from 2008 to 2012  
Month: July**

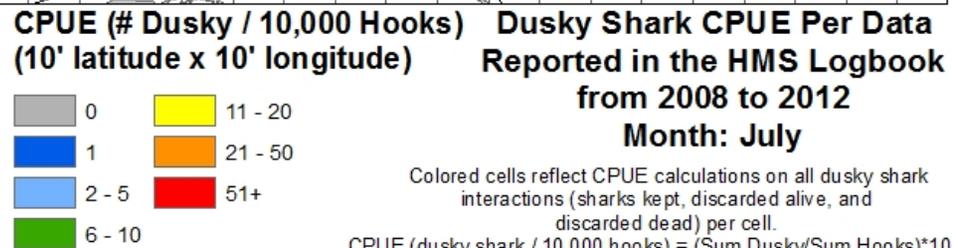
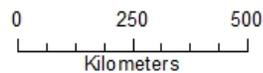
Colored cells reflect all dusky shark interactions (sharks kept, discarded alive, and discarded dead) observed by the POP in each grid cell. Data are aggregated to protect confidentiality.

Data Source: HMS Logbook Data

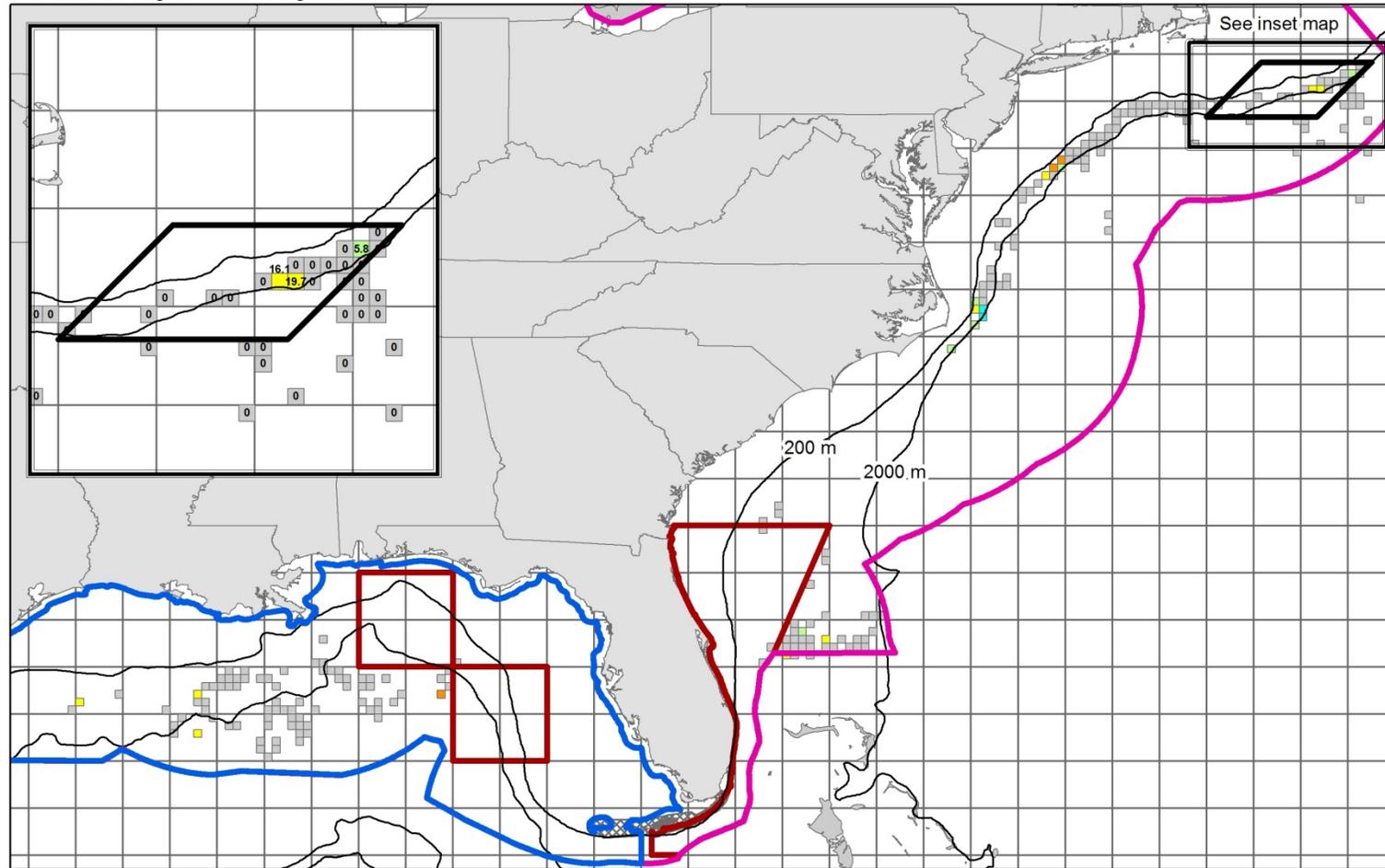


- A5 Proposed Closure
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1960  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26

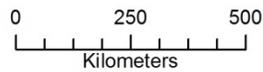


Data Source: Pelagic Observer Program Data

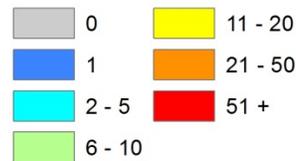


- A5 Proposed Closures
- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26



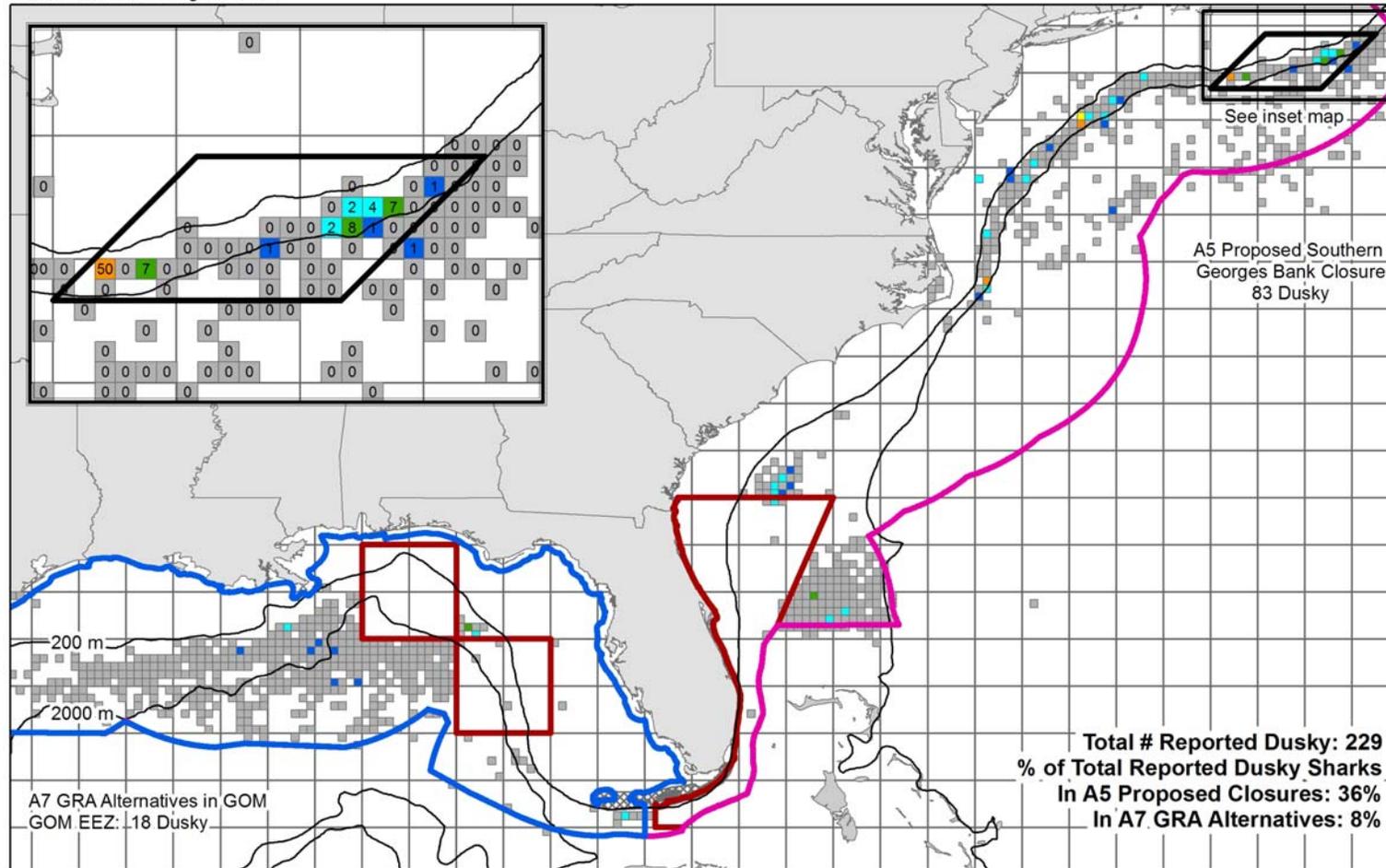
**CPUE (# Dusky / 10,000 Hooks)  
 (10' latitude x 10' longitude)**



**Observed Dusky Shark CPUE  
 from 2008 to 2012  
 Month: July**

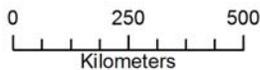
Colored cells reflect all dusky shark interactions (sharks kept, discarded alive, and discarded dead) observed by the POP in each grid cell. Data are aggregated to protect confidentiality.

