



SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

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MEMORANDUM

Date: November 16, 2014

TO: South Atlantic Fishery Management Council

FROM: Chip Collier, SAFMC Staff

SUBJECT: Area Description of Bycatch in the Rock Shrimp Fishery

The Council requested additional detail on the distribution of bycatch in the area east and west of the closure listed in Coral Amendment 8. This information is based on 10 rock shrimp trips that had observers onboard that were described in the Observer Coverage of the U.S. South Atlantic Rock Shrimp Fishery, 2008 through 2013: Report to the South Atlantic Fishery Management Council (attached). Most of the effort (>90% of the tow time) was conducted west of the closure area. Only one data point ended up inside the closed area out of over 200 tows observed. Therefore this description is only for bycatch in the rock shrimp fishery east and west of the closure area listed in Coral Amendment 8.

The estimates presented are a percent of the total catch weight with debris removed (Figure 1). Actual catch rates are confidential. The rock shrimp percent of the total weight caught was similar among the two different areas (38%). In the area east of the closure area, the percent of crustaceans (22% compared to 12%) was higher than in the area west of the Coral Amendment 8 closure. In the area west of the closure area, the percent of fish (41% compared to 34%) was higher. The percents of the other bycatch categories were similar among the two areas.

In an attempt to gather additional information, University of Georgia Marine Extension was contacted after the September Council meeting. In the discussion, Mr. Parker indicated he was not aware of any observers being placed on rock shrimp vessels from Georgia. The Gulf and South Atlantic Fisheries Foundation was also contacted but no additional data were available.

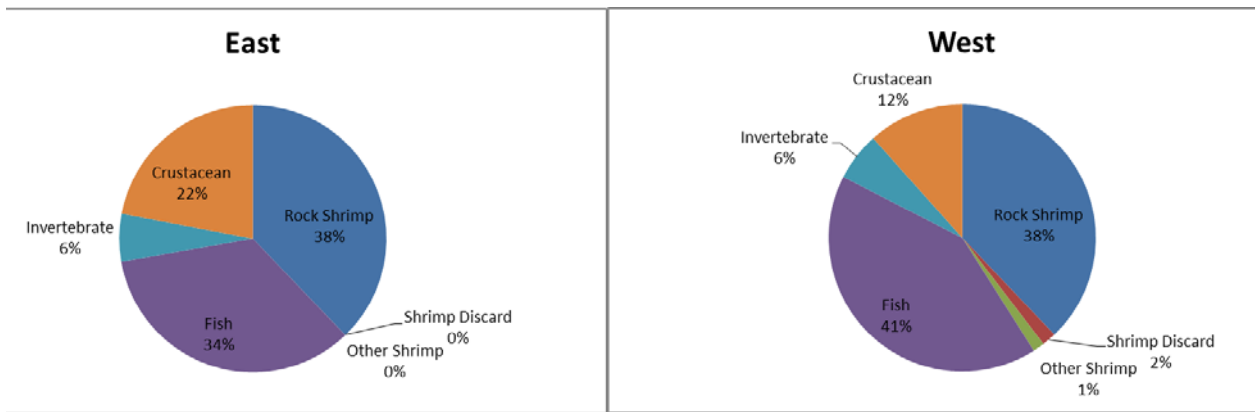


Figure 1. The percent by weight of rock shrimp, fish, invertebrate, crustacean, shrimp discarded, and other shrimp observed in the South Atlantic rock shrimp fishery. Source: National Marine Fisheries Service.

