2010 SEDAR DATA WORKSHOP DOCUMENT

Preliminary Mark/Recapture Data for the Sandbar Shark (*Carcharhinus plumbeus*), Dusky Shark (*C. obscurus*), and Blacknose Shark (*C. acronotus*) in the Western North Atlantic

Nancy E. Kohler and Patricia A. Turner

NOAA/NMFS/NEFSC
Apex Predators Program
28 Tarzwell Drive
Narragansett, RI 02882

Nancy.Kohler@noaa.gov
Pat.Turner@noaa.gov

June 2010

SUMMARY

Mark/recapture information from the National Marine Fisheries Service (NMFS) Cooperative Shark Tagging Program (CSTP) covering the period from 1962 through 2009 are summarized for the sandbar shark (*Carcharhinus plumbeus*), dusky shark (*C. obscurus*), and blacknose shark (*C. acronotus*) in the western North Atlantic. The extent of the tagging effort, areas of release and recapture, movements, and length frequencies of tagged sharks are reported. Areas were distinguished in order to identify regional trends in size and quantify exchange between the Atlantic and Gulf of Mexico. Only data with information on size and mark/recapture location were included in these regional analyses. Data synopses include overall recapture rates, maximum and mean distances traveled, maximum times at liberty, and numbers of fish tagged and recaptured, mean lengths, and length frequencies by region. Overall, movement between the Atlantic and Gulf of Mexico and between the US and the Mexican-managed portion of the Gulf of Mexico occurred for the sandbar and dusky shark. Blacknose sharks showed no movement between regions. The true extent of these movements is unclear due to the possibility of under-reporting of recaptures.

INTRODUCTION

The purpose of this document is to summarize mark/recapture information from the NMFS Cooperative Shark Tagging Program (CSTP) for the sandbar shark (*Carcharhinus plumbeus*), dusky shark (*C. obscurus*), and blacknose shark (*C. acronotus*) in the western North Atlantic. These data cover the period from 1962 through 2009 presenting the extent of the tagging effort, areas of release and recapture, and movements of tagged sharks. Data synopses include overall recapture rates, maximum and mean distances traveled, maximum times at liberty, and numbers of fish tagged and recaptured, mean lengths, and length frequencies by region.

METHODS

Summary information on the history and methods of the CSTP has been published previously (Casey 1985, Casey and Kohler 1992, Kohler et al. 1998, Kohler and Turner 2001) and excerpts from these reports are included here. The two principal CSTP tags are a fin tag (Jumbo Rototag) and a dart tag ("M" tag). Tagging studies have been mostly single release events in which recoveries are made opportunistically by recreational and commercial fishermen. When a marked shark is re-caught, information similar to that obtained at release is requested from the recapturer. Distance traveled in nautical miles (nm) between tagging and recapture sites is a minimum straight-line distance. Tagging and recapture sizes are originally recorded in fork length (FL) or total length (TL). Fork length is used throughout this report with TL converted to FL using the relationships in Kohler et al. (1996) for the sandbar and dusky shark and Carlson (personal communication) for the blacknose shark.

The study area is divided into geographical regions in order to identify regional trends in size and quantify exchange between the Atlantic and Gulf of Mexico. The Gulf Mexico was defined as west of 80°25’ longitude (Figure 1). These regions are defined as Atlantic (US), Gulf of Mexico (US), Gulf of Mexico (Mexico), and Other. Only data with information on size, sex, and mark/recapture location were included in these regional analyses. These areas are defined solely based on release and recapture distributions, which largely reflects the fishing effort patterns of cooperative taggers aboard private, commercial, and research vessels. The authors do not believe that these boundaries are necessarily associated with stock or management units.

RESULTS

SANDBAR SHARK (*Carcharhinus plumbeus*)

A total of 30,982 sandbar sharks were released with tags along the U.S. Atlantic and the Gulf of Mexico between 1962 and 2009 (Table 1). Of the 27,099 fish of known sex, 10,577 (39%) were males and 16,522 (61%) were females resulting in a 1:1.6 male:female sex ratio. For 32,188 sandbar sharks with lengths (both tags and recaptures), the average overall size was 101.0 cm FL (range 34-228 cm), for males 91.9 cm FL and females 103.8 cm FL (Table 2). The smallest mean FL for both sexes was in the Atlantic (US), however, some of the largest fish were found in this region (Figures 2, 3). Male:female sex ratios were nearly identical in the Atlantic (US) and the Gulf of Mexico (US) (1:1.6 and 1:1.8, respectively) (Table 2).

A total of 1,382 sandbar sharks were recaptured from 1964 through 2009 with an overall recapture rate of 4.5% (Table 1) and a mean distance traveled of 444 nm. The sandbar shark at liberty the longest was tagged off Great Machipongo Sound, VA in June 1965 and recaptured 27.8 years later off the East coast of Florida in March. The longest distance traveled was 2039 nm established by a fish tagged off Rhode Island and recaptured off Tamaulipas, Mexico.

