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Observer Coverage of the 2013 Gulf of Mexico Skimmer Trawl Fishery

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Introduction

Skimmer trawl vessels primarily fish inshore waters targeting penaeid shrimp (Family Penaeidae). The species typically targeted are brown shrimp, *Farfantepenaeus aztecus*, from May through August and white shrimp, *Litopenaeus setiferus*, from August through December. Skimmer trawls have been documented in the gulf coast states of Louisiana, Alabama, and Mississippi as well as North Carolina. In 2012, Louisiana sold 6,670 resident (per net) and 138 non-resident (per net) commercial skimmer net licenses[1]. Skimmer trawls are unique in that the nets are attached to rigid frames on the vessel instead of using conventional otter trawl doors to open the net. This allows the vessel to retrieve the cod end while the nets are still actively fishing. Numerous studies have examined various aspects of the skimmer trawl fishery in the southeastern U.S. (Hines et al., 1993; Coale et al., 1994; Hein and Meier, 1995; Scott-Denton et al., 2007; Price and Gearhart, 2011; Pulver et al., 2012).

Commercial shrimping activities in the Gulf of Mexico have been shown to result in sea turtle mortality (Magnuson et al., 1990; Epperly et al., 2002). The mandatory observer program for Federal penaeid and rock shrimp (Family Sicyoniidae) permit holders using primarily otter trawls in the Gulf of Mexico and South Atlantic from July 2007 through December 2012 recorded 55 sea turtle captures (Scott-Denton et al., 2012). Price and Gearhart (2011) reported 3 Kemp's ridley sea turtle, *Lepidochelys kempii*, captures during turtle excluder device (TED) evaluations aboard skimmer trawl vessels from North Carolina in 2010. All 3 sea turtles captured were released alive and occurred in skimmer trawl nets not equipped with TEDs.

An increase in sea turtle strandings occurred in 2010 and 2011 in the northern Gulf of Mexico, particularly the Mississippi Sound area. Necropsies indicated forced submergence to be

[1] Louisiana Department of Wildlife and Fisheries. 2013. 2000 Quail Dr., Baton Rouge, Louisiana. (available at http://www.wlf.louisiana.gov/licenses/statistics).

a likely cause for a significant number of the stranded sea turtles. Historically, the skimmer trawl fishery has been exempt from the use of a TED in lieu of seasonal tow-time restrictions of less than 55 min from April 1 to October 31 and no more than 75 min for the rest of the year[2]. Interest in the possible causes for the increase in sea turtle strandings initiated mandatory observer coverage for the Gulf of Mexico skimmer trawl fishery in May 2012 to obtain more information on the fishery (Pulver et al., 2012).

Additionally, a rule to require the use of TEDs in place of the seasonal tow time restrictions for the skimmer fishery was proposed by the Southeast Regional Office in May 2012[3]. Data from the 2012 observer coverage of the skimmer trawl fishery were used to examine the potential implications of implementing this rule (Pulver et al., 2012). Epperly and Stokes (2012) provide a detailed analysis of the 24 sea turtles captured during the 2012 observer coverage of the fishery. A number of factors were examined when the proposed rule to require TED use was withdrawn in February 2013[4]. Some of these factors were a) the effectiveness of TEDs for size of sea turtles encountered, b) condition of sea turtles when captured, c) TED enforcement, and d) possible tow time implications. The majority (58%) of the sea turtles captured during the 2012 observer coverage were small enough to possibly pass thru the maximum 4-inch TED bar spacing currently allowed. Even though tow time restrictions were exceeded on 65% of the tows observed in 2012, all sea turtles captured were released alive. One sea turtle was comatose when captured, but active when released. Also, the majority of skimmer vessels operate in Louisiana state waters where Federal TED requirements are not enforced by

[2] Federal Register. 1992. Final rule establishing limited tow-times as an alternative to turtle excluder devices. 57 FR 57348.
[3] Federal Register. 2012. Proposed rule to withdraw the alternative tow-time restriction and require all skimmer trawls, pusher-head trawls, and wing nets (butterfly trawls) rigged for fishing to use turtle excluder devices in their nets. 77 FR 27411.
[4] Federal Register. 2013. NOAA Fisheries decision to withdraw a proposed rule requiring turtle excluder devices in skimmer trawls, pusher-head trawls, and wing nets (butterfly trawls) at this time. 78 FR 9024.

state law enforcement due to state legislation[5]. Finally, it was assumed that the elimination of tow time restrictions would likely increase tow times, thus potentially increasing mortality for any sea turtle passing thru the TED grid into the cod end of the trawl.

To increase the amount of information available on the skimmer trawl fishery, mandatory observer coverage was implemented again in 2013. The primary objectives were the same as the 2012 study: 1) document interactions with threatened or endangered sea turtles during commercial shrimping operations and; 2) quantify both target and nontarget species by area.

The specific objectives of this paper are to: 1) summarize trip, vessel, environmental, and gear characteristics; 2) quantify fish and protected species captures; and 3) estimate catch per unit of effort (CPUE) trends and spatial distribution for target and nontarget species, excluding protected species.

Methods

Methods used in this investigation were similar to those described for the voluntary coastal Louisiana skimmer trawl observer program in 2004-2005 (Scott-Denton et al., 2007), 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), and the initial mandatory skimmer trawl coverage in 2012 (Pulver et al., 2012). For this investigation, NMFS-approved observers were placed on selected skimmer trawl vessels fishing primarily for brown shrimp off Louisiana, Mississippi, and Alabama from January through July 2013.

[5] Louisiana Revised Statutes § 56:57.2. Turtle excluder devices; findings; enforcement of federal requirements; rules and regulations.

The authority to place observers on commercial fishing vessels falls under the Endangered Species Act of 1973 as amended. In addition, pursuant to Magnuson- Stevens Fishery Conservation and Management Act (MSFCMA; 16 USC 1801), fishery permit or license holders are required to carry an observer if selected for Federal mandatory coverage. Among the several provisions promulgated under MSFCMA § 303(b)(8) is a mandate for vessel owners to obtain a current Commercial Fishing Vessel Safety Examination decal prior to the selection period for Federal mandatory observer coverage.