Observer Coverage of the U.S. South Atlantic Rock Shrimp Fishery, 2008 through 2013: Report to the South Atlantic Fishery Management Council

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Southeast Fisheries Science Center
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September 2, 2014

Introduction

In 1992, in response to Congressional directives, NOAA's National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center (SEFSC), in cooperation with the Gulf and South Atlantic Fisheries Foundation, Inc. (Foundation), implemented a voluntary shrimp trawl bycatch observer program to 1) characterize and estimate catch rates of trawl caught bycatch, and 2) identify, develop, and evaluate gear options to reduce bycatch in the Gulf of Mexico and South Atlantic shrimp fisheries (NMFS, 1991; Hoar et al., 1992; NMFS, 1995; NMFS, 1998; Foster and Scott-Denton, 2004; Scott-Denton, 2007). To improve the statistical validity of data from the voluntary observer program, the Gulf of Mexico Fishery Management Council, through Amendment 13 to the Shrimp Fishery Management Plan (FMP), mandated observer coverage of Federally-permitted shrimp vessels. In 2007, the SEFSC implemented a mandatory observer program for the commercial shrimp fishery operating in the U.S. Gulf of Mexico (Scott-Denton et al., 2012; Scott-Denton, 2014). In June 2008, observer coverage expanded to include the South Atlantic penaeid and rock shrimp fisheries through Amendment 6 to the Shrimp FMP for the South Atlantic Region. A full history of the Shrimp Observer Program is documented (NMFS 1991; NMFS 1998; Foster and Scott-Denton, 2004; Scott-Denton, 2007; Scott-Denton et al., 2012; Scott-Denton, 2014).

Currently, there are 1,411 Federally-permitted vessels in the Gulf of Mexico, and 514 penaeid and 103 rock shrimp Federal permit holders in the South Atlantic (SERO, 2014). Observer coverage of the entire southeastern shrimp fishery is approximately 2% based on industry effort (nominal days at sea).

The continuing goals of the mandatory observer programs are to provide quantitative biological, vessel, and gear-selectivity information for the southeastern shrimp fishery. The primary objectives are to: 1) provide general fishery bycatch characterization and catch rates for finfish species by area and target species; and 2) provide catch rates that can be used to estimate protected species bycatch levels. Collectively, these data are used extensively by the SEFSC and the Southeast Fisheries Regional Office (SERO) for stock assessment (e.g. SEDAR), and as a foundation for many fishery management decisions.

The primary focus of this report addresses program data collection efforts from mandatory observer coverage in the South Atlantic rock shrimp fishery from 2008 through 2013. A seven-year review of all mandatory coverage efforts for the U.S. Gulf of Mexico and South Atlantic penaeid and rock shrimp fisheries will be available in early 2015.

Methods

Methods are similar to those described for the voluntary shrimp trawl observer program (Scott-Denton et al., 2007; Scott-Denton. 2014), and the current mandatory Federal shrimp observer program operating in the U.S. Gulf of Mexico and along the U.S. southeastern Atlantic coast (Scott-Denton et al., 2012). NMFS-approved observers are placed on randomly selected shrimp vessels targeting rock shrimp, *Sicyonia* spp. For the South Atlantic, under the mandatory selection process, Federally-permitted vessels were randomly selected using previous year landings data to proportionally allocate sampling effort. SERO provided owner names and contact information from permit records. Once selected, permit holders were notified by certified mail at least one month prior to the selection period. The seasonal selection period was July through November.

The authority to place observers falls under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA; 16 USC 1801), the Endangered Species Act, and the Marine Mammal Protection Act. Pursuant to MSFCMA § 303(b)(8), Federal fishery permit holders are required to carry an observer if selected for mandatory coverage. Among the several provisions promulgated under MSFCMA § 303(b)(8) is the mandate for Federal permit holders to obtain a current Commercial Fishing Vessel Safety Examination decal prior to the selection period for mandatory observer coverage.

For each observed trip, vessel length, hull construction material, gross tonnage, engine horsepower, and crew size information were recorded. Gear characteristics related to BRD, turtle excluder device (TED), net type and other associated gear were recorded at the start of each trip, and updated if changes were made during the trip. Bottom time, vessel speed, and operational aspects relative to each net were documented for each tow.