Sandbar sharks that were recaptured were tagged within all areas except the Gulf of Mexico (Mexico) with the great majority tagged in the Atlantic (US) (Figure 4, 5). Of the fish tagged off the US Atlantic, 19.7% moved to the US Gulf of Mexico and 3.8% moved to Mexican Gulf waters. Of the fish tagged in the US Gulf of Mexico, 18.2% moved to the US Atlantic and 4.6% moved to Mexican Gulf waters (Table 3).

DUSKY SHARK (*Carcharhinus obscurus*)

A total of 7,832 dusky sharks were released with tags along the U.S. Atlantic and the Gulf of Mexico between 1963 and 2009 (Table 1). Of the 5,380 fish of known sex, 1,944 (36%) were males and 3,436 (64%) were females resulting in a 1:1.8 male:female sex ratio. For 7,967 sharks with lengths (both tags and recaptures), the average overall size was 118.3 cm FL (range 46-400 cm), for males 112.3 cm FL and females 117.6 cm FL (Table 2, Figure 6, 7).

A total of 161 dusky sharks were recaptured from 1967 through 2009 with an overall recapture rate of 2.1%, a maximum distance traveled of 2052 nm (Table 1), and a mean distance traveled of 582 nm. The dusky shark at liberty the

longest was for a total of 16.1 years. This fish was originally tagged off New Jersey and recaptured off Key Biscayne, FL.

Dusky sharks that were recaptured were originally tagged in US waters (Atlantic and Gulf of Mexico) with the great majority tagged in the Atlantic (US) (Figure 8, 9). Of the fish tagged off the US Atlantic, 9.6% moved to the US Gulf of Mexico and 14.4% moved to Mexican Gulf waters. Of the fish tagged in the US Gulf of Mexico, 18.2% moved to the US Atlantic and 36.4% moved to Mexican Gulf waters (Table 4).

BLACKNOSE SHARK (*Carcharhinus acronotus*)

A total of 2,116 blacknose sharks were released with tags along the U.S. Atlantic and the Gulf of Mexico between 1965 and 2009 (Table 1). Of the 2,056 fish of known sex, 906 (44%) were males and 1,150 (56%) were females resulting in a 1:1.3 male:female sex ratio. For 2,137 sharks with lengths (both tags and recaptures), the mean overall size of 92.8 cm FL was similar for males and females with slightly smaller fish tagged in the Gulf of Mexico (US) (Table 2, Figure 10, 11).

A total of 23 blacknose sharks were recaptured from 1979 through 2009 with an overall recapture rate of 1.1% (Table 1) and mean distance traveled of 59.0 nm. The blacknose shark at liberty the longest was 9.5 years and the longest distance traveled was 226 nm. The fish with the longest time at liberty was originally tagged off Ponte Verde, FL and recaptured off St. Lucie Inlet, FL.

Blacknose sharks were tagged along the coast of the US Atlantic and Gulf of Mexico with one fish also tagged in Mexican waters (Figure 12, 13). There was no movement between the Atlantic and Gulf of Mexico and no recaptures in Mexican waters (Table 5).

REFERENCES

Casey, J.G. 1985. Trans-Atlantic migrations of the blue shark: a case history of cooperative shark tagging. *In*: R.H. Stroud (ed.), World angling resources and challenges, pp. 253-267. Proceedings of the First World Angling Conference, Cap d Agde, France, September 12-18, 1984.

Casey, J.G. and N.E. Kohler. 1992. Tagging studies on the shortfin mako shark *Isurus oxyrinchus* in the Western North Atlantic. Australian Journal of Marine Freshwater Research, 43:45-60.

Kohler, N.E., J.G. Casey and P. Turner. 1996. An analysis of length-length and length-weight relationships for 13 species of sharks from the western North Atlantic. NOAA Technical Memorandum, NMFS-NE-110. 22 pp.

Kohler, N.E., J.G. Casey and P.A. Turner. 1998. NMFS Cooperative Shark Tagging Program, 1962-1993: An atlas of shark tag and recapture data. Marine Fisheries Review 60:1-87.

Kohler, N.E. and P.A. Turner. 2001. Shark tagging: a review of conventional methods and studies. Environmental Biology of Fishes 60:191-223

Table 1. Number of sharks tagged and recaptured by species and region.