A mandatory selection process was used in this investigation. Selection was based on 2012 state penaeid shrimp trips obtained from the Gulf Shrimp System (GSS) database. All vessels that had landings using skimmer trawl gear from January through July 2012 were selected. Selections were made without replacement. From January through March, 27 state permit holders were selected (i.e. all vessels that fished in 2012 GSS database in time frame) and notified by certified mail. Upon receipt of the letter, vessel owners were required to contact program staff within 24 hours to make arrangements to carry an observer. Similarly, 348 state permit holders were selected for the second season from April through July.

Although most trips were typically two days in duration, a minimum sea day requirement of 5 days was established to augment logistical considerations and minimize travel costs. This often resulted in more than one trip on a selected vessel. For each observed trip, vessel length, hull construction material, gross tonnage, engine horsepower, and crew size information were recorded. Gear characteristics related to bycatch reduction device (BRD), TED, net type and other associated gear were recorded at the start of each trip, and updated if changes were made during the trip. Tow time, vessel speed, and operational aspects relative to each net were also documented for each tow.

Skimmer trawl vessels use two framed nets (port and starboard) during fishing operations. For the entire duration of the trip, both nets were monitored for protected species interactions. For sampling finfish and shrimp, the observer randomly (coin flip) picked a net to start sampling (i.e. port or starboard). The observer continued to sample that net until a break in fishing operations. At that point, the observer sampled the other net. The net being sampled was alternated back and forth until the completion of the trip.

For the net being sampled, tow time in and out was defined as when the cod end (bag) was deployed in the water and when the cod end was brought onboard the vessel (i.e., bag in - bag out). All tow times were recorded to the nearest whole minute. Cod ends may be periodically brought up to the surface without being brought onboard (remaining in the water) to determine the size of the catch and check for protected species interactions. In our study, tow time out was not recorded until the cod ends were brought fully onboard the vessel.

Skimmer trawl operations allow the nets to fish continuously while retrieving only the cod end. For tows when the frames remained in the water between tows, the subsequent tow's start time was recorded as the next whole minute after the previous tow's end time. This accounted for the time when frames remained in the water while dumping the catch and redeploying the cod end. If both the frames and cod ends were picked up out of the water, the next tow's start time was recorded when the frames and cod ends were redeployed, as both are deployed simultaneously.

On the majority of tows (70%), both cod ends were picked up at the same time. Thus tow times are known for both nets. However, on some vessels the cod ends were not picked up at the same time. For these vessels, the observer only recorded the time in and out for the net being sampled.

For the net being sampled, the observer attempted to obtain a total weight of the catch and total shrimp weight. Depending on the vessel layout and fishing operations, observers made an effort to characterize a portion or subsample of the catch for species grouping. A detailed description of at-sea collection methods and data requirements are presented in the Galveston Laboratory's observer manual entitled "Characterization of the U.S. Gulf of Mexico and Southeastern Atlantic Otter Trawl and Bottom Reef Fish Fisheries"[6].

Data Analysis

Extrapolation, variance estimates, and CPUE are the same as described by Scott-Denton et al. (2011), Scott-Denton et al. (2012) and Pulver et al. (2012). Species total weights were extrapolated from subsample weight using the total catch weight, and were based on all sampled nets per tow. The coefficient of variation (CV) was used as a measure of precision for bycatch estimates as described in "Evaluating Bycatch" (NMFS, 2004). CV estimates were calculated by dividing the estimated standard error by the estimate of the mean CPUE (kg per hour for selected species).

To identify patterns in CPUE for species of interest, a local spatial statistic, the Getis-Ord Gi* (Gi*), was calculated using the Hot Spot Analysis tool in ArcGIS[7,8] to locate clusters of features with similarly high or low values. A detailed description of the Hot Spot Analysis tool is given in Scott-Denton et al. (2011) and Scott-Denton et al. (2012). For the skimmer trawl fishery, the search radius was based on the maximum tow length (15-km) from tow start to tow end.

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[6] NMFS. 2013. Characterization of the U.S. Gulf of Mexico and southeastern Atlantic otter trawl and bottom reef fish fisheries. Observer Training Manual. NMFS, Southeast Fisheries Science Center, Galveston Laboratory, Galveston, Texas. (available at http://www.galvestonlab.sefsc.noaa.gov/research/fishery_management/index.html).
[7] Mention of trade names or commercial firms does not imply endorsement by the National Marine Fisheries Service, NOAA.
[8] ArcGIS 10.1 Computer Software. 380 New York Street, Redlands, California 92373 (available at http://www.esri.com/software/arcgis/index.html).

Sea Turtle data were reported on a modified Southeast Fisheries Science Center (SEFSC) Sea Turtle Life History Form (Belskis et al. 2009, revised 2011) and sampled following SEFSC protocols (NMFS, 2008). The Sea Turtle Life History forms were transmitted to the SEFSC in Miami where the data were entered into the Sea Turtle Life History database.

All fishery data were entered into the southeast regional shrimp trawl bycatch database. This database is housed at the SEFSC Galveston Laboratory and was developed in 1992 through cooperation with commercial fishing interests, state fishery management agencies, and universities.

Results

Fishing Characteristics

For the 375 state permit holders selected for observer coverage, 26 carried an observer, 50 contacted the program stating they would carry an observer if they fished but never called back, 119 stated the vessel was sold, inactive, or not using skimmer trawl gear, and 180 permit holders selected did not contact the program. No observer coverage was obtained for the January through March selection period. From April through July 2013, data from 1,075 tows were collected during 35 trips (145 sea days) aboard 26 unique skimmer trawl vessels. Trip, vessel, tow and environmental characteristics are summarized (Table 1)[9].

Trip length averaged 4.1 days with an average of 30.7 tows per trip. Vessel length ranged from 38 to 61 ft, with a mean of 49.2 ft. The majority (>42%) of vessels were fiberglass construction. Average tow time for all nets was 1.05 h (62.7 min) with a range of <0.05 to 3.95 hours. Average tow time for all nets not equipped with a TED was less at 1.02 h (60.9 min).

[9] Percentages may not equal 100% due to rounding.