Fishery-specific data were collected for each tow from the two outboard nets from vessels equipped with four nets, and one net for vessels equipped with two nets. Total catch, total shrimp, and red snapper weights were recorded for each net sampled. A subsample (one basket per net; approximately 32 kg) was processed from each net for bycatch composition by sorting for species, family, or species groupings (now referred to as species). Penaeid shrimp (and/or rock shrimp depending on the target), nonpenaeid crustaceans (crustaceans), noncrustacean invertebrates (invertebrates), and debris (e.g., rocks, logs, trash) were recorded from the subsample. A detailed description of at-sea collection methods and data requirements are presented in the NMFS Galveston Laboratory's observer manual entitled "Characterization of the U.S. Gulf of Mexico and Southeastern Atlantic Otter Trawl and Bottom Reef Fish Fisheries" (NMFS, 2014).

Biological measurements (weight and length) were recorded in metric units. Vessel, gear, and depth measurements followed current standards for the fisheries (U.S. system equivalents) as related to relevant regulatory mandates.

Protected species were documented and reported to SERO and/or SEFSC, generally within 24 h of capture. Sighting or capture of sea turtles were recorded in accordance with SEFSC protocol (NMFS, 2008). Observer data pertaining to sea turtle interactions were transmitted to SEFSC for sea turtle take level estimations.

All data were entered into the southeast regional shrimp trawl bycatch database. The database was developed in 1992 through a southeast regional program conducted by NMFS in cooperation with commercial fishing organizations and interests, state fishery management agencies and universities. This database is housed and managed at SEFSC's Galveston Laboratory, where data sets are archived.

Results

Fishing Characteristics

From June 2008 through September 2013, a total of 10 trips were observed that targeted rock shrimp in the South Atlantic (Table 1). A total of 224 tows targeting rock shrimp were sampled during 110 sea days of observations in the South Atlantic. The highest concentration of effort was in statistical areas 27 and 28 (Fig. 1).

Table 1.—Trip, tows, and sea days by year, based on mandatory observer coverage of the U.S. South Atlantic rock shrimp fishery from June 2008 through September 2013.

Year	Trips	Tows	Sea days
2008	3	97	53
2009	2	16	13
2010	1	41	14
2011			
2012			
<u>2013</u>	<u>4</u>	<u>70</u>	<u>30</u>
Total	10	224	110