Numbers Tagged and Recaptured by Species - Overall											
	Tagged				Recaptured						
	Total	Male	Female	Unknown	Number	%	Male	Female	Unknown	Max. Time (yr)	Max. Dist. (nm)
Sandbar shark	30,982	10,577	16,522	3,883	1,382	4.5	510	730	142	27.8	2,039
Dusky shark	7,832	1,944	3,436	2,452	161	2.1	47	69	45	16.1	2,052
Blacknose shark	2,116	906	1,150	60	23	1.1	11	11	1	9.5	226

Numbers Tagged by Species - Atlantic (US)				
	Tagged			
	Total	Male	Female	Unknown
Sandbar shark	29,820	10,203	15,858	3,759
Dusky shark	7,361	1,841	3,247	2,273
Blacknose shark	1,730	794	888	48

Numbers Tagged by Species - Gulf of Mexico (US)				
	Tagged			
	Total	Male	Female	Unknown
Sandbar shark	1,156	373	661	122
Dusky shark	368	85	138	145
Blacknose shark	347	106	235	6

Numbers Tagged by Species - Gulf of Mexico (Mexico)				
	Tagged			
	Total	Male	Female	Unknown
Sandbar shark	1	1	0	0
Dusky shark	12	3	4	5
Blacknose shark	1	0	1	0

Numbers Tagged by Species - Other				
	Tagged			
	Total	Male	Female	Unknown
Sandbar shark	5	0	3	2
Dusky shark	91	15	47	29
Blacknose shark	38	6	26	6

Table 2. Mean fork lengths of sharks (both tags and recaptures) by species and region.

Mean Fork Length - Overall										
	Total	Mean FL	Min FL	Max FL	Male	Mean FL	Female	Mean FL	Unknown	Mean FL
Sandbar shark	32,188	101	34	228.0	11,043	91.9	17,180	103.8	3,965	114.0
Dusky shark	7,967	118.3	46.0	400.0	1,987	112.3	3,497	117.6	2,483	124.3
Blacknose shark	2,137	92.8	25.0	148.0	917	91.5	1,159	93.9	61	93.7

Mean Fork Length - Atlantic (US)										
	Total	Mean FL	Min FL	Max FL	Male	Mean FL	Female	Mean FL	Unknown	Mean FL
Sandbar shark	30,698	99.2	34.0	228.0	10,566	90.0	16,351	102.0	3,781	113.2
Dusky shark	7,448	116.7	46.0	400.0	1,872	111.3	3,286	115.9	2,290	122.2
Blacknose shark	1,749	94.0	33.7	148.0	805	92.6	895	95.1	49	95.3

Mean Fork Length - Gulf of Mexico (US)										
	Total	Mean FL	Min FL	Max FL	Male	Mean FL	Female	Mean FL	Unknown	Mean FL
Sandbar shark	1,425	136.3	41.0	228.0	453	134.3	809	139.7	163	124.9
Dusky shark	384	134.7	48.0	320.0	88	115.6	147	133.5	149	147.2
Blacknose shark	349	87.9	25.0	134.0	106	84.1	237	89.5	6	93.6

Mean Fork Length - Gulf of Mexico (Mexico)										
	Total	Mean FL	Min FL	Max FL	Male	Mean FL	Female	Mean FL	Unknown	Mean FL
Sandbar shark	52	158.0	92.0	208.0	21	156.2	14	147.1	17	169.2
Dusky shark	37	182.1	115.0	276.0	11	183.1	13	211.8	13	151.5
Blacknose shark	1	46.7	46.7	46.7	0		1	46.7	0	

Mean Fork Length - Other										
	Total	Mean FL	Min FL	Max FL	Male	Mean FL	Female	Mean FL	Unknown	Mean FL
Sandbar shark	13	163.3	114.6	216.0	3	154.3	6	167.3	4	164.0
Dusky shark	98	154.1	48.9	278.1	16	157.5	51	152.7	31	154.8
Blacknose shark	38	87.0	57.0	111.0	6	76.3	26	90.9	6	80.8

Table 3. Regional movements of the sandbar shark.

		Recapture Region				
		Atlantic (US)	Gulf of Mexico (US)	Gulf of Mexico (Mexico)	Other	Total
Tagging Region	Atlantic (US)	997 *75.99*	258 *19.66*	50 *3.81*	7 *0.53*	1312
	Gulf of Mexico (US)	4 *18.18*	17 *77.27*	1 *4.55*	0	22
	Other	0	0	0	1 *100*	1
	Total	1001 *74.98*	275 *20.60*	51 *3.82*	8 *0.60*	1335

Key
Frequency
Row Percent

Table 4. Regional movements of the dusky shark.

		Recapture Region				
		Atlantic (US)	Gulf of Mexico (US)	Gulf of Mexico (Mexico)	Other	Total
Tagging Region	Atlantic (US)	104 *71.23*	14 *9.59*	21 *14.38*	7 *4.79*	146
	Gulf of Mexico (US)	2 *18.18*	4 *36.36*	4 *36.36*	1 *9.09*	11
	Other	0	0	0	0	0
	Total	106 *67.52*	18 *11.46*	25 *15.92*	8 *5.1*	157

Key
Frequency
Row Percent

Table 5. Regional movements of the blacknose shark.