Data Source: HMS Logbook Data

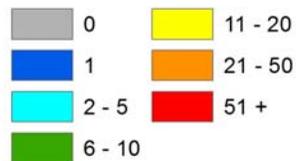


- A5 Proposed Closures
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26



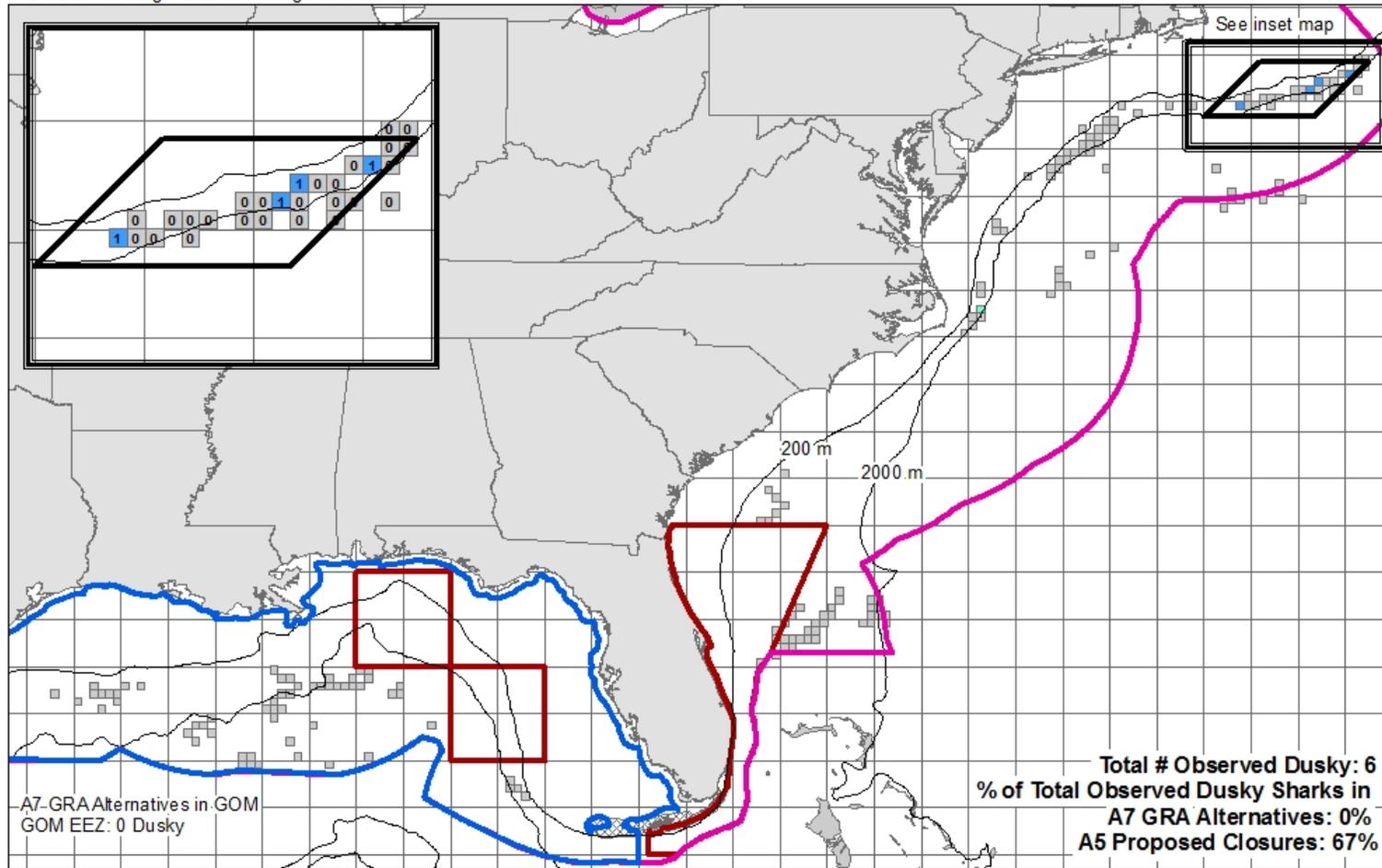
**Total Dusky Shark Interactions (10' latitude x 10' longitude)**



**Total Dusky Shark Interactions Reported in the HMS Logbook from 2008 to 2012**  
**Month: August**

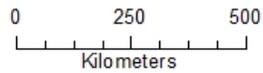
Colored cells reflect all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: Pelagic Observer Program Data



- A5 Proposed Closures
- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



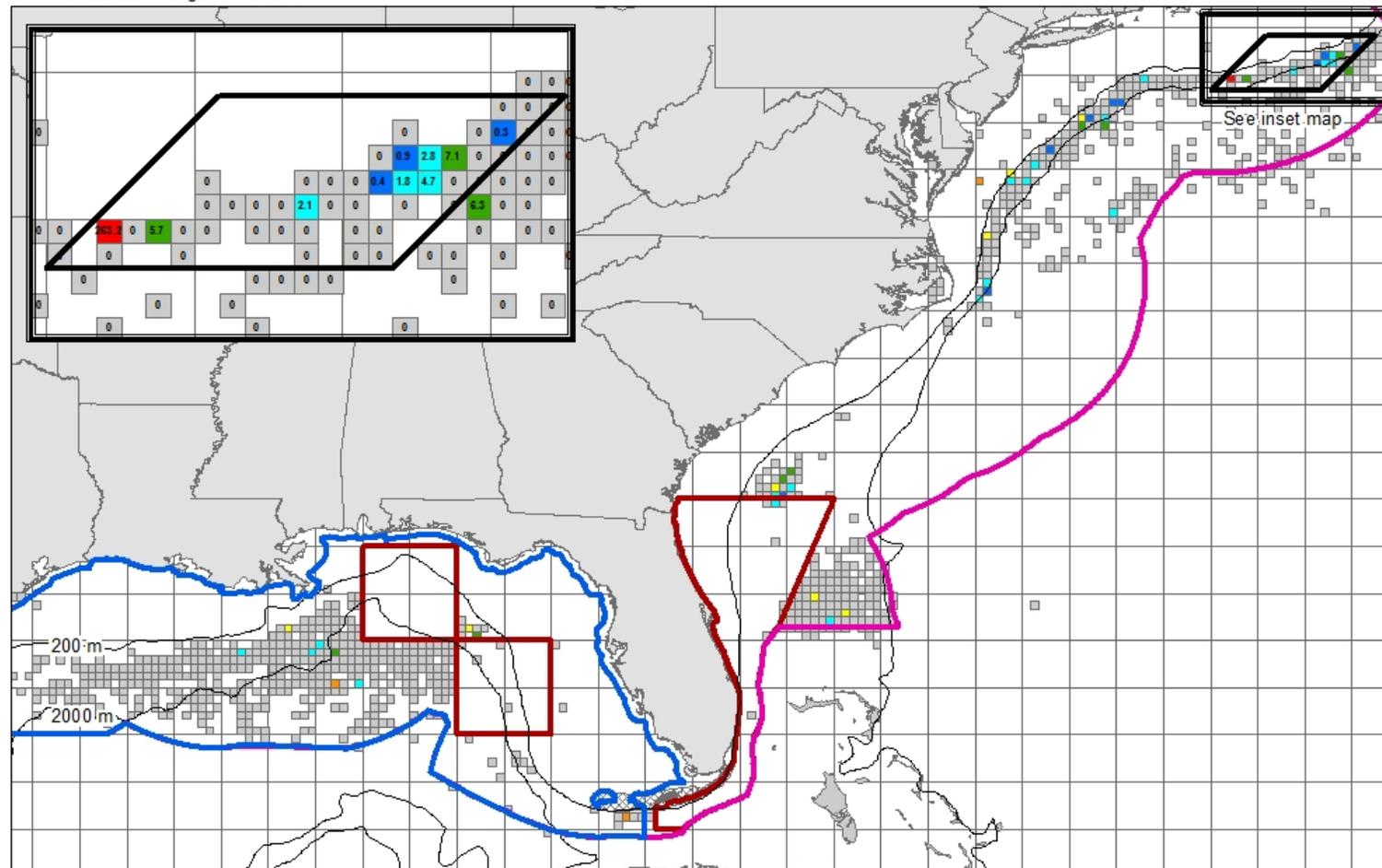
**Observed # Dusky Shark (10' latitude x 10' longitude)**



**Observed Dusky Shark Interactions from 2008 to 2012  
Month: August**

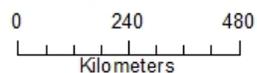
Colored cells reflect all dusky shark interactions (sharks kept, discarded alive, and discarded dead) observed by the POP in each grid cell. Data are aggregated to protect confidentiality.

Data Source: HMS Logbook Data

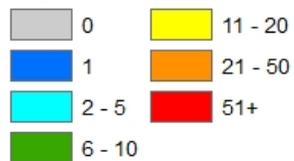


- A5 Proposed Closure
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



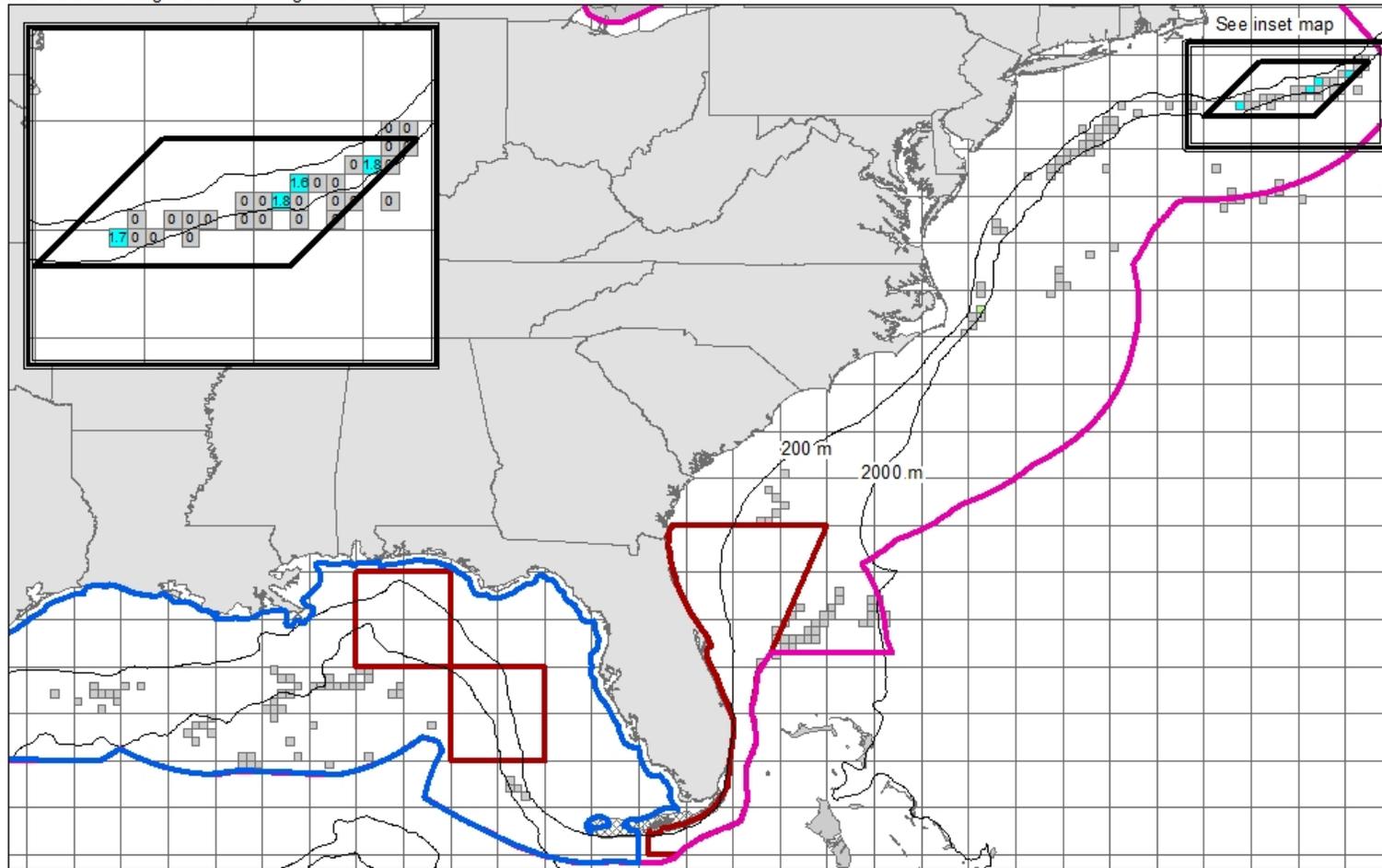
**CPUE (# Dusky / 10,000 hooks)  
(10' latitude x 10' longitude)**