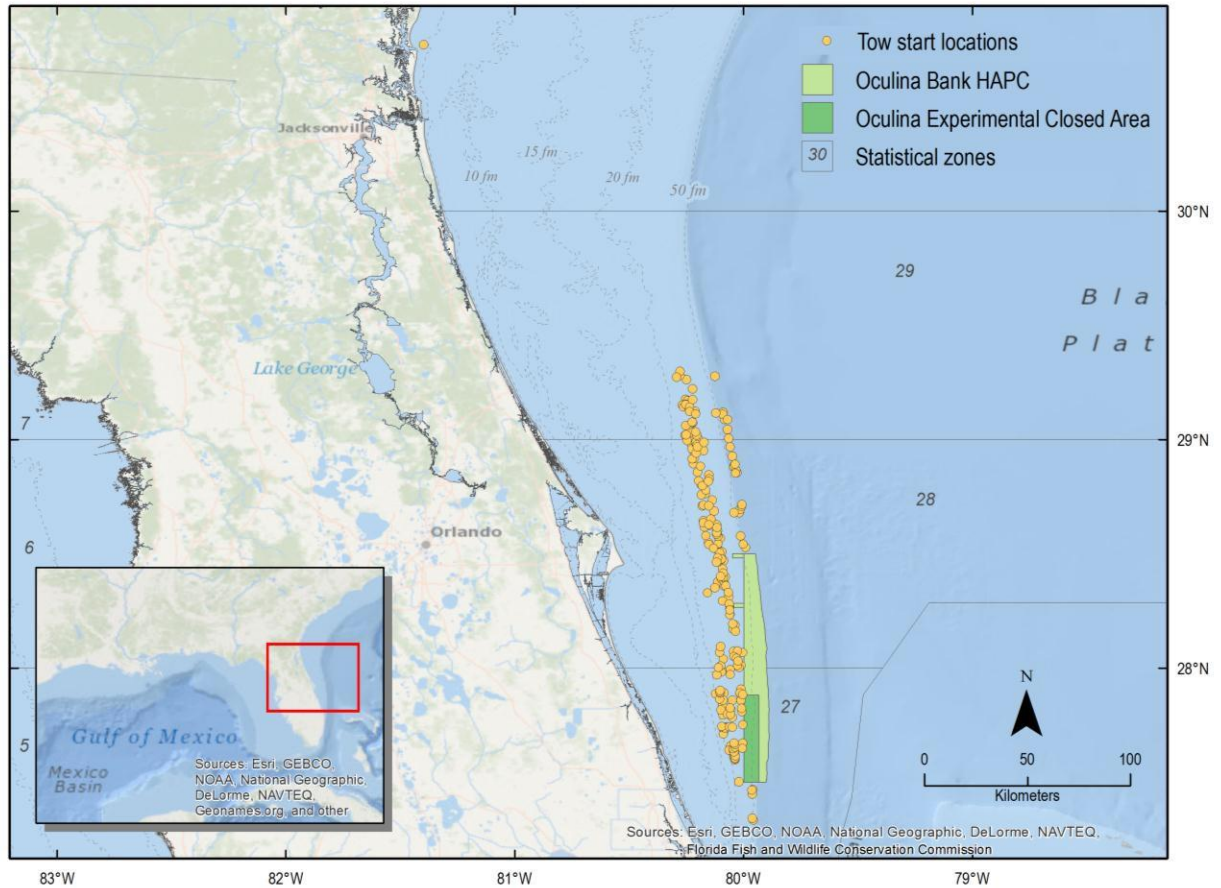


Figure 1.—Location of tows based on mandatory observer coverage of the U.S. South Atlantic rock shrimp fishery from June 2008 through September 2013.

Trip and tow characteristics are depicted in Table 2. Trip length averaged 11.0 (\pm 6.4 s.d.) days for the South Atlantic rock shrimp fishery. Average tow time was 2.9 h (\pm 0.9 s.d.). The try net (a small net used to intermittently test for shrimp concentrations) tow time was 0.8 h (\pm 0.3 s.d.). On average, South Atlantic rock shrimp vessels fished deeper depths (32.2 fm) than traditionally observed in penaeid fisheries. Average vessel speed was 2.6 kn.

Table 2.—Trip characteristics based on mandatory observer coverage of the U.S. South Atlantic rock shrimp fishery from June 2008 through September 2013.

Item	n	Mean	Range	s.d.
Trip length (days)	10	11.0	1.0–22.0	6.4
Main net tow time (h)	444	2.9	0.3–6.4	0.9
Try net tow time (h)	96	0.8	0.2–1.8	0.3
Water depth (ftm)	224	32.2	5.0–90.0	17.4
Vessel Speed (kn)	224	2.6	1.9–3.2	0.2

Vessel characteristics are denoted in Table 3. Vessel length averaged 78.3 (\pm 5.6 s.d.) feet. All vessels had freezer storage capacity, and the majority (87.5%) were of steel construction.

Table 3.—Vessel characteristics based on mandatory observer coverage of the U.S. South Atlantic rock shrimp fishery from June 2008 through September 2013.

Item	Type	Percent
Cold storage	Freezer	100.0
Hull construction	Steel	87.5
	Wood	12.5

Item	n	Mean	Range	s.d.
Vessel length (ft)	8	78.3	72.0–87.0	5.6
Year built	8	1988	1977–2001	10.5
Gross tons	8	140.9	107.0–165.0	18.1
Horsepower	7	588	425–720	123
Crew size	10	3	1–4	1.0

Net characteristics for the South Atlantic rock fishery are given in Table 4. Flat nets were used most often (39%). Headrope length for the primary trawls average 54.4 ft. Try net headrope averaged approximately 12 ft. Several trawl characteristics recorded dominated: codend material (nylon), door type (wood), trawl extension (none), chaffing gear (mesh), and lazy line rigging (elephant ears).

Table 4.—Net characteristics by based on mandatory observer coverage of the U.S. South Atlantic rock shrimp fishery from June 2008 through September 2013.