		Recapture Region				
		Atlantic (US)	Gulf of Mexico (US)	Gulf of Mexico (Mexico)	Other	Total
Tagging Region	Atlantic (US)	21 *100*	0	0	0	21
	Gulf of Mexico (US)	0	2 *100*	0	0	2
	Other	0	0	0	0	0
	Total	21 *91.30*	2 *8.70*	0	0	23

Key
Frequency
Row Percent

Figure 1. Geographical regions used to identify regional trends.

Figure 2. Length frequencies for Sandbar Sharks – sexes combined, males, and females.

Sandbar Shark (*Carcharhinus plumbeus*)

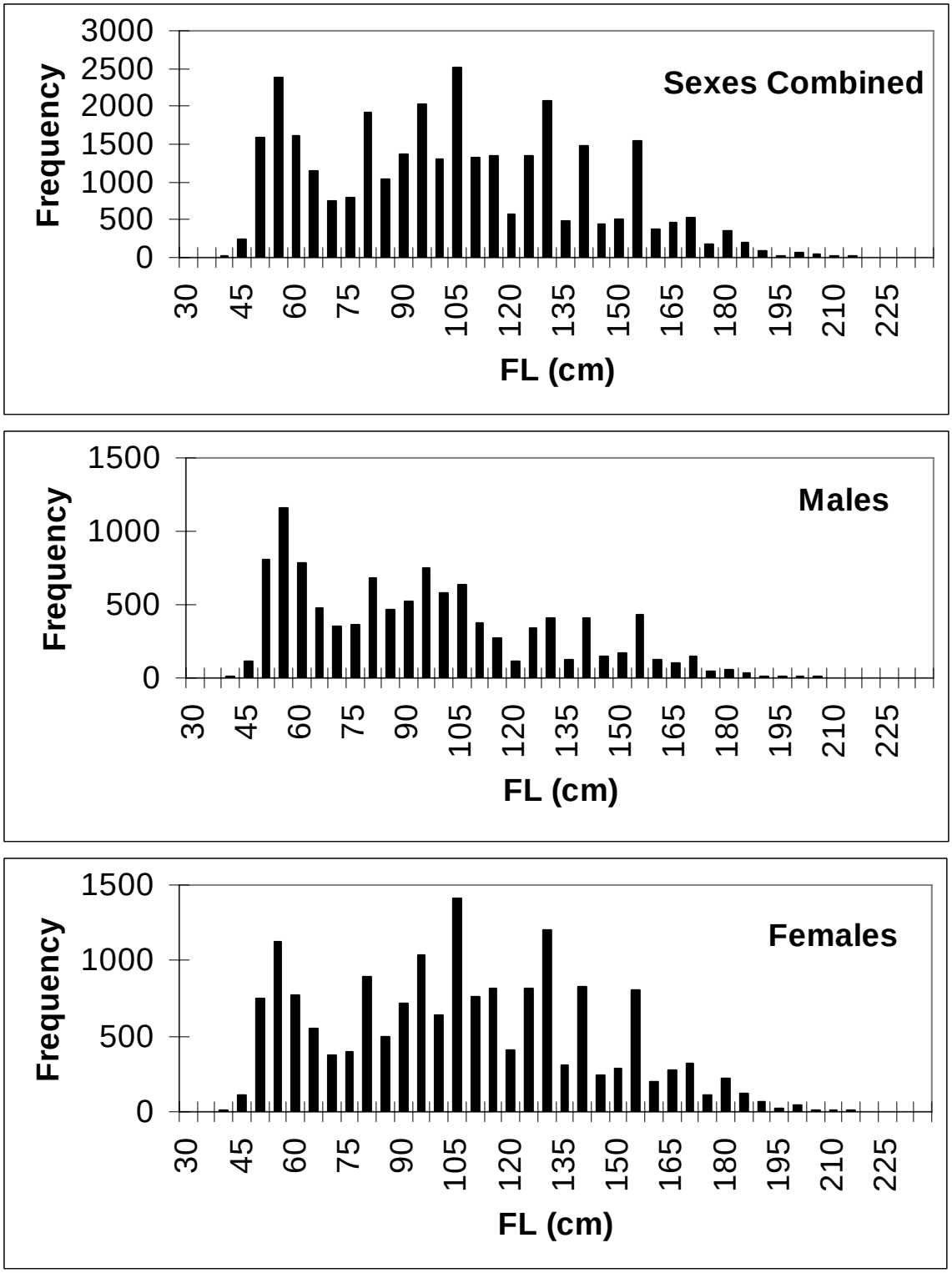

Figure 3. Length frequencies for Sandbar Sharks by region – sexes combined.