**Dusky Shark CPUE per Data  
Reported in the HMS Logbook  
from 2008 to 2012  
Month: August**

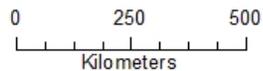
Colored cells reflect CPUE calculations all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead) per cell.  
 $CPUE (dusky / 10,000 \text{ hooks}) = (\text{sum dusky} / \text{sum hooks}) * 10,000$

Data Source: Pelagic Observer Program Data

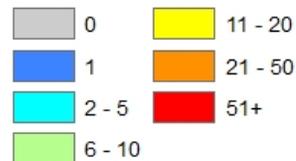


- A5 Proposed Closures
- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



**CPUE (# Dusky / 10,000 Hooks)  
(10' latitude x 10' longitude)**



**Observed Dusky Shark CPUE  
from 2008 to 2012**

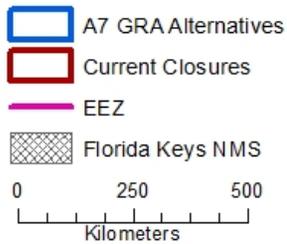
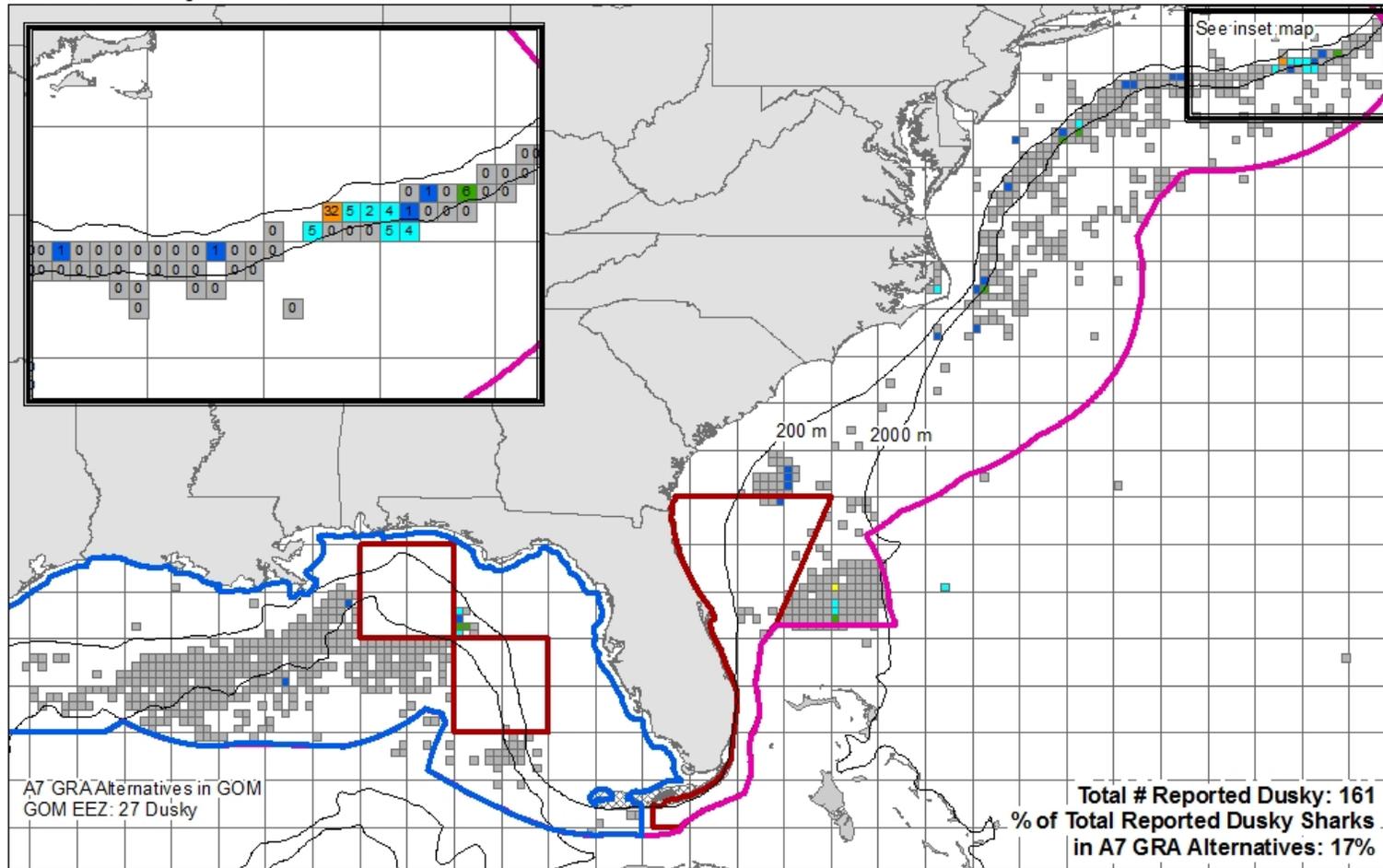
**Month: August**

Colored cells reflect CPUE calculations based on observed dusky shark interactions (sharks kept, discarded alive, and discarded dead).

For each grid cell:

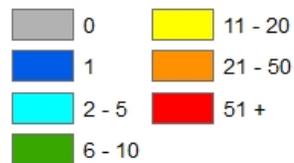
$$\text{CPUE (dusky/10,000 hooks)} = (\text{sum dusky}/\text{sum hooks}) * 10,000$$

Data Source: HMS Logbook Data



Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26

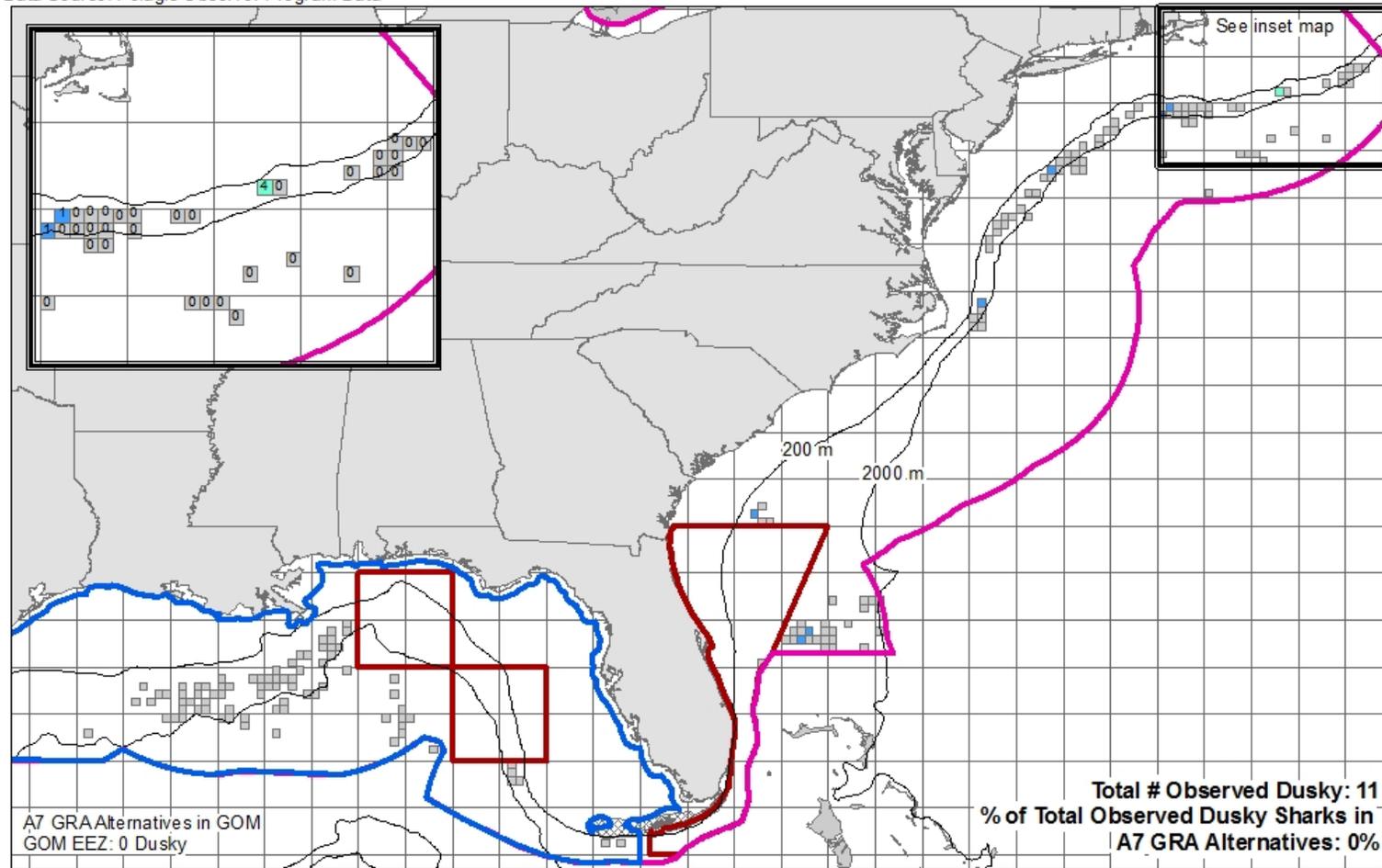
**Total Dusky Shark Interactions  
(10' latitude x 10' longitude)**



**Total Dusky Shark Interactions  
Reported in the HMS Logbook  
from 2008 to 2012  
Month: September**

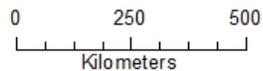
Colored cells reflect all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: Pelagic Observer Program Data



- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semi-major Axis: 6378137.0  
Semi-minor Axis: 6356752.3  
Inverse Flattening: 298.26