Item	Type	Percent		
Net type	Flat	39.0		
	2 seam flat	25.6		
	4 seam balloon	16.6		
	2 seam balloon	13.0		
	2 seam	5.8		
Trawl body	Nylon	88.3		
	Poly	8.1		
	Other	2.2		
	Sapphire	1.3		
Cod end	Nylon	94.2		
	Poly	5.8		
Door type	Wood	69.1		
	Aluminum	30.9		
Trawl extension type	None	53.4		
	Nylon	40.8		
	Poly	4.5		
	Sapphire	1.3		
Chaffing gear type	Mesh	53.8		
	Other	23.8		
	Whiskers	17.9		
	None	4.5		
Lazy line rigging	Elephant ears	100.0		

			Range	s.d.
Main net headrope length (ft)	446	54.4	35.0–68.0	6.8
Main net footrope length (ft)	446	58.0	41.2–72.0	7.4
Try net headrope length (ft)	82	11.7	6.2–12.0	1.3
Try net footrope length (ft)	82	13.2	12.0–14.0	1.0
Trawl body mesh size (in)	446	1.9	1.5–2.0	0.1
Cod end mesh size (in)	446	1.8	1.3–2.0	0.2
Door length (ft)	446	9.8	9.0–11.8	0.8
Door height (ft)	446	3.6	3.0–3.9	0.2
Dummy door length (ft)	446	7.7	5.0–10.0	1.2
Tickler chain length (ft)	446	64.1	46.6–82.0	9.4

BRD type and dimensions (Table 5) were also similar among vessels and included: BRD type (fisheye), BRD position (top), and BRD location (behind elephant ears).

Table 5.—Bycatch reduction device (BRD) characteristics based on mandatory observer coverage of the U.S. South Atlantic rock shrimp fishery from June 2008 through September 2013.

Item	Type	Percent
BRD type	Fish eye	100.0
BRD position	Top	100.0
BRD escape shape	Diamond	87.4
	Oval	9.0
	Cat eye	2.2
	Half moon	1.3
BRD location	Behind	70.9
	Front	29.1

Item	n	Mean	Range	s.d.
BRD cod end length (meshes)	446	142.0	107.0–167.0	17.6
BRD circumference (meshes)	446	144.5	109.0–150.0	10.3
BRD distance to tie-off rings (ft)	364	11.2	6.7–14.5	1.9
BRD fisheye escape height (in)	446	6.7	5.0–9.0	1.4
BRD fisheye escape width (in)	446	8.5	6.0–13.0	2.4

This was also evident with several attributes for TED's (Table 6), including TED type and design (hard/curved bar), TED opening (bottom), and TED angle ($\bar{x} = 50.4$ degrees).

Table 6.—Turtle excluder device (TED) characteristics based on mandatory observer coverage of the U.S. South Atlantic rock shrimp fishery from June 2008 through September 2013.

Item	Type	Percent		
TED type	Hard	100.0		
TED design	Curved bar	100.0		
TED opening	Bottom	100.0		
TED funnel	No	67.3		
	Yes	32.7		
TED flap	Yes	100.0		
TED material	Aluminum	100.0		
TED float type	Foam football	75.6		
	Foam cylinder	9.9		
	Plastic football	9.0		
	Multiple	2.9		
	Sponge football	2.7		
			Range	s.d.
TED angle (degrees)	446	50.4	45.0–64.0	5.4
TED length (in)	446	49.2	42.0–53.0	2.3
TED width (in)	446	38.7	36.0–43.0	2.3
Number of TED floats	446	2.4	2.0–4.0	0.6

Catch Composition

Data were collected from 448 nets. Based on actual weight (i.e., nonextrapolated) data, 48,538.5 kg of total catch was documented from 292 nets that had an effort value (850.8 h) and an associated total catch and shrimp weight recorded. Rock shrimp comprised 16,735.4 thousand kg (heads-on) or 34% of the total weight. Average shrimp CPUE was 19.7 kg/h. A total of seven red snapper were documented in the South Atlantic rock shrimp fishery.