Sandbar Shark (*Carcharhinus plumbeus*)

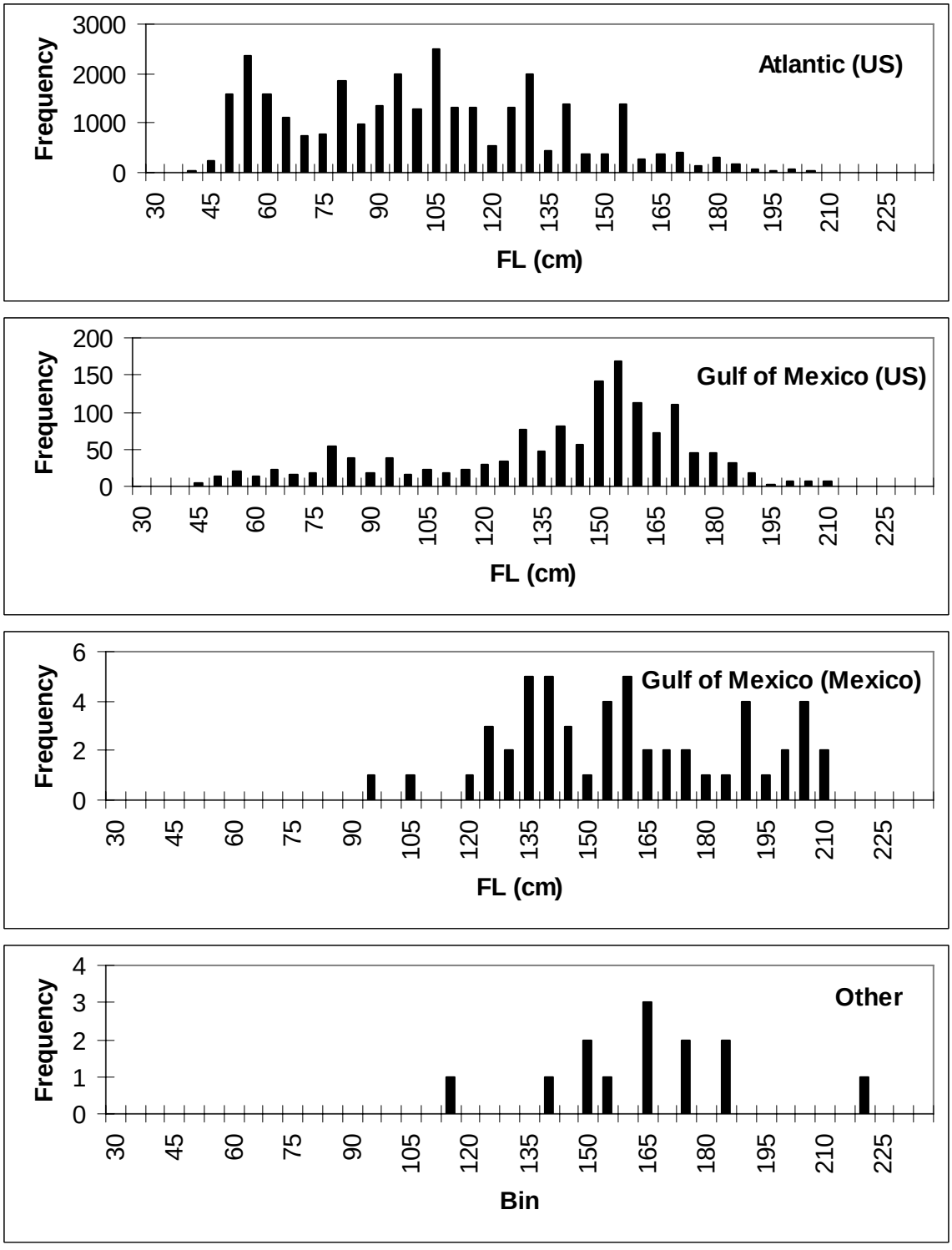

Figure 4. Location of sandbar shark tags and recaptures, 1963-2009.