Average fishing depth was 2.1 fm. Most tows (76%) occurred in seas <2 ft in wave height. Based on total hours towed the highest concentration of effort occurred in Terrebonne Bay and Black Bay in coastal Louisiana (Figure 1).

Net characteristics for observed skimmer trawl vessels are given (Table 2). Headrope length ranged from 11 to 29.6 ft with an average of 16.9. Several dominant trawl characteristics included trawl body and cod end material (polyethylene), extension (none), and lazy line rigging (elephant ears). Trawl body mesh size ranged from 1.4 to 2.3 in. with a mean of 1.7 in. The majority (51%) of nets (Table 3) were equipped with fisheye BRDs; however, only 3% of nets were equipped with TEDs.

Catch Composition

For nets that had an effort value and an associated total catch and shrimp weight recorded, 45,683 kg of total catch were documented from 940 nets (1,025 h). Penaeid shrimp comprised 20,780.9 kg (heads-on) or 45% of the total weight. Average retained penaeid shrimp CPUE was 20.3 kg/h.

Extrapolated Species Composition

Weight extrapolations from species characterization data collected from 200 nets (240.2 h) were placed into major categories. In terms of percent composition and CPUE, penaeid shrimp dominated the catch at 52% (18.2 kg/h), followed closely by finfishes at 43% (15.0 kg/h), crustaceans at 3% (1.0 kg/h), debris at 1% (0.4 kg/h), invertebrates at 1% (0.3 kg/h), and discarded penaeid shrimp at 0.1 %. Overall (total catch) CPUE was 35.0 kg/h.

A total of 23 species (or species groupings) were identified (Table 4). Three species comprised > 69% of total catch: brown shrimp at 30 %, grouped finfish species at 26%, and white shrimp at 14%.

CPUE and variance estimates for selected species collected from all sampled nets from April through July 2013 depict very good CV estimates (<0.3) for penaeid shrimp and grouped finfish (Table 4). CVs were higher for some species of sharks and sciaenids (Family Sciaenidae) and in some instances equal to 1.0.

Based on weight extrapolations from species composition samples, the bycatch to penaeid shrimp ratio was 0.92. The finfish to penaeid shrimp ratio was 0.82.

A statistically significant clustering of high CPUE for penaeid shrimp was most pronounced in Terrebonne Bay and Vermilion Bay (Figure 2). A clustering of high CPUE for bycatch, excluding protected species, was detected in areas in Black Bay and Mobile Bay (Figure 3). The areas that showed the most significant cluster of high CPUE for shrimp had no significant clustering of high CPUE values for bycatch.

Protected Species

Locations for the 8 sea turtles captured on observed trips using skimmer trawl gear are given in figure 4. The highest concentration of sea turtle captures occurred off southeastern Louisiana. Seven captures were identified as Kemp's ridley sea turtle species and one green sea turtle, *Chelonia mydas*. Seven sea turtles were released alive and one was previously dead when captured. Details for observed sea turtles captured are given in table 5.

Figures 5 and 6 depict observed tow times in minutes and the seasonal legal maximum tow time (55 minutes) for all tows combined and for nets without a TED observed respectively. Based on observer data, 38.07% of all tows and 38.66% of all tows from nets without TEDs were below the seasonal 55-minute limit based on calculated tow times.

Discussion

In April 2012, mandatory observer coverage was implemented for the Gulf of Mexico skimmer trawl fishery. Observer coverage increased to 145 sea days (1,075 tows) in 2013 from 119 sea days (796 tows) obtained in the 2012 initial mandatory coverage period. Total catch observed increased to 45,683 kg from 26,755 kg. Average retained penaeid shrimp CPUE increased in this study to 20.3 kg/h from 14.3 kg/h in the 2012 study. The current penaeid shrimp CPUE of 20.3 kg/h is closer to the 20.2 kg/h reported by Scott-Denton et al. (2007) from the voluntary skimmer trawl observer program. In addition, the bycatch to penaeid shrimp ratio decreased to 0.92 from 1.24 reported by the 2012 study.

TEDs have been used in the penaeid shrimp fishery otter trawl fishery to reduce sea turtle bycatch since the early 1990's. A reanalysis of data by Gallaway et al. (2008) suggests a shrimp loss rate of 6% associated with TED use in offshore waters of the southeastern U.S. Data from inshore skimmer trawl "Super Shooter" style TED testing reported by Price and Gearhart in 2011 had a combined mean shrimp loss rate of 5%. Many solutions have been proposed to address the potential for sea turtle interaction in the skimmer trawl fishery. One gear solution being examined is lowering the maximum TED bar spacing allowed from 4 in to 3 in to reduce the possible number of small sea turtles passing thru the TED bar grid. The SEFSC Harvesting Systems Unit is currently studying the catch loss and feasibility of using these TEDs in the inshore skimmer trawl fishery. Additional efforts include improving industry outreach and addressing tow time compliance issues in the fishery.

The number of sea turtle captures decreased from 24 observed in 2012 to 8 observed in 2013. While sea turtle interactions were lower this summer than last fluctuations are to be expected due to variations in weather, water temperature, animal abundance, as well as other

unknowns. For future consideration, continued research would provide more accurate estimates of protected species interactions in the skimmer trawl fishery. Observer programs remain a vital component in addressing concerns associated with commercial fishing operations.

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Table 1. —Trip, vessel, set, gear, and environmental characteristics observed in the U.S. Gulf of Mexico skimmer trawl fishery from April through July 2013.