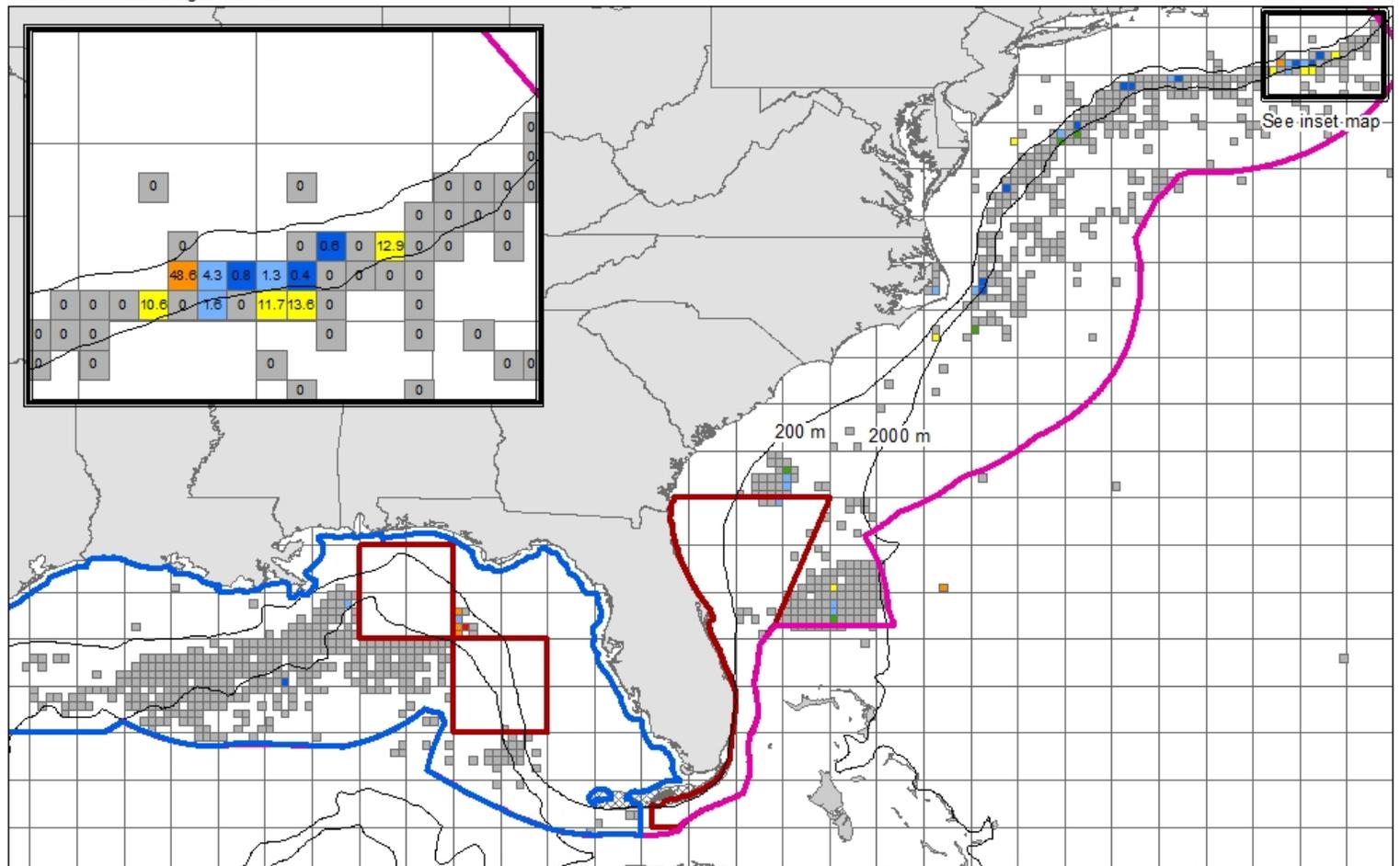
**Observed # Dusky Sharks  
(10' latitude x 10' longitude)**



**Observed Dusky Shark Interactions  
from 2008 to 2012  
Month: September**

Colored cells reflect all dusky shark interactions (sharks kept, discarded alive, and discarded dead) observed by the POP in each grid cell. Data are aggregated to protect confidentiality.

Data Source: HMS Logbook Data



**Legend:**

- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

**Scale:** 0, 250, 500 Kilometers

**Geographic Coordinate System**  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26

**CPUE (# dusky/10,000 hooks) (10' latitude x 10' longitude)**

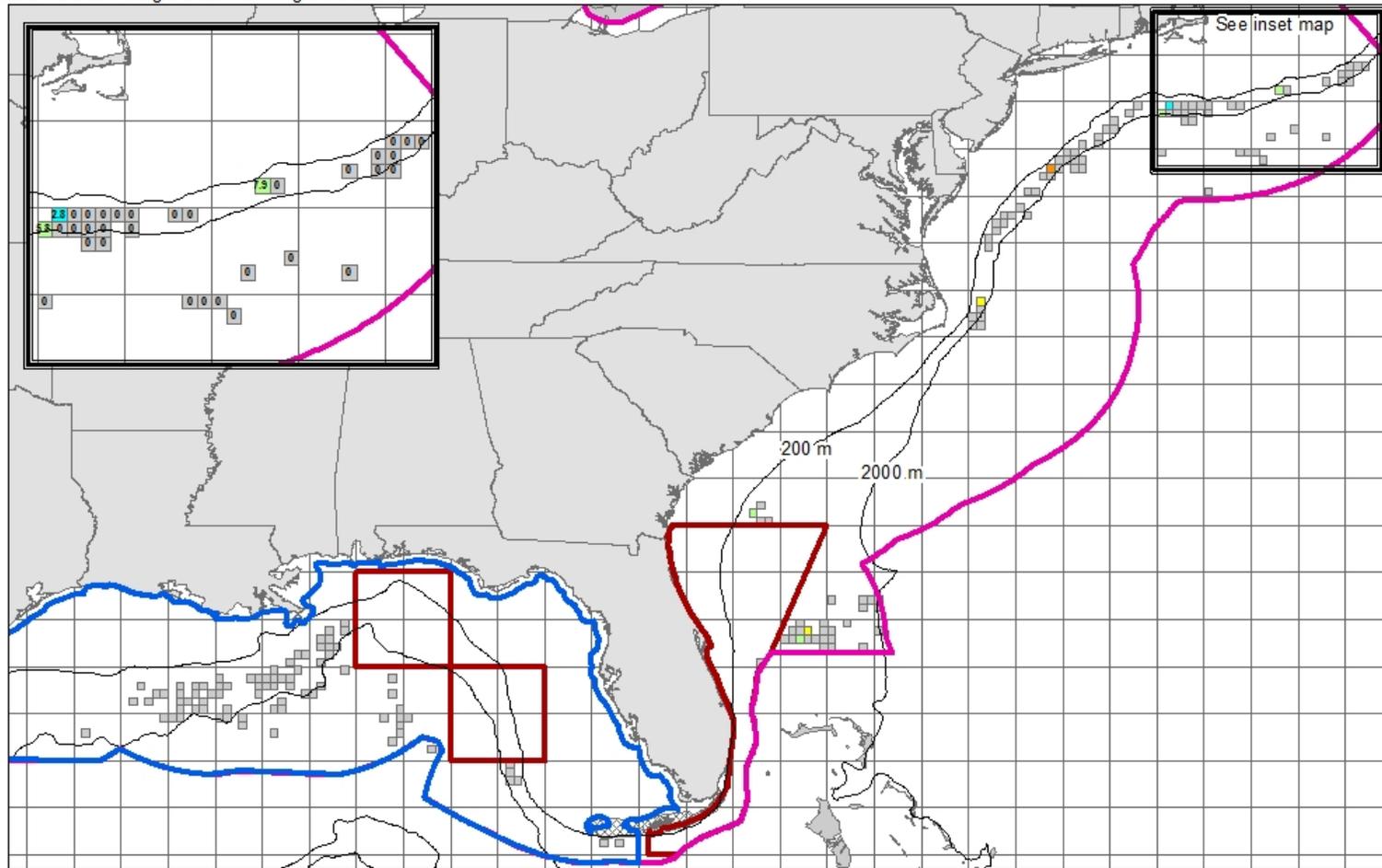
<span style="display: inline-block; width: 15px; height: 15px; background-color: gray; border: 1px solid gray;"></span> 0	<span style="display: inline-block; width: 15px; height: 15px; background-color: yellow; border: 1px solid gray;"></span> 11 - 20
<span style="display: inline-block; width: 15px; height: 15px; background-color: blue; border: 1px solid gray;"></span> 1	<span style="display: inline-block; width: 15px; height: 15px; background-color: orange; border: 1px solid gray;"></span> 21 - 50
<span style="display: inline-block; width: 15px; height: 15px; background-color: lightblue; border: 1px solid gray;"></span> 2 - 5	<span style="display: inline-block; width: 15px; height: 15px; background-color: red; border: 1px solid gray;"></span> 51 +
<span style="display: inline-block; width: 15px; height: 15px; background-color: green; border: 1px solid gray;"></span> 6 - 10	

**Dusky Shark CPUE per Data Reported in the HMS Logbook from 2008 - 2012**  
**Month: September**

Colored cells reflect CPUE calculations on all dusky shark interactions (sharks kept, discarded alive, and discarded dead) per grid cell.

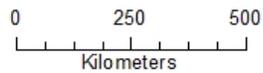
CPUE (dusky/10,000 hooks) = (Sum Dusky/Sum Hooks)\*10,000

Data Source: Pelagic Observer Program Data

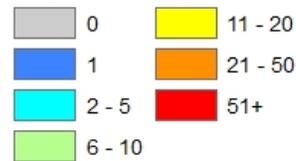


- A7 GRA Alternatives
- EEZ
- Current Closures
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



**CPUE (# Dusky / 10,000 Hooks)  
(10' latitude x 10' longitude)**



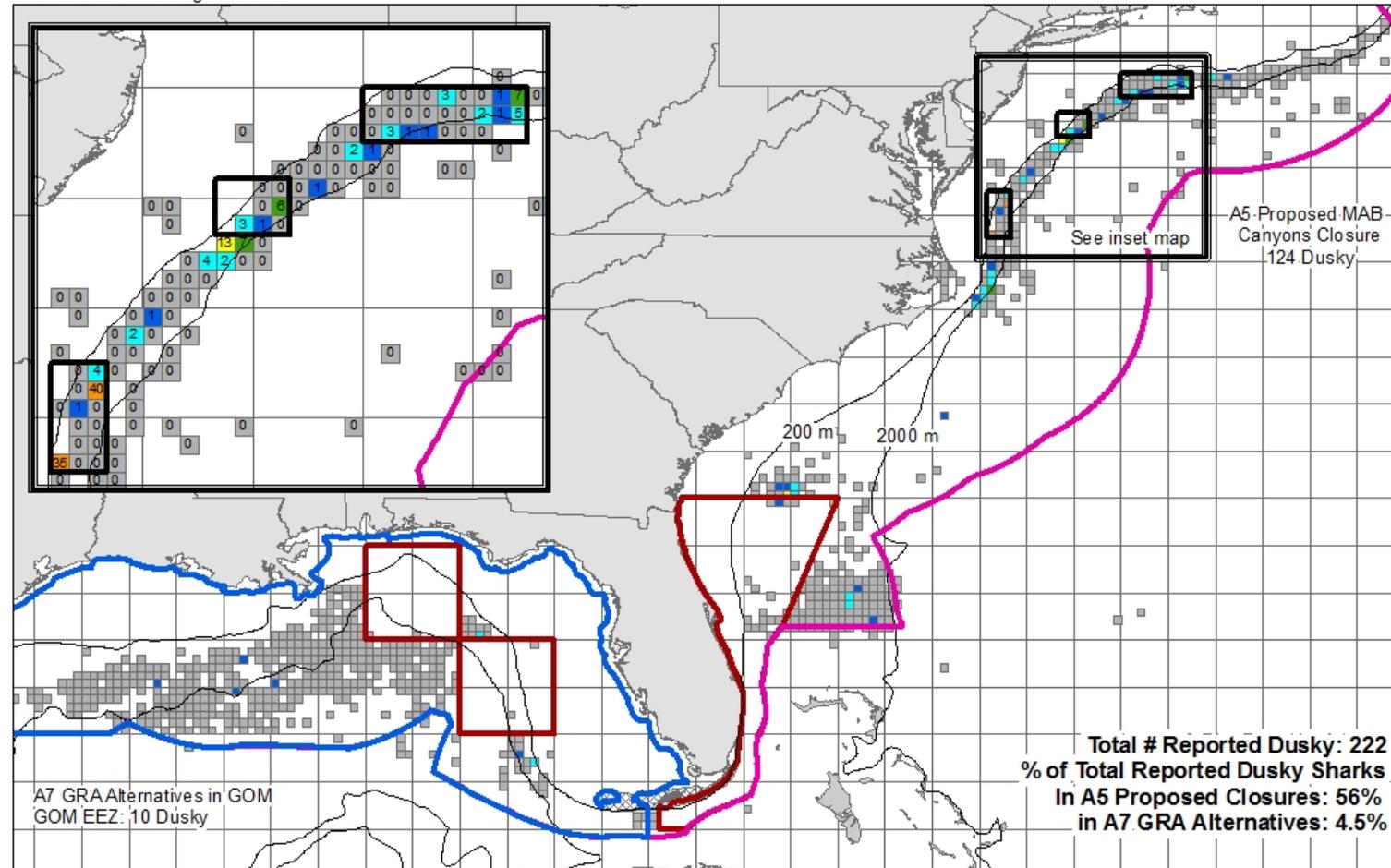
**Observed Dusky Shark CPUE  
from 2008 to 2012  
Month: September**