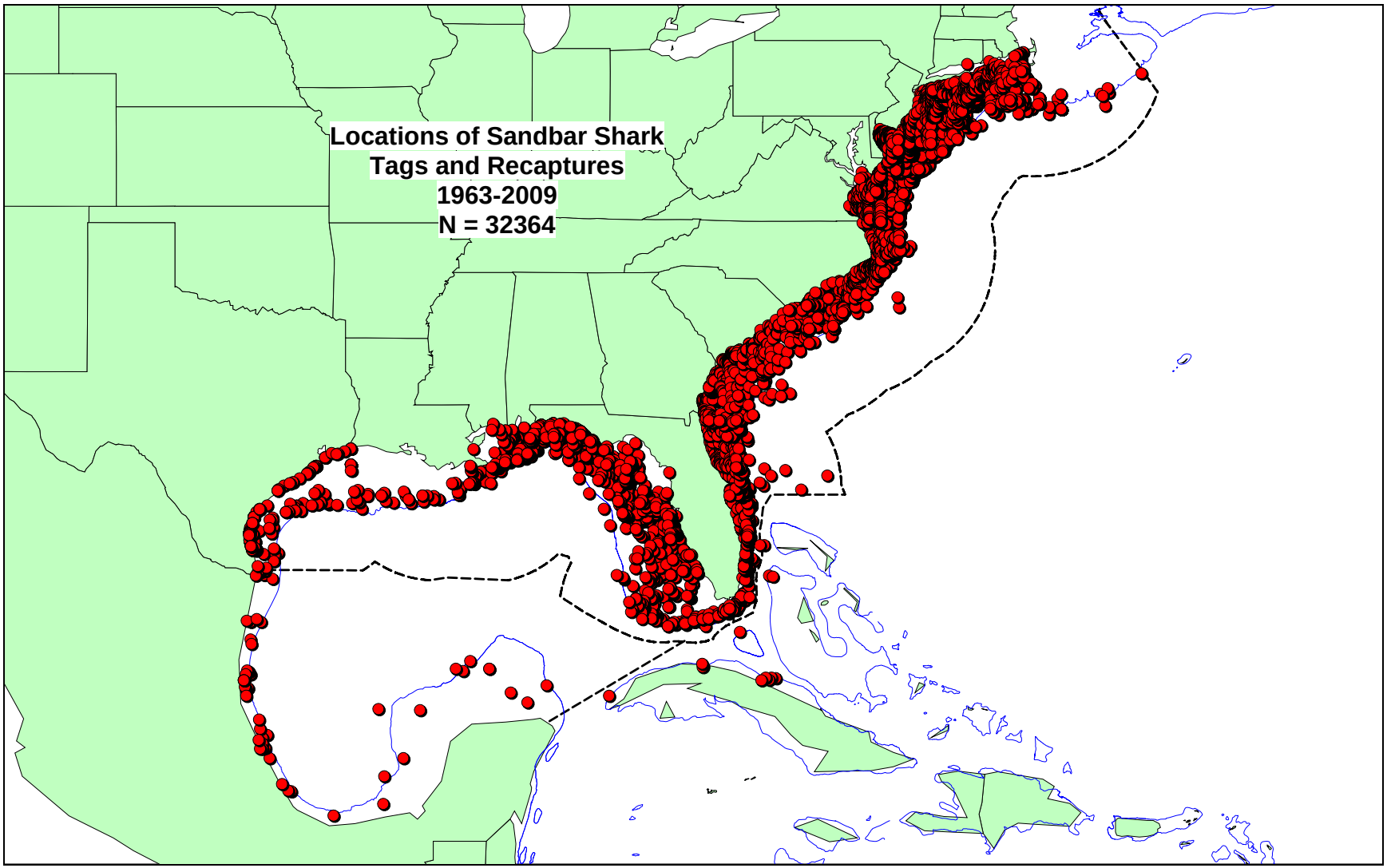

Figure 5. Sandbar shark recaptures, 1963-2009.