Trip	**Vessel**	**Tow**	**Environmental**
145 Sea days 35 trips aboard 26 vessels 1,075 tows Tows per trip: Avg: 30.7 (± 31.5 s.d.) Range: 3 to 147	Length: Avg: 49.2 ft Range: 38 to 61 ft (± 6.1 s.d.). Age: Avg: 22.6 yrs Range: 4 – 41 yrs	Tow time: Avg: 1.05 hrs (± 0.51 s.d.) Range: <0.05 to 3.95 hours	Water depth: Avg: 2.1 fathoms (± 2.4 s.d.) Range: 0.5 to 20.5
Trip length (days): Avg: 4.1 (± 2.2 s.d.) Range: 0.6 to 10 Trips per vessel: Avg: 1.3 (± 0.6 s.d.) Range: 1 to 3	Hull construction: Fiberglass: 42% Steel: 31% Fiberglass/wood: 15% Wood: 12% Type: Ice boat: 96% Freezer: 4%	Vessel speed: Avg: 2.3 knots (± 0.62 s.d.) Range: <0.1 to 4.9 knots	Sea state: 0 to 2 foot seas: 76% 3 to 5 foot seas: 18% 6 to 8 foot seas: 5% 8 foot seas: <1%
Crew size: 0 to 2 individuals (excluding captain)	Engine horsepower: Avg: 442 hp (± 242 s.d.) Range: 165 to 1,006 hp		

Table 2.—Net characteristics based on mandatory observer coverage of the U.S. Gulf of Mexico skimmer trawl fishery from April through July 2013.

Item		n = 75 nets
Main net headrope length (ft)		
Mean		16.9
Range		11.0 – 29.6
s.d.		2.7
Main net footrope length (ft)		
Mean		28.5
Range		16.0 - 38.0
s.d.		3.8
Trawl body (%)	Poly	43
	Nylon	31
	Spectra	16
	Sapphire	5
	Other/Unknown	6
Trawl body mesh size (in)		
Mean		1.7
Range		1.4 - 2.3
s.d.		0.2
Cod end (%)	Poly	53
	Nylon	35
	Sapphire	11
	Spectra	1
Cod end mesh size (in)		
Mean		1.4
Range		1.3 - 1.8
s.d.		0.1
Trawl extension type (%)	None	63
	Spectra	16
	Nylon	11
	Poly	8
	Other	3
Lazy line rigging (%)	Elephant ears	65
	Choke	35
Tickler chain length (ft)		
Mean		29.9
Range		20.0 – 46.9
s.d.		4.4

Table 3.—Bycatch reduction device (BRD) and turtle excluder device (TED) characteristics based on mandatory observer coverage of the U.S. Gulf of Mexico skimmer trawl fishery from April through July 2013.

Item		
BRD type (%)	Fisheye	51
	None	49
BRD fisheye position (%)	None	49
	Top	41
	Offset	9
BRD escape shape (%)	None	49
	Oval	19
	Cat eye	17
	Half moon	15
TED type (%)	None	97
	Hard	3

Table 4.—Species documented from bycatch characterization samples, based on mandatory observer coverage of U.S. Gulf of Mexico skimmer trawl fishery from April through July 2013.

Common name	Scientific name	Extrapolated weight (kg)	Kg/h	Percent total	CV
Brown shrimp	*Farfantepenaeus aztecus*	2561.4	10.7	30.5	0.1
Fish (superclass)	Pisces	2175.3	9.1	25.9	0.1
White shrimp	*Litopenaeus setiferus*	1131.9	4.7	13.5	0.1
Atlantic croaker	*Micropogonias undulatus*	768.0	3.2	9.1	0.1
Penaeid shrimp (brown,white, pink)	*Penaeus* spp.	674.7	2.8	8.0	0.2
Cownose ray	*Rhinoptera bonasus*	304.9	1.3	3.6	0.3
Crustacean	Crustacean	252.0	1.0	3.0	0.1
Seatrout (genus)	*Cynoscion* spp.	130.7	0.5	1.6	0.1
Debris (rocks,logs,etc.)	Debris	94.0	0.4	1.1	0.2
Invertebrate	Invertebrate	77.9	0.3	0.9	0.3
Alligator gar	*Atractosteus spatula*	39.8	0.2	0.5	0.8
Sheepshead	*Archosargus probatocephalus*	39.1	0.2	0.5	0.4
Spotted seatrout	*Cynoscion nebulosus*	38.5	0.2	0.5	0.2
Spanish mackerel	*Scomberomorus maculatus*	25.8	0.1	0.3	0.3
Blacktip shark	*Carcharhinus limbatus*	23.0	0.1	0.3	0.4
Paddlefish	*Polyodon spathula*	21.2	0.1	0.3	0.7
Shrimp discards (brown,white, pink)	*Penaeus* discard	9.9	0.0	0.1	0.4
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*	9.5	0.0	0.1	0.4
Black drum	*Pogonias cromis*	5.3	0.0	0.1	0.7
Southern flounder	*Paralichthys lethostigma*	4.4	0.0	0.1	0.4
Red drum	*Sciaenops ocellatus*	3.7	0.0	0.0	1.0
Bull shark	*Carcharhinus leucas*	3.1	0.0	0.0	1.0
Bonnethead shark	*Sphyrna tiburo*	1.0	0.0	0.0	1.0
		8395.1		100.0	

Table 5.—Observed sea turtles captured based on mandatory observer coverage of U.S. Gulf of Mexico skimmer trawl fishery from April through July 2013.

Capture Date	Species	Capture Condition	Release Condition	Attempt Resuscitation	Water Depth (ft)	Tow Time (min)	Time Onboard (min)	Estimated Carapace Length (ft)	SCL std (cm)	CCL (cm)	SCW (cm)	CCW (cm)
5/17/13	Green	Previously dead	Discarded marked dead	N/A	6.7	61	125	—	27	27.8	20.4	23.2
5/20/13	Kemp's Ridley	Alive	Released alive	N/A	4	77	151	—	20.1	20.7	19.1	22.1
5/21/13	Kemp's Ridley	Alive	Released alive	N/A	5	74	95	—	20.8	21.9	18.9	22.5
5/22/13	Kemp's Ridley	Alive	Released alive	N/A	5	79	81	—	19.5	20.1	18.1	21.1
5/30/13	Kemp's Ridley	Alive	Released alive	N/A	7.2	120	133	—	32.8	35	31.3	36.8
6/1/13	Kemp's Ridley	Alive	Released alive	N/A	6.4	125	77	—	30	31	28	31.2
6/17/13	Kemp's Ridley	Alive	Released alive	N/A	12.3	30	37	—	34.3	40.6	33	39.4
6/26/13	Kemp's Ridley	Alive	Released alive	N/A	9	149	90	1.3	—	—	—	—