Extrapolated Species Composition

For the 287 nets that contained species characterization data, 48,479.3 kg of total catch was recorded. A total of 33 species were identified (Table 9). Four species comprised > 71% of total catch: rock shrimp (37%), grouped finfish (13%), inshore lizardfish, *Synodus foetens* (12%), and dusky flounder, *Syacium papillosum* (10%).

Table 9.—Species documented from bycatch characterization samples based on mandatory observer coverage of the U.S. South Atlantic rock shrimp fishery from June 2008 through September 2013.

Common name	Scientific name	Weight (kg)	Percent
Rock shrimp (genus)	<i>Sicyonia</i> spp	17,790.9	36.7
Fish (superclass)	Pisces	6,392.3	13.2
Inshore lizardfish	<i>Synodus foetens</i>	5,583.0	11.5
Dusky flounder	<i>Syacium papillosum</i>	4,850.1	10.0
Invertebrate	Invertebrate	2,782.2	5.7
Iridescent swimming crab	<i>Portunus gibbesii</i>	2,263.5	4.7
Crustacean	Crustacean	2,201.1	4.5
Longspine swimming crab	<i>Portunus spinicarpus</i>	1,294.5	2.7
Debris (rocks,logs,etc.)	Debris	1,201.4	2.5
Rock seabass	<i>Centropristis philadelphica</i>	803.8	1.7
Rock shrimp (discards)	<i>Sicyonia</i> discards	769.3	1.6
Spot (flat croaker)	<i>Leiostomus xanthurus</i>	649.3	1.3
Brown shrimp	<i>Farfantepenaeus aztecus</i>	507.1	1.0
Atlantic croaker	<i>Micropogonias undulatus</i>	397.0	0.8
Bank seabass	<i>Centropristis ocyurus</i>	295.0	0.6
Pink shrimp	<i>Farfantepenaeus duorarum</i>	166.7	0.3
Clearnose skate	<i>Raja eglanteria</i>	128.5	0.3
Black seabass	<i>Centropristis striata</i>	110.3	0.2
Flounder (genus)	<i>Bothus</i> spp	106.0	0.2
Atlantic sharpnose shark	<i>Rhizoprionodon terraenovae</i>	47.1	0.1
Southern flounder	<i>Paralichthys lethostigma</i>	44.1	0.1
Bluefish	<i>Pomatomus saltatrix</i>	33.9	0.1
Summer flounder	<i>Paralichthys dentatus</i>	23.1	0.0
Ling cobia	<i>Rachycentron canadum</i>	11.0	0.0
Red snapper	<i>Lutjanus campechanus</i>	10.4	0.0
Sharks grouped	General sharks	7.9	0.0
Northern kingfish	<i>Menticirrhus saxatilis</i>	6.7	0.0
Silver seatrout	<i>Cynoscion nothus</i>	5.4	0.0
White shrimp	<i>Litopenaeus setiferus</i>	3.0	0.0
Spanish mackerel	<i>Scomberomorus maculatus</i>	2.3	0.0
King mackerel	<i>Scomberomorus cavalla</i>	2.1	0.0
Southern kingfish	<i>Menticirrhus americanus</i>	0.6	0.0
Shrimp (brown,white, pink) discard	<i>Penaeus</i> discard	<u>0.1</u>	<u>0.0</u>
Total		48,489.7	100.0

Catch rates for species selected from all sampled nets with an effort value (286 nets) are depicted in Table 10. Catch rates for rock shrimp were highest (21.2 Kg/h) among selected species.

Table 10.— Selected rock shrimp fishery species recorded from all nets with recorded effort from bycatch characterization samples based on mandatory observer coverage of the U.S. South Atlantic rock shrimp fishery from June 2008 through September 2013.