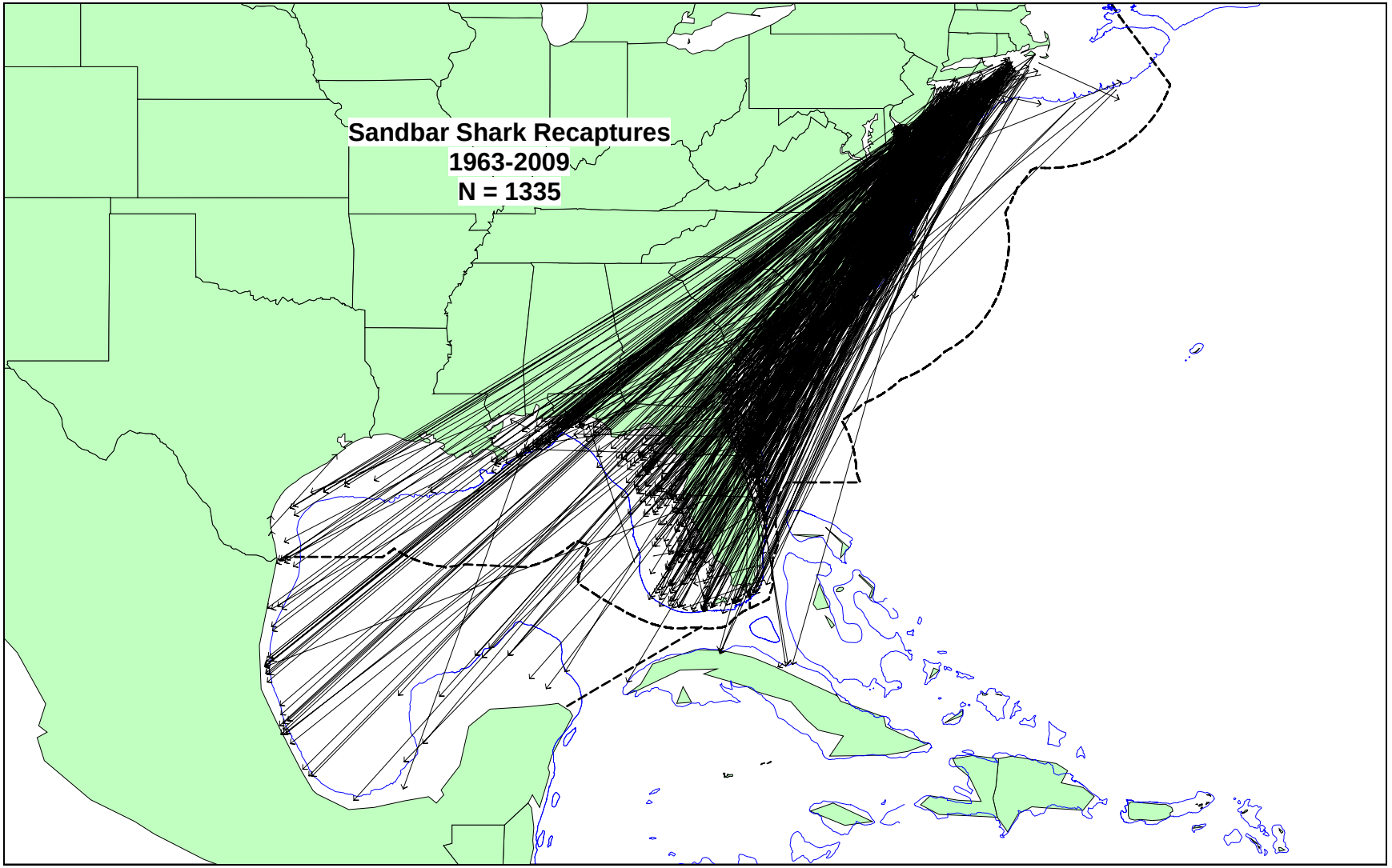

Figure 6. Length frequencies for Dusky Sharks – sexes combined, males, and females.

Dusky Shark (*Carcharhinus obscurus*)