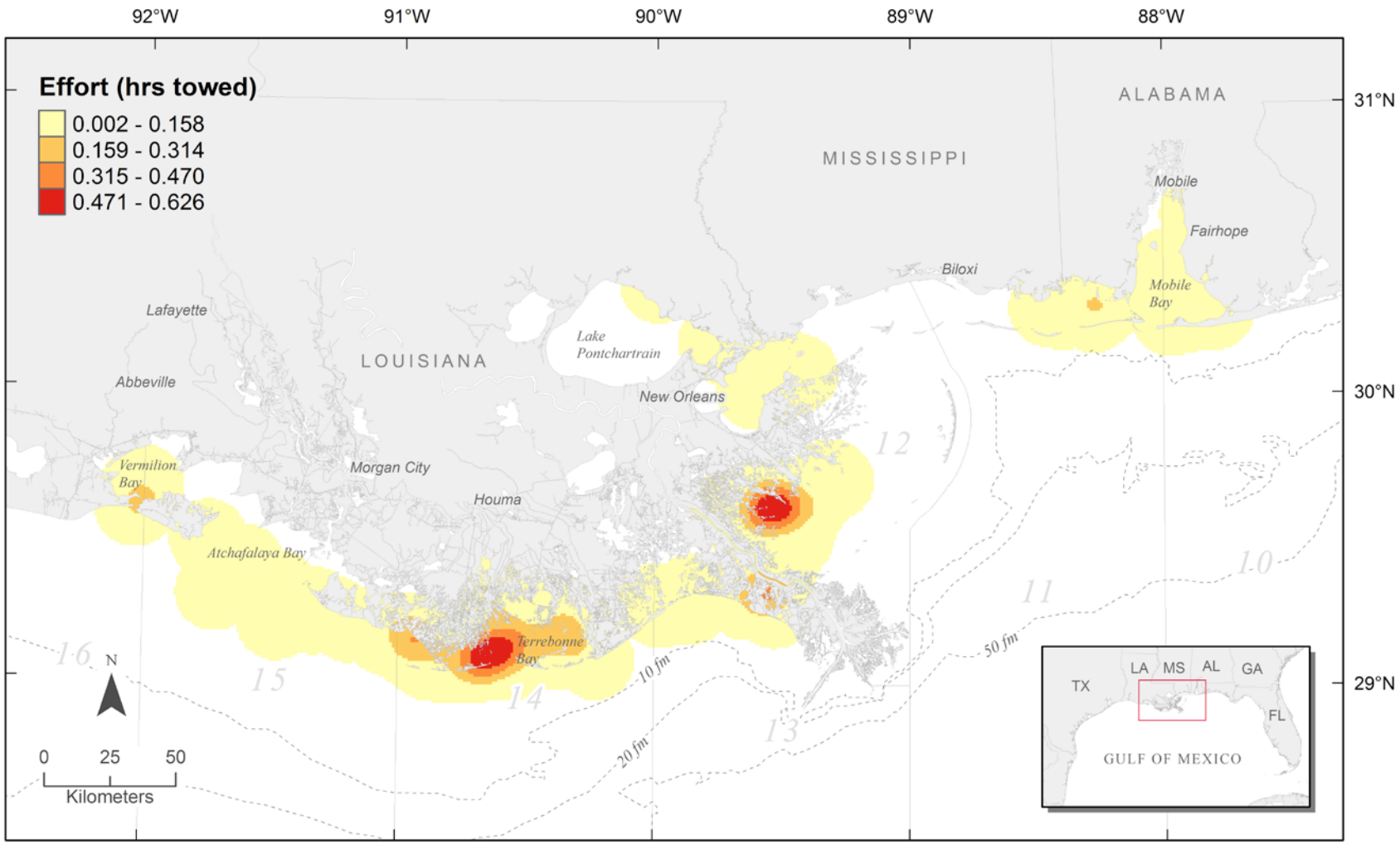

Figure 1.—Skimmer trawl effort by hours based on mandatory observer coverage of the U.S. Gulf of Mexico skimmer trawl fishery from April through July 2013.