Colored cells reflect CPUE calculations based on observed dusky shark interactions (sharks kept, discarded alive, and discarded dead).

For each grid cell:

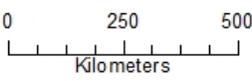
$$\text{CPUE (dusky/10,000 hooks)} = (\text{sum dusky}/\text{sum hooks}) * 10,000$$

Data Source: HMS Logbook Data

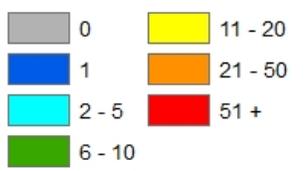


- A5 Proposed Closures
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26



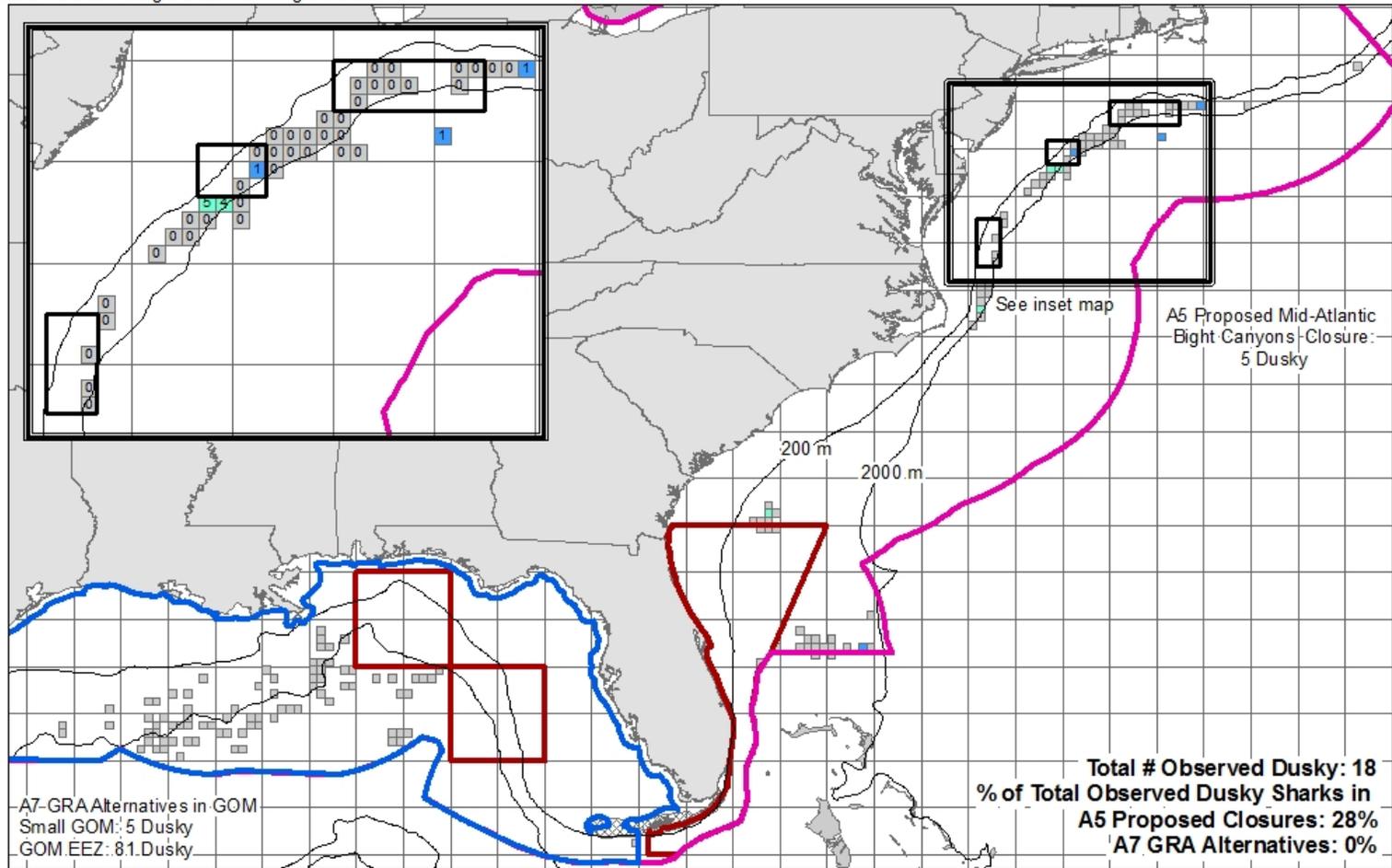
**Total Dusky Shark Interactions (10' latitude x 10' longitude)**



**Total Dusky Shark Interactions Reported in the HMS Logbook from 2008 to 2012**  
**Month: October**

Colored cells reflect all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: Pelagic Observer Program Data



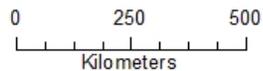
A7-GRA Alternatives in GOM  
 Small GOM: 5 Dusky  
 GOM EEZ: 81 Dusky

A5 Proposed Mid-Atlantic  
 Eight Canyons Closure:  
 5 Dusky

**Total # Observed Dusky: 18**  
**% of Total Observed Dusky Sharks in**  
**A5 Proposed Closures: 28%**  
**A7 GRA Alternatives: 0%**

- A5 Proposed Closures
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26



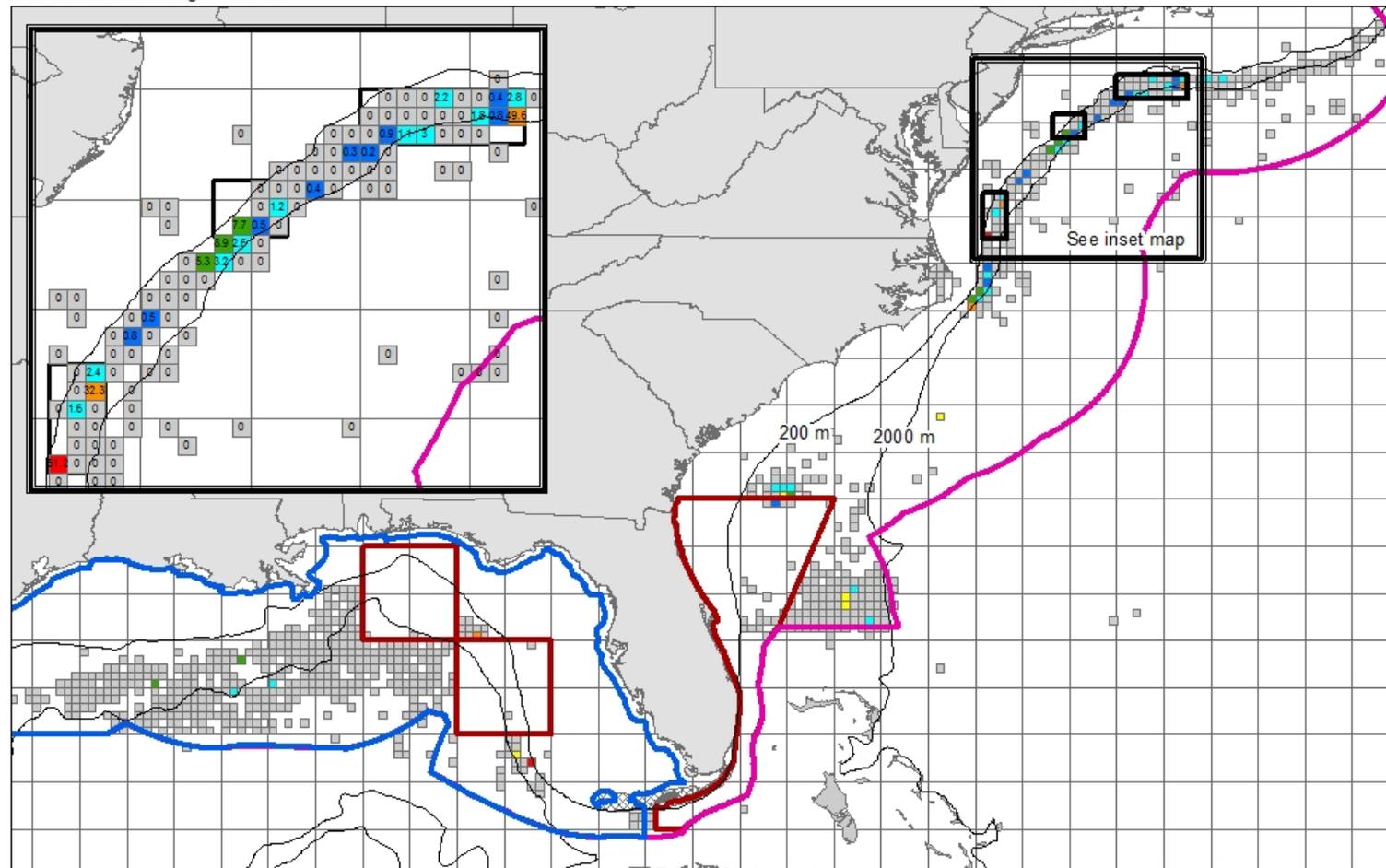
**Observed # Dusky Sharks  
 (10' latitude x 10' longitude)**

- 0
- 1
- 2 - 5
- 6 - 10
- 11 - 20
- 21 - 300

**Observed Dusky Shark Interactions  
 from 2008 to 2012  
 Month: October**

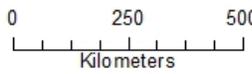
Colored cells reflect all dusky shark interactions (sharks kept, discarded alive, and discarded dead) observed by the POP in each grid cell. Data are aggregated to protect confidentiality.