Scientific name	Common name	Extrapolated weight(kg)	Kg/h
<i>Sicyonia</i> spp	Rock shrimp (genus)	17,745.8	21.2
<i>Pisces</i>	Fish (superclass)	6,333.9	7.6
<i>Synodus foetens</i>	Inshore lizardfish	5,472.6	6.5
<i>Syacium papillosum</i>	Dusky flounder	4,818.0	5.8
Invertebrate	Invertebrate	2,770.4	3.3
<i>Portunus gibbesii</i>	Iridescent swimming crab	2,263.4	2.7
Crustacean	Crustacean	2,199.0	2.6
<i>Portunus spinicarpus</i>	Longspine swimming crab	1,271.5	1.5
Debris	Debris (rocks,logs,etc.)	1,200.3	1.4
<i>Centropristis philadelphica</i>	Rock seabass	802.7	1.0
<i>Sicyonia</i> discards	Rock shrimp (discards)	758.5	0.9
<i>Leiostomus xanthurus</i>	Spot (flat croaker)	649.3	0.8
<i>Farfantepenaeus aztecus</i>	Brown shrimp	507.1	0.6
<i>Micropogonias undulatus</i>	Atlantic croaker	397.0	0.5
<i>Centropristis ocyurus</i>	Bank seabass	295.0	0.4
<i>Farfantepenaeus duorarum</i>	Pink shrimp	166.7	0.2
<i>Centropristis striata</i>	Black seabass	110.3	0.1
General sharks	Sharks grouped	55.0	0.1
<i>Paralichthys lethostigma</i>	Southern flounder	44.1	0.1
<i>Pomatomus saltatrix</i>	Bluefish	33.9	0.0
<i>Paralichthys dentatus</i>	Summer flounder	23.1	0.0
<i>Rachycentron canadum</i>	Ling cobia	11.0	0.0
<i>Lutjanus campechanus</i>	Red snapper	10.4	0.0
<i>Menticirrhus saxatilis</i>	Northern kingfish	6.7	0.0
<i>Cynoscion nothus</i>	Silver seatrout	5.4	0.0
<i>Litopenaeus setiferus</i>	White shrimp	3.0	0.0
<i>Scomberomorus maculatus</i>	Spanish mackerel	2.3	0.0
<i>Scomberomorus cavalla</i>	King mackerel	2.1	0.0
<i>Menticirrhus americanus</i>	Southern kingfish	0.6	0.0
<i>Penaeus</i> discard	Shrimp, discard (brown,white, pink)	0.1	0.0
<i>Pogonias cromis</i>	Black drum	0.0	0.0
<i>Carcharhinus limbatus</i>	Blacktip shark	0.0	0.0
<i>Sphyrna tiburo</i>	Bonnethead shark	0.0	0.0
<i>Carcharhinus isodon</i>	Finetooth shark	0.0	0.0
<i>Trachinotus carolinus</i>	Florida pompano	0.0	0.0
<i>Myxeroperca microlepis</i>	Gag	0.0	0.0
<i>Sphyrna lewini</i>	Hammerhead scalloped shark	0.0	0.0
<i>Alosa</i> spp	Herring (genus)	0.0	0.0
<i>Sciaenops ocellatus</i>	Red drum	0.0	0.0
<i>Stenotomus chrysops</i>	Scup	0.0	0.0
<i>Cynoscion</i> spp	Seatrout (genus)	0.0	0.0
<i>Carcharhinus falciformis</i>	Silky shark	0.0	0.0
<i>Mustelus canis</i>	Smooth dogfish shark	0.0	0.0
<i>Carcharhinus brevipinna</i>	Spinner shark	0.0	0.0
<i>Cynoscion nebulosus</i>	Spotted seatrout	0.0	0.0
<i>Acipenser</i> spp	Sturgeon (genus)	0.0	0.0
<i>Cynoscion regalis</i>	Weakfish	0.0	0.0

Protected Species

Protected species interactions are depicted in Figure 2. From June 2008 through September 2013, two loggerhead sea turtles were captured in rock shrimp trawls. By method of capture, one was observed in the try net, and the other slid out of a TED-equipped net upon retrieval. Both sea turtles were released alive and conscious.