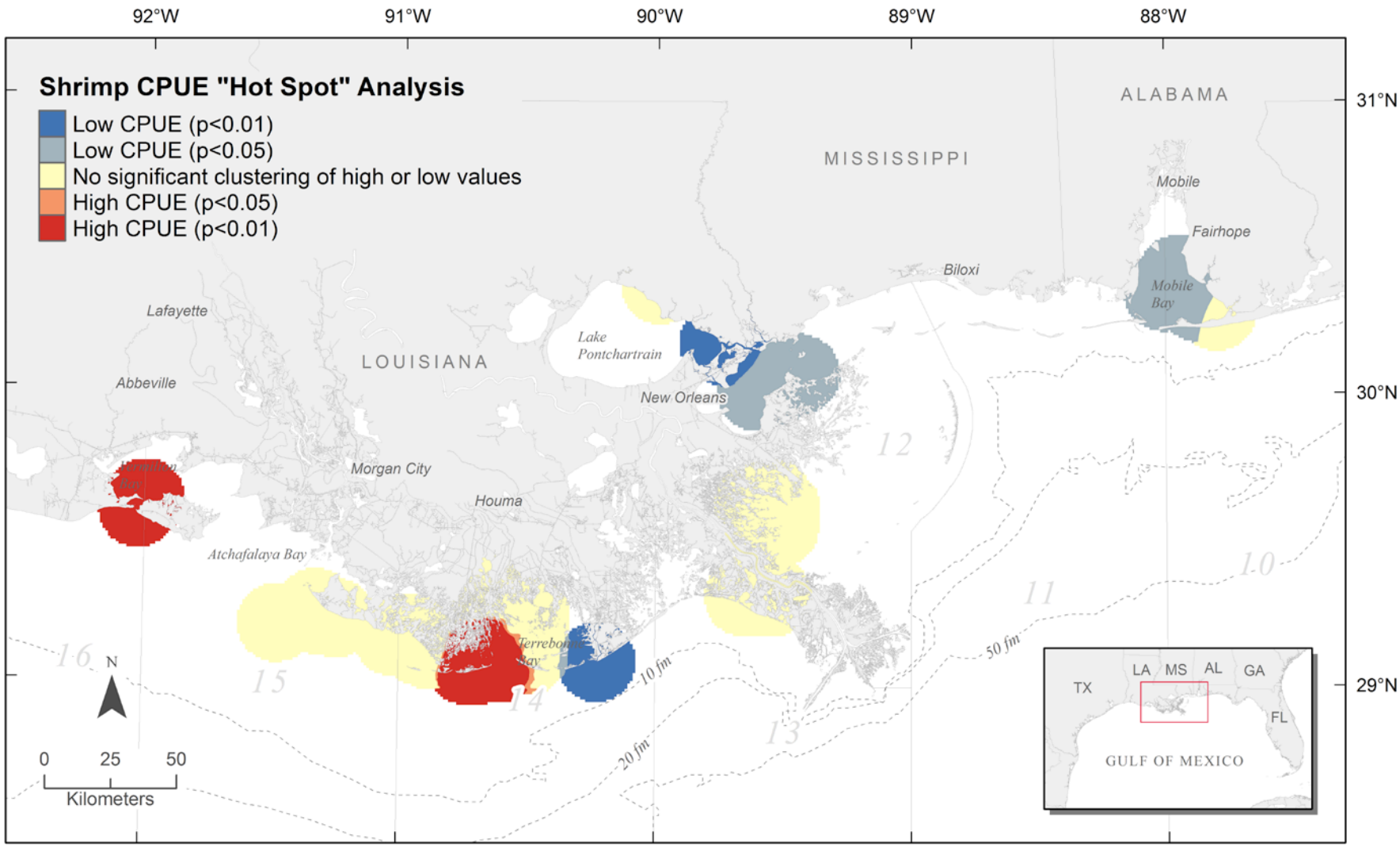

Figure 2. —Shrimp CPUE "Hot Spot" analysis based on mandatory observer coverage of the U.S. Gulf of Mexico skimmer trawl fishery from April through July 2013.

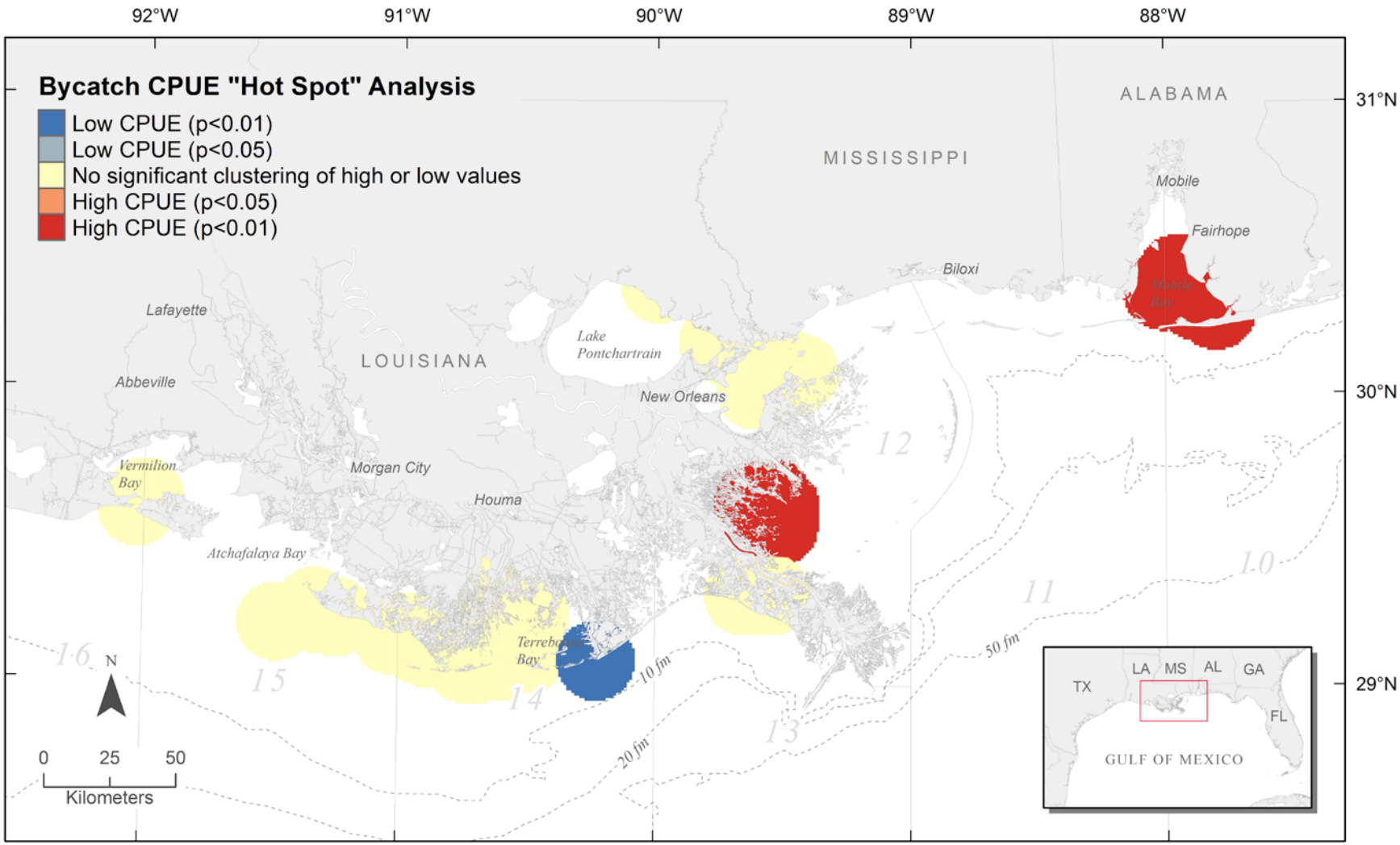

Figure 3. —Bycatch CPUE, excluding protected species, “Hot Spot” analysis based on mandatory observer coverage of the U.S. Gulf of Mexico skimmer trawl fishery from April through July 2013.