Data Source: HMS Logbook Data

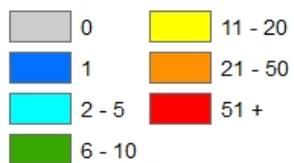


- A5 Proposed Closures
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



**CPUE (# Dusky/10,000 hooks)  
(10' latitude x 10' longitude)**

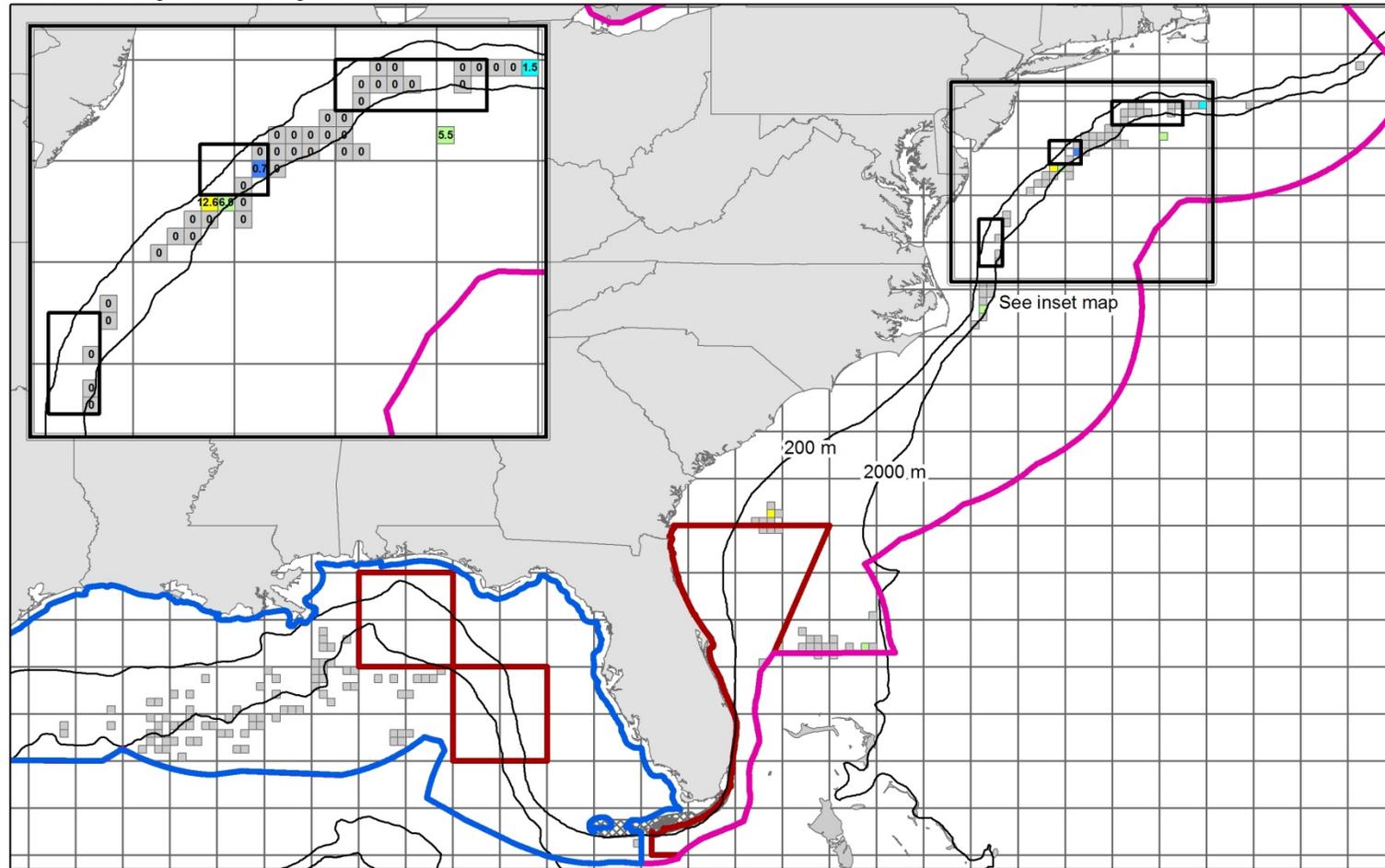


**Dusky Shark CPUE per Data  
Reported in the HMS Logbook  
from 2008 to 2012**

**Month: October**

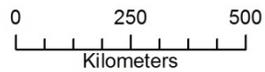
Colored cells reflect CPUE calculations on all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead) within each cell.  
CPUE (dusky/10,000 hooks) = (sum dusky/sum hooks)\*10,000

Data Source: Pelagic Observer Program Data

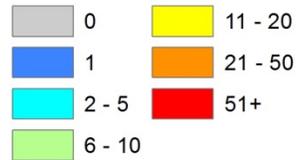


- A5 Proposed Closures
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26



**CPUE (# Dusky / 10,000 Hooks)  
 (10' latitude x 10' longitude)**



**Observed Dusky Shark CPUE  
 from 2008 to 2012  
 Month: October**

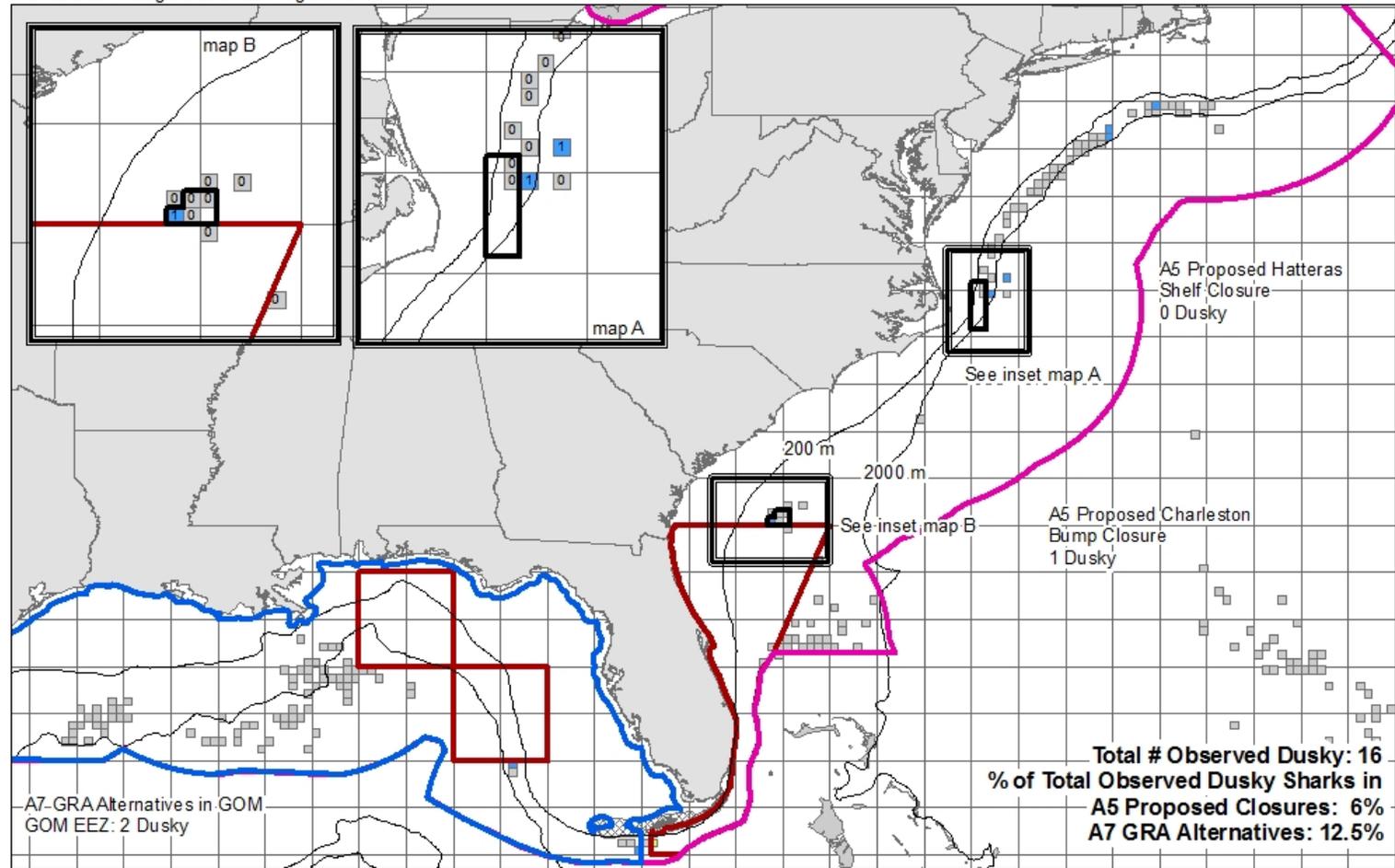
Colored cells reflect CPUE calculations based on observed dusky shark interactions (sharks kept, discarded alive, and discarded dead).

For each grid cell:

$$\text{CPUE (dusky/10,000 hooks)} = (\text{sum dusky}/\text{sum hooks}) * 10,000$$

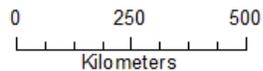


Data Source: Pelagic Observer Program Data



- A5 Proposed Closures
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semi-major Axis: 6378137.0  
Semi-minor Axis: 6356752.3  
Inverse Flattening: 298.26