One smalltooth sawfish was captured in the rock shrimp fishery since mandatory observer coverage began. A detailed description and resulting estimates of the rate of take are reported in Carlson and Scott-Denton, 2011.

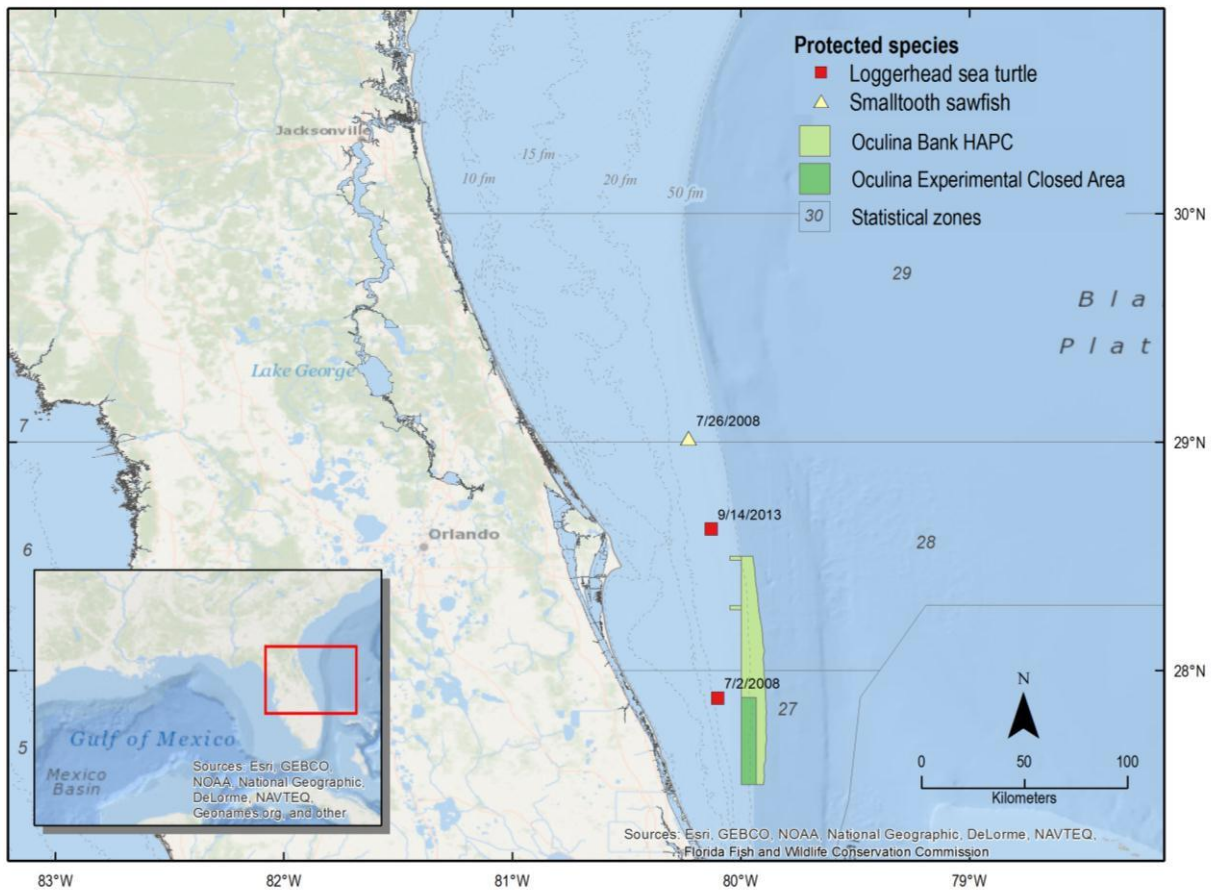


Figure 2.—Location of protected species interactions based on mandatory observer coverage of the U.S. South Atlantic rock shrimp fishery from June 2008 through September 2013

Acknowledgments

We commend the outstanding efforts given by the fishery observers involved in this research effort and the commercial fishing industry for their continued participation

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