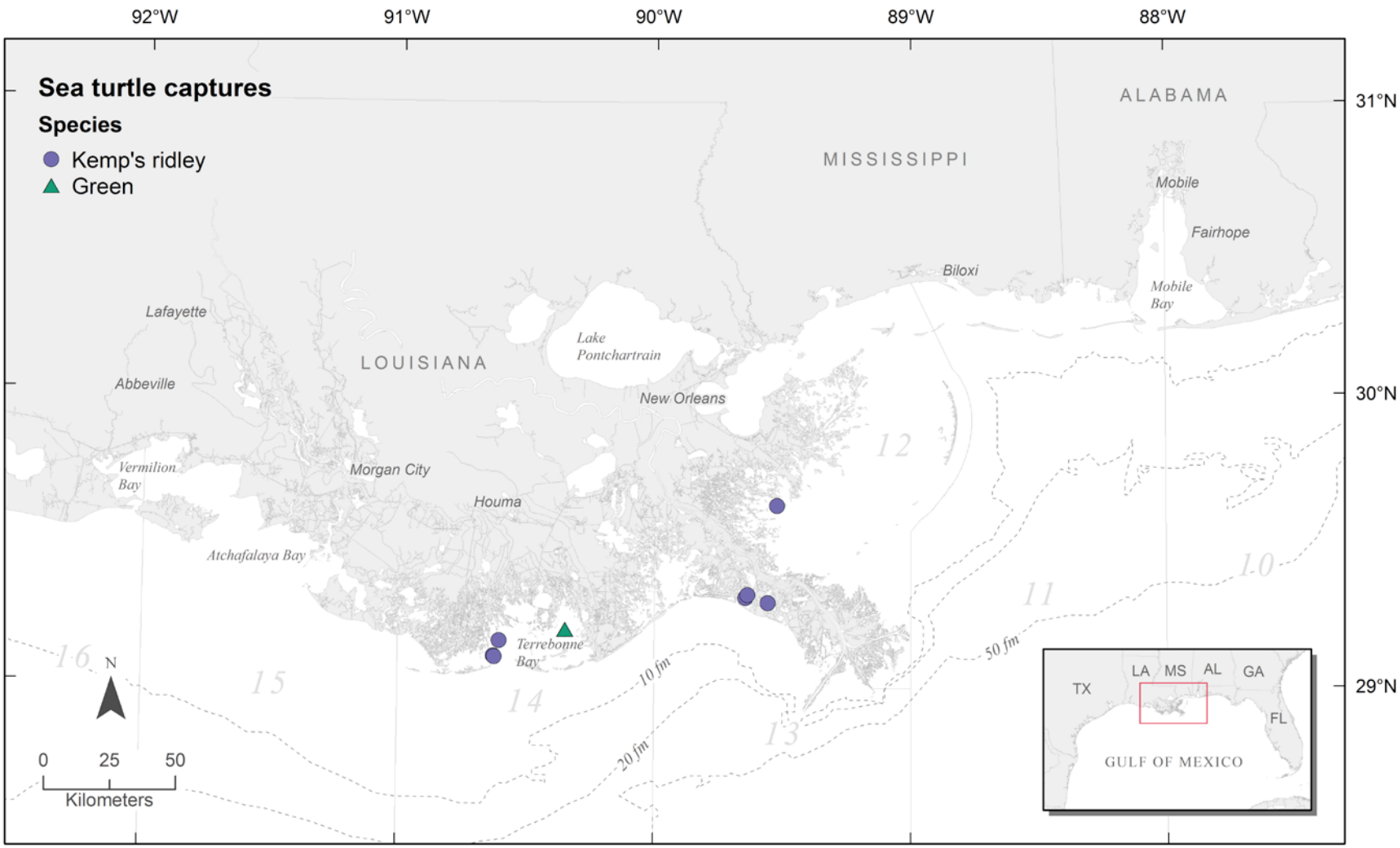

Figure 4. —Sea turtle capture locations based on mandatory observer coverage of the U.S. Gulf of Mexico skimmer trawl fishery from April through July 2013.