**Observed # Dusky Sharks  
(10' latitude x 10' longitude)**

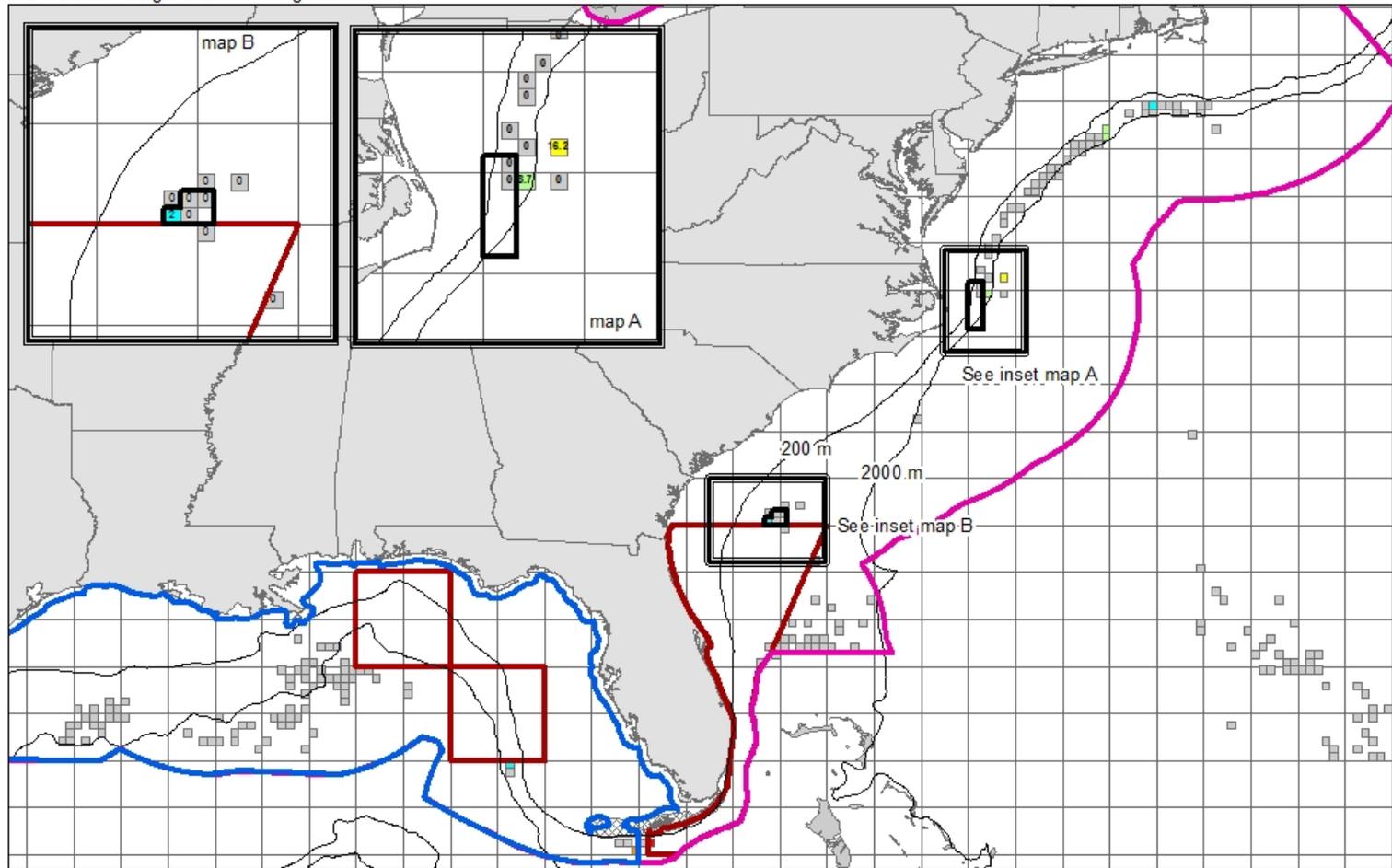


**Observed Dusky Shark Interactions  
from 2008 to 2012  
Month: November**

Colored cells reflect all dusky shark interactions (sharks kept, discarded alive, and discarded dead) observed by the POP in each grid cell. Data are aggregated to protect confidentiality.

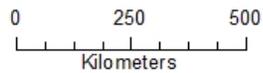


Data Source: Pelagic Observer Program Data

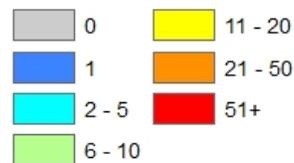


- A5 Proposed Closures
- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26



**CPUE (# Dusky / 10,000 Hooks)  
(10' latitude x 10' longitude)**



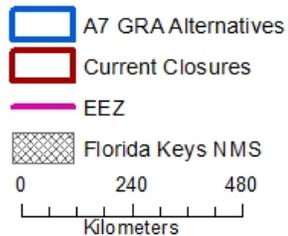
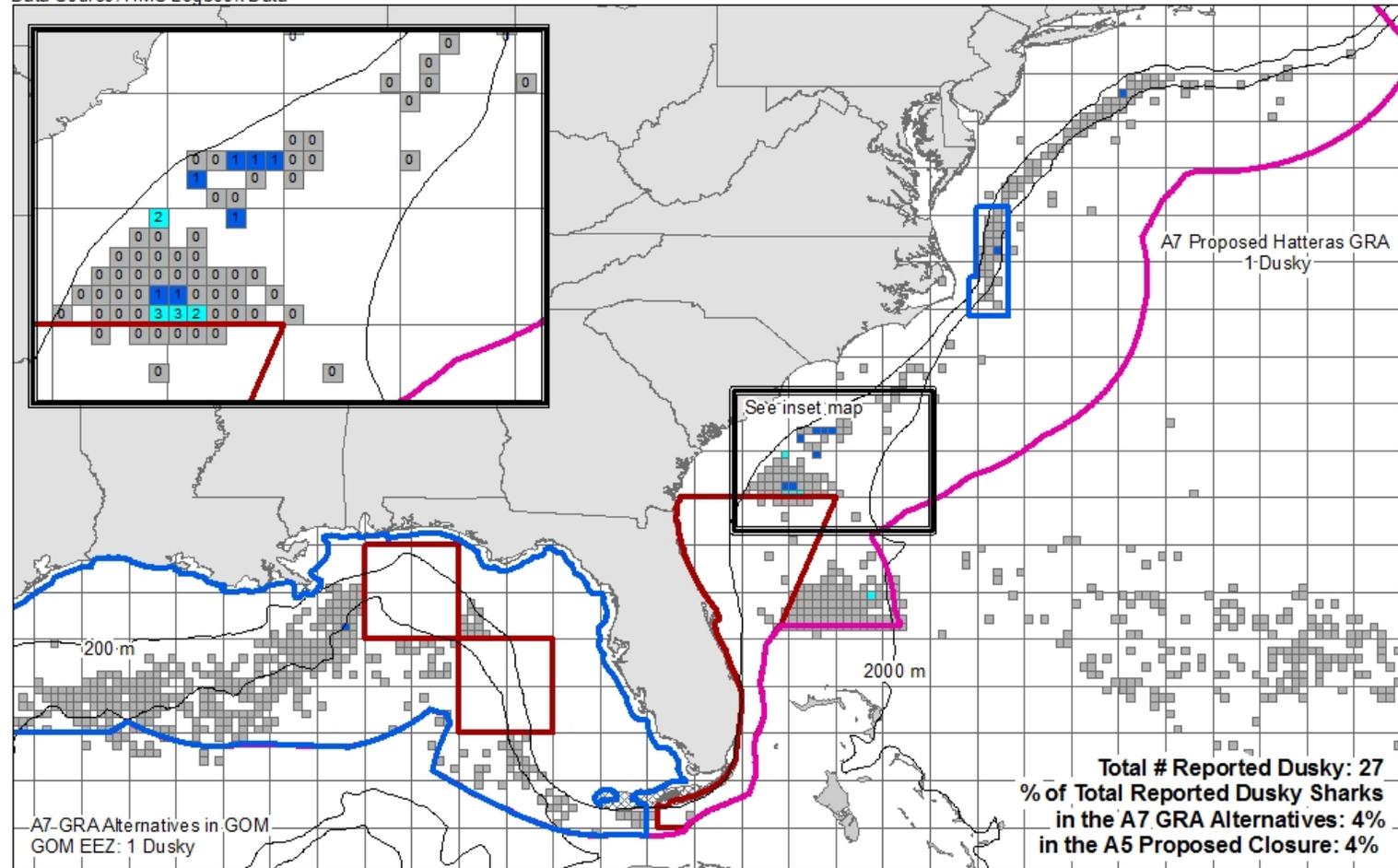
**Observed Dusky Shark CPUE  
from 2008 to 2012  
Month: November**

Colored cells reflect CPUE calculations based on observed dusky shark interactions (sharks kept, discarded alive, and discarded dead).

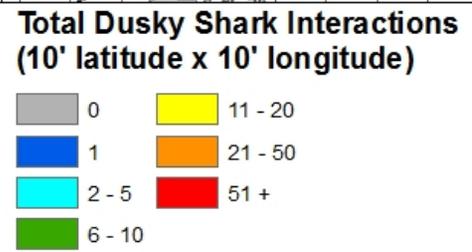
For each grid cell:

$$\text{CPUE (dusky/10,000 hooks)} = (\text{sum dusky}/\text{sum hooks}) * 10,000$$

Data Source: HMS Logbook Data



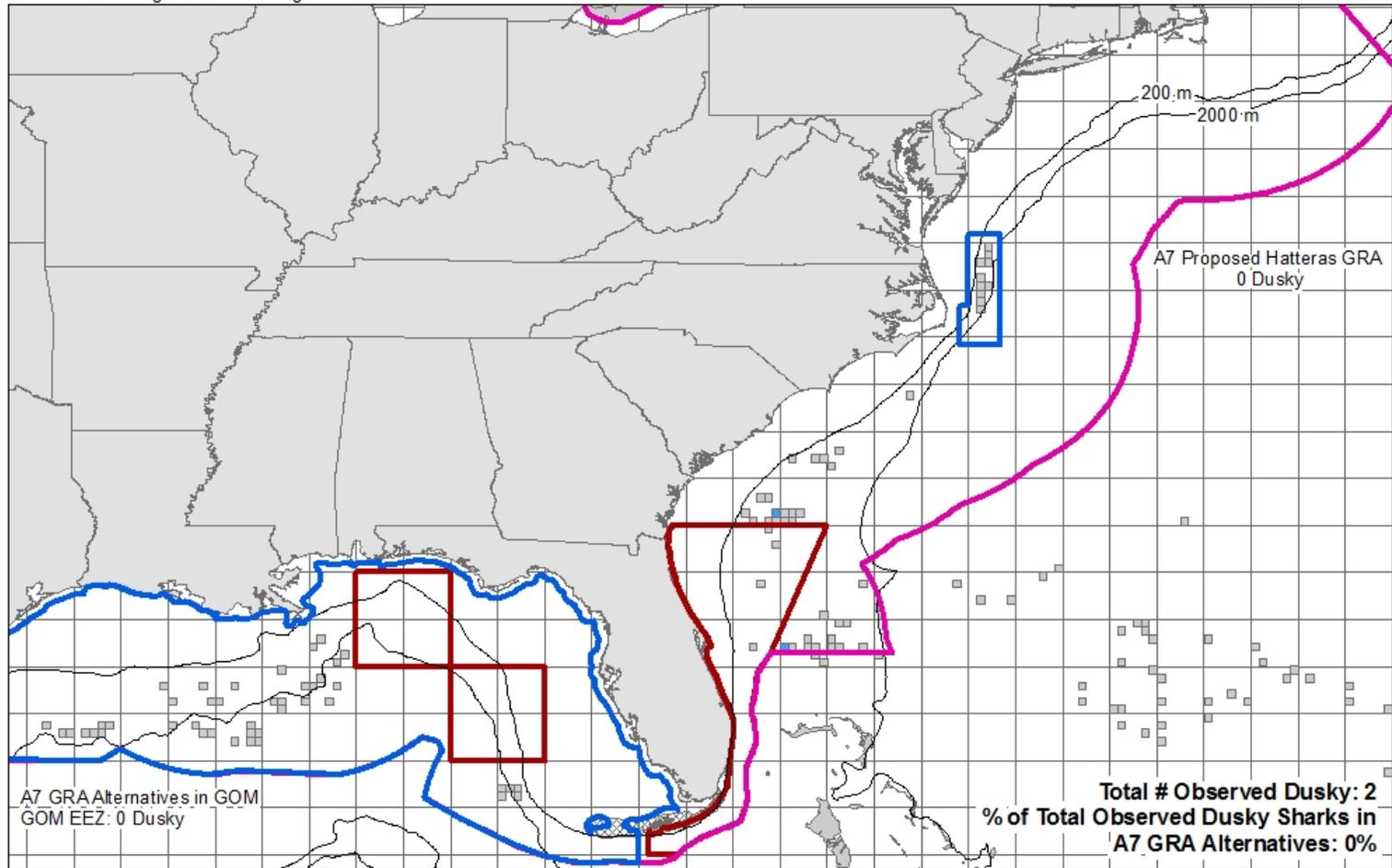
Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semi-major Axis: 6378137.0  
Semi-minor Axis: 6356752.3  
Inverse Flattening: 298.26



**Total Dusky Shark Interactions  
Reported in the HMS Logbook  
from 2008 to 2012  
Month: December**

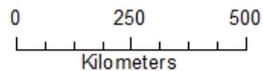
Colored cells reflect all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead).

Data Source: Pelagic Observer Program Data



- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semi-major Axis: 6378137.0  
Semi-minor Axis: 6356752.3  
Inverse Flattening: 298.26



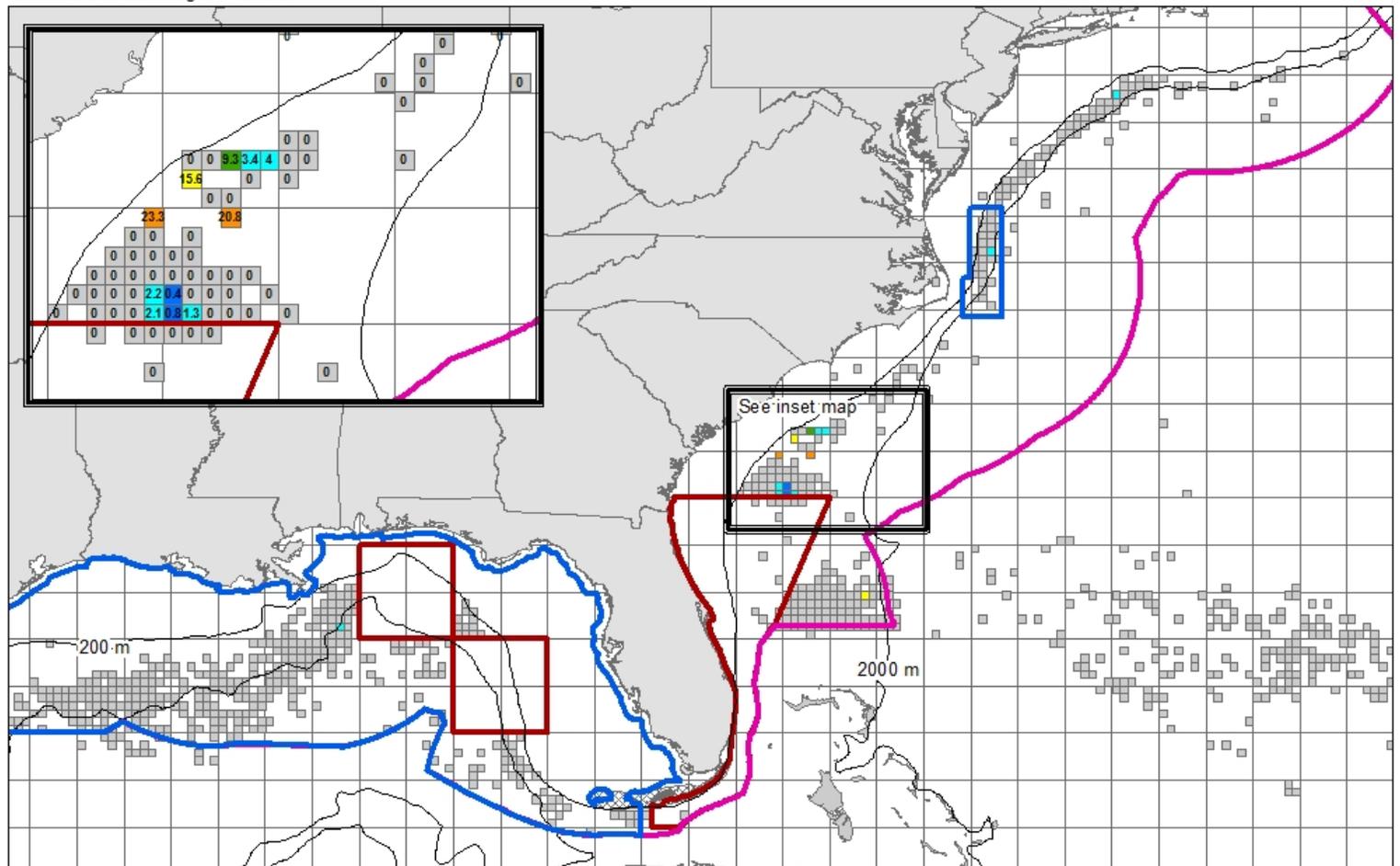
**Observed # Dusky Sharks  
(10' latitude x 10' longitude)**



**Observed Dusky Shark Interactions  
from 2008 to 2012  
Month: December**

Colored cells reflect all dusky shark interactions (sharks kept, discarded alive, and discarded dead) observed by the POP in each grid cell. Data are aggregated to protect confidentiality.

Data Source: HMS Logbook Data



-  A7 GRA Alternatives
  -  Current Closures
  -  EEZ
  -  Florida Keys NMS
- 0 250 500  
Kilometers

Geographic Coordinate System  
Datum: North American 1983  
Spheroid: GRS 1980  
Semimajor Axis: 6378137.0  
Semiminor Axis: 6356752.3  
Inverse Flattening: 298.26

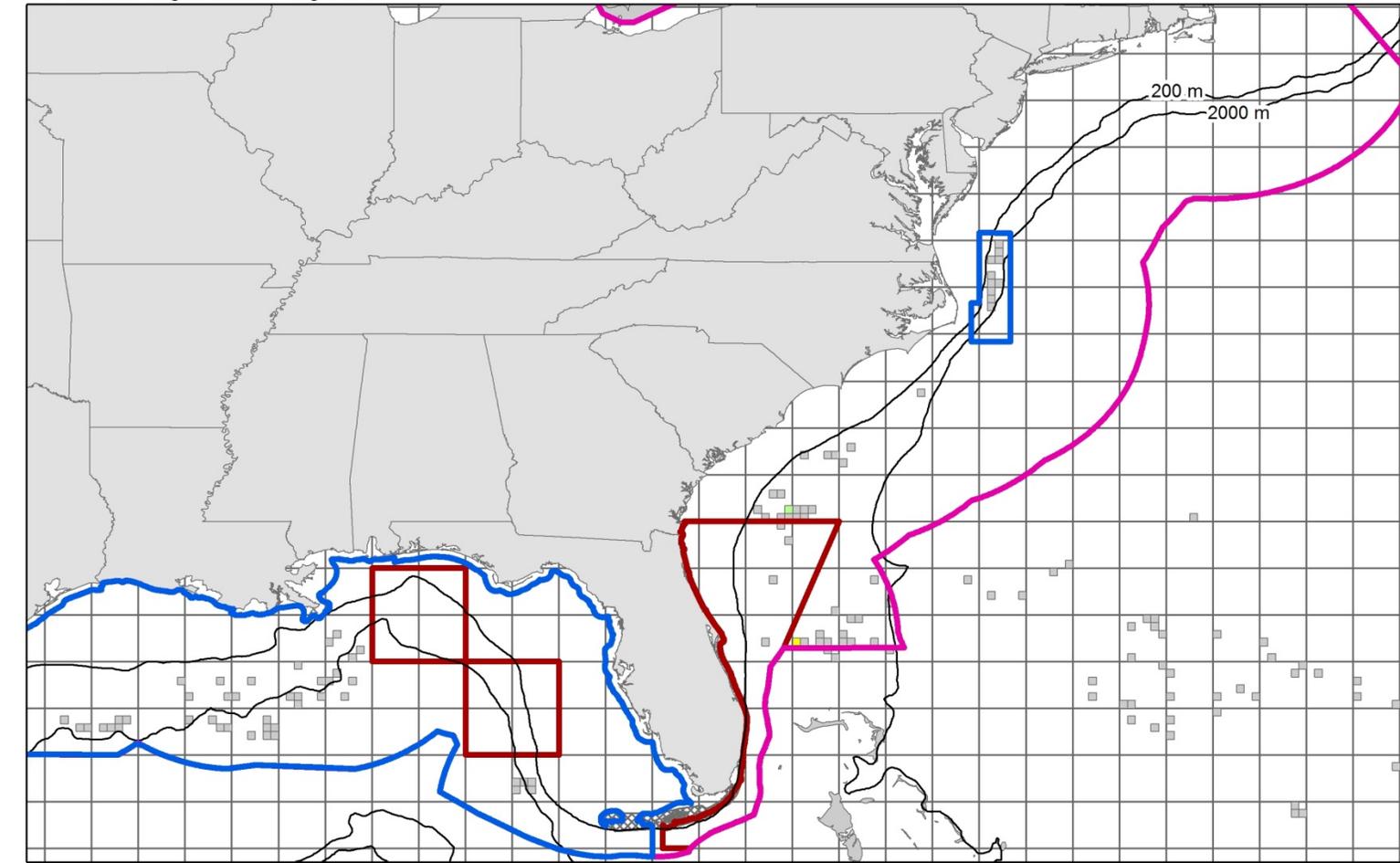
**CPUE (# Dusky / 10,000 Hooks)  
(10' latitude x 10' longitude)**

- |  |   |
|--|---|
|  0      |  11 - 20 |
|  1      |  21 - 50 |
|  2 - 5  |  51 +    |
|  6 - 10 |   |

**Dusky Shark CPUE per Data  
Reported in the HMS Logbook  
from 2008 to 2012  
Month: December**

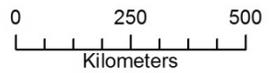
Colored cells reflect CPUE calculations on all reported dusky shark interactions (sharks kept, discarded alive, and discarded dead) within each cell.  
CPUE (dusky/10,000 hooks) = (sum dusky/sum hooks)\*10,000

Data Source: Pelagic Observer Program Data

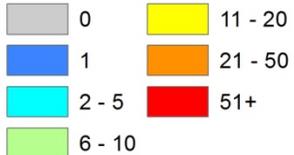


- A7 GRA Alternatives
- Current Closures
- EEZ
- Florida Keys NMS

Geographic Coordinate System  
 Datum: North American 1983  
 Spheroid: GRS 1980  
 Semimajor Axis: 6378137.0  
 Semiminor Axis: 6356752.3  
 Inverse Flattening: 298.26



**CPUE (# Dusky / 10,000 Hooks)  
 (10' latitude x 10' longitude)**



**Observed Dusky Shark CPUE  
 from 2008 to 2012  
 Month: December**

Colored cells reflect CPUE calculations based on observed dusky shark interactions (sharks kept, discarded alive, and discarded dead).

For each grid cell:

$$\text{CPUE (dusky/10,000 hooks)} = (\text{sum dusky}/\text{sum hooks}) * 10,000$$