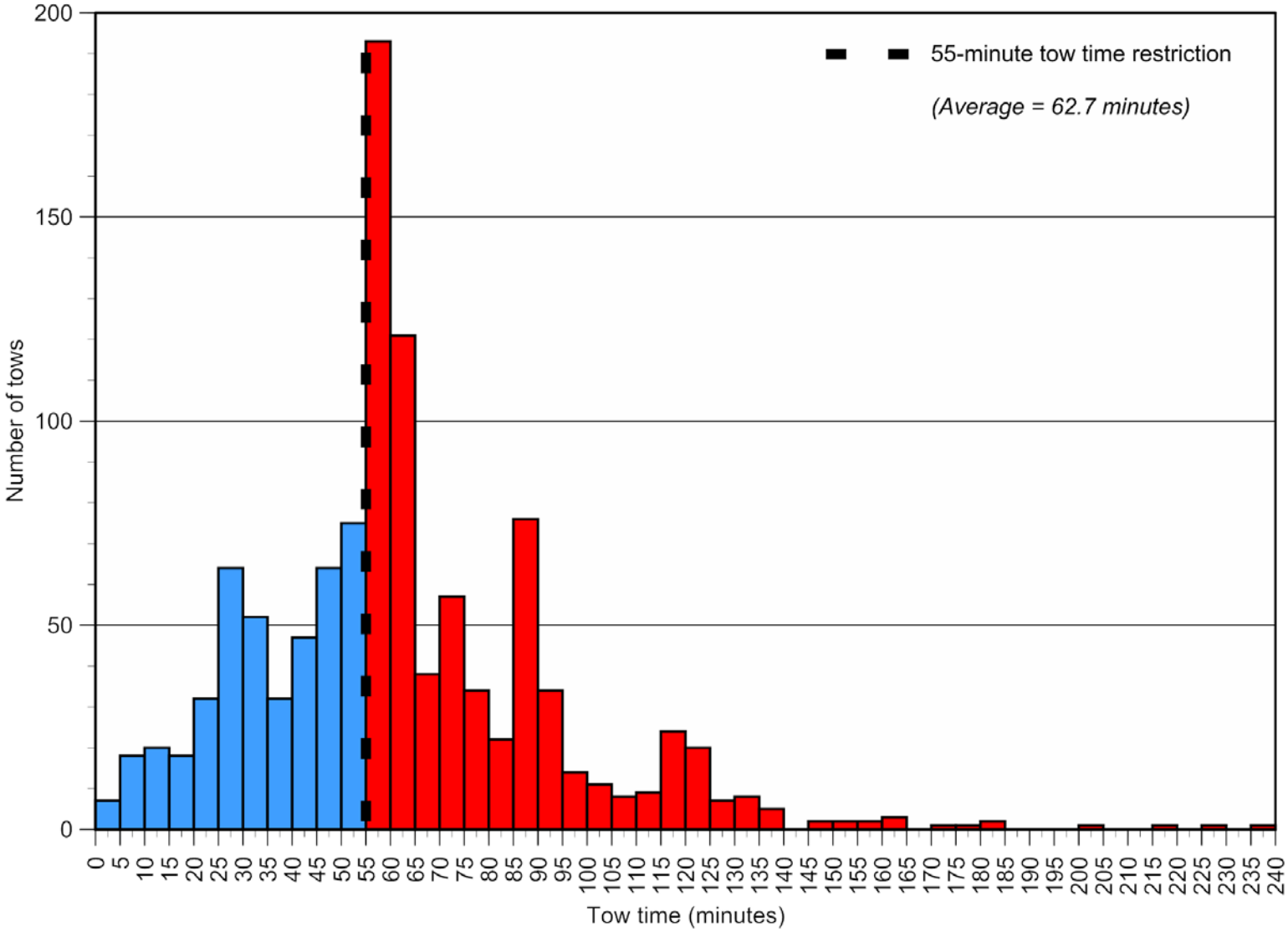

Figure 5. —Skimmer tow times relative to seasonal tow time restrictions for all tows combined based on mandatory observer coverage of the U.S. Gulf of Mexico skimmer trawl fishery from April through July 2013.

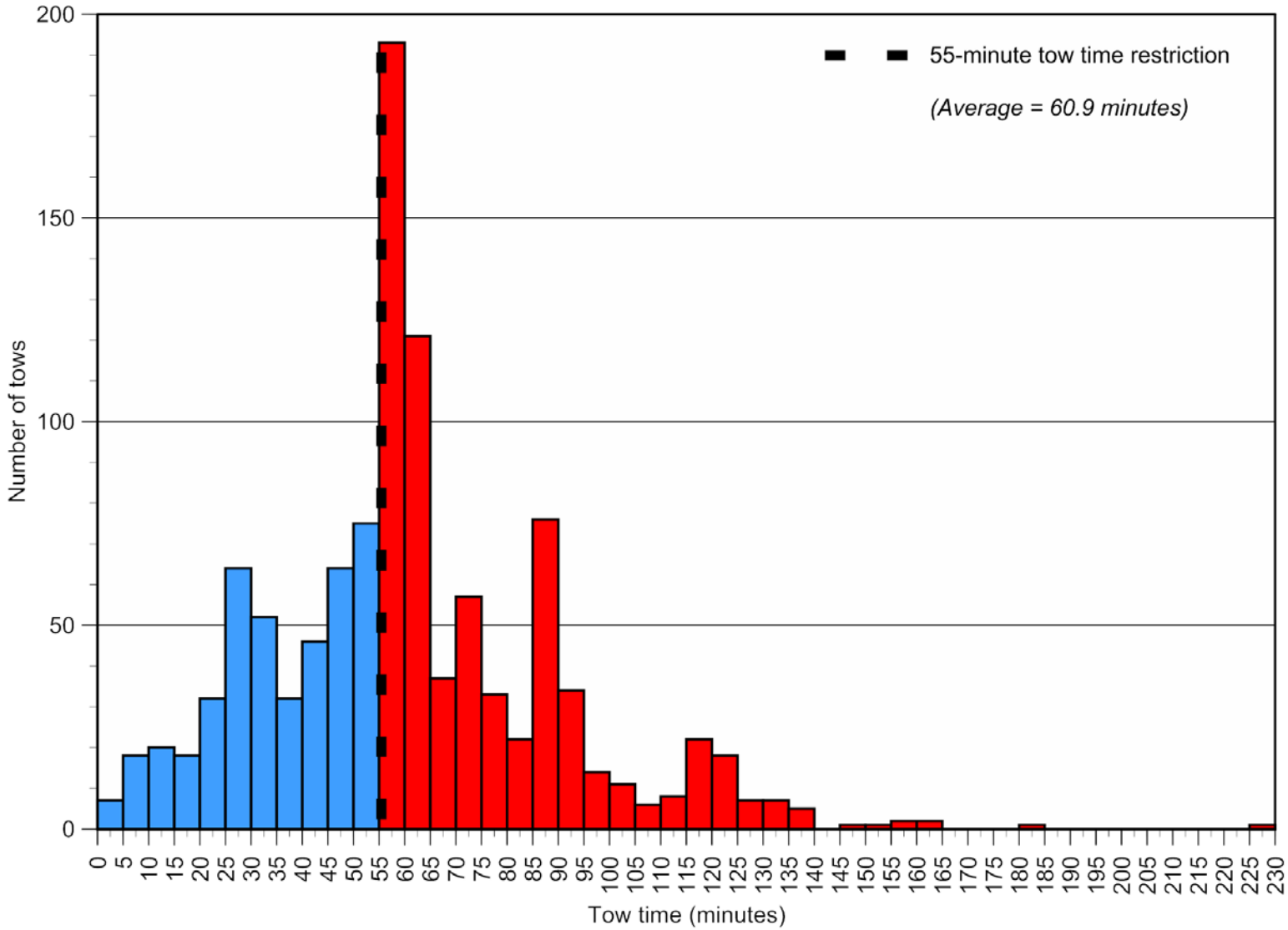

Figure 6. —Skimmer tow times relative to seasonal tow time restrictions for all tows with nets without a TED observed based on mandatory observer coverage of the U.S. Gulf of Mexico skimmer trawl fishery from April through July 201