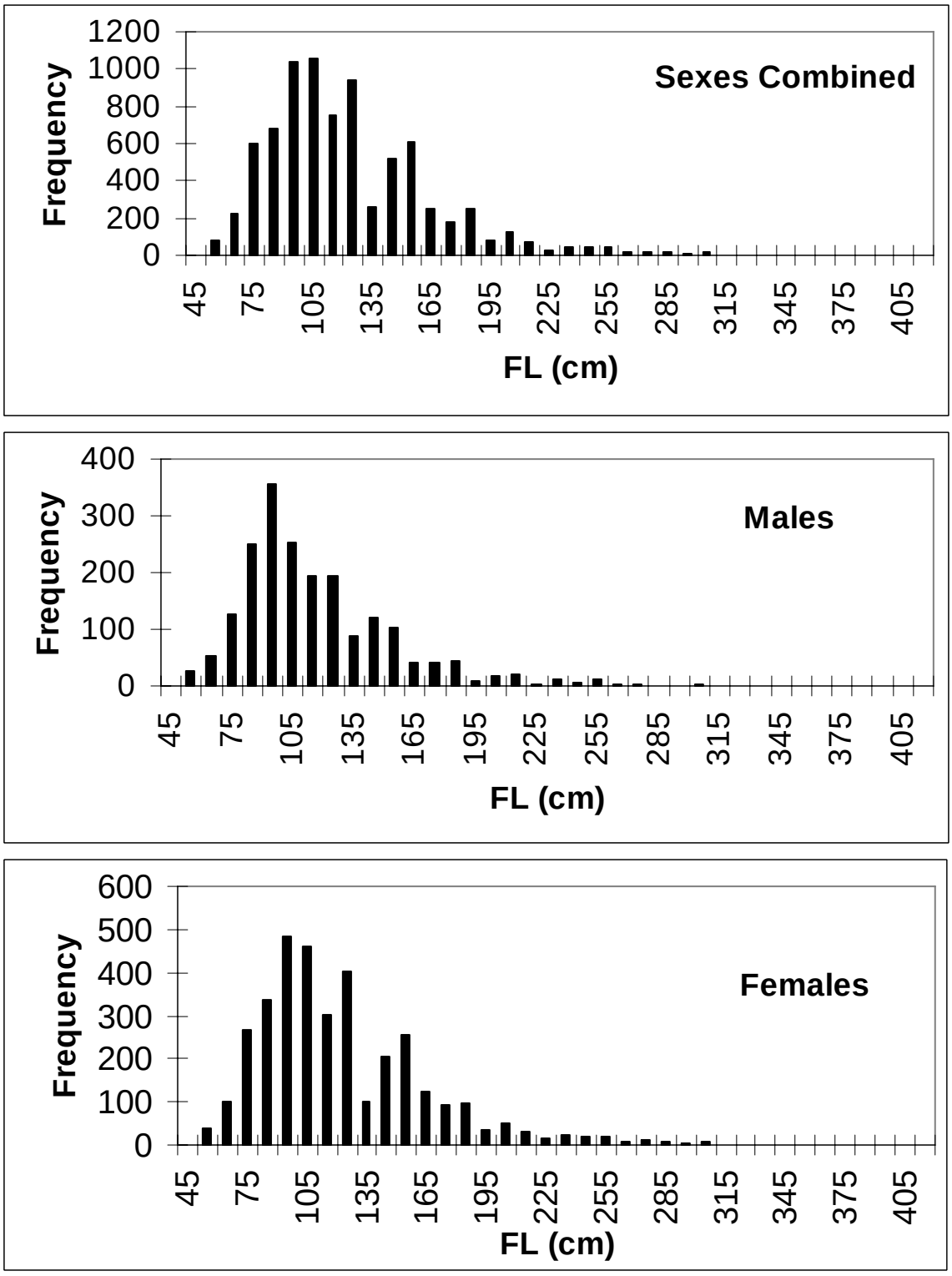

Figure 7. Length frequencies for Dusky Sharks by region – sexes combined.

Dusky Shark (*Carcharhinus obscurus*)

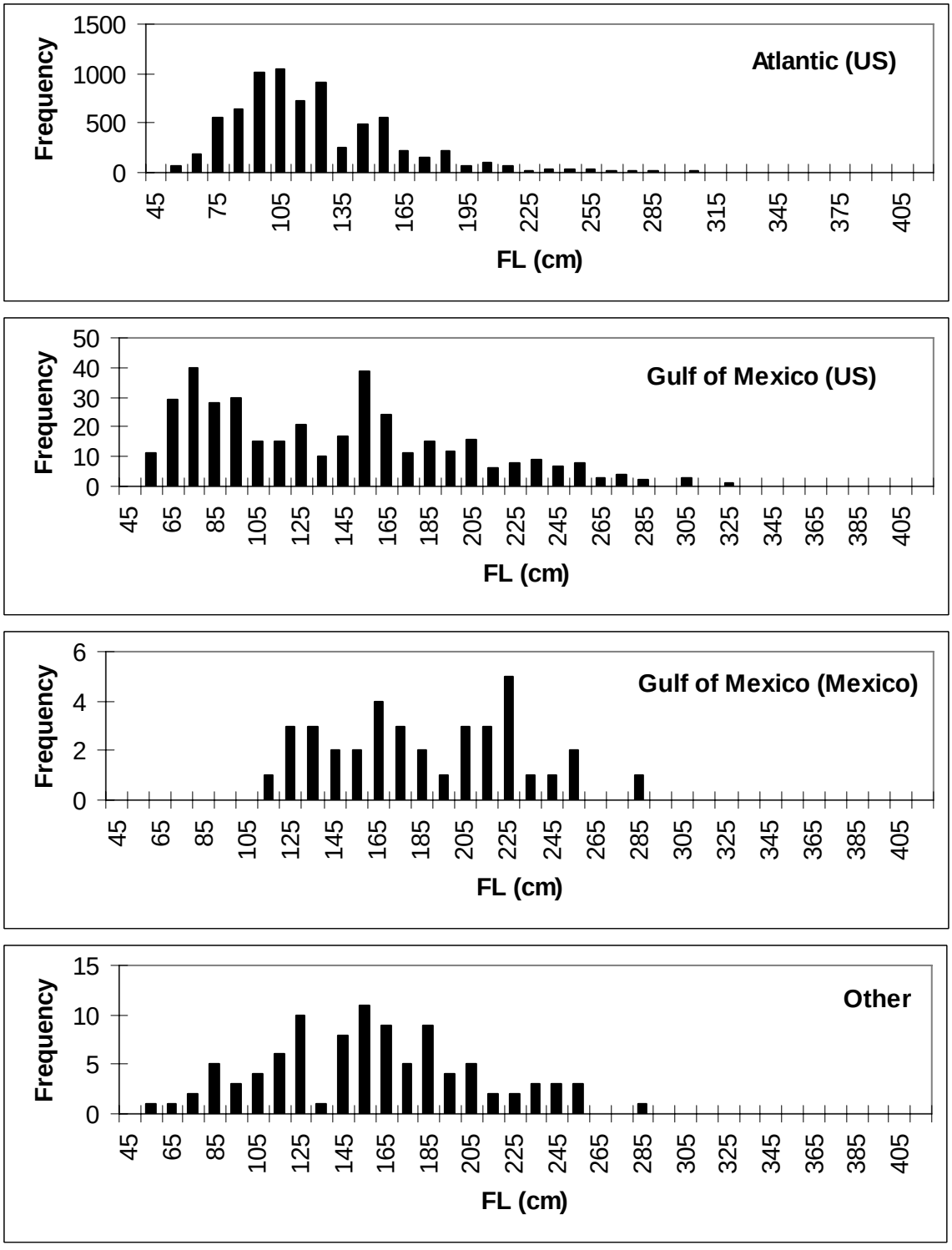

Figure 8. Locations of dusky shark tags and recaptures, 1963-2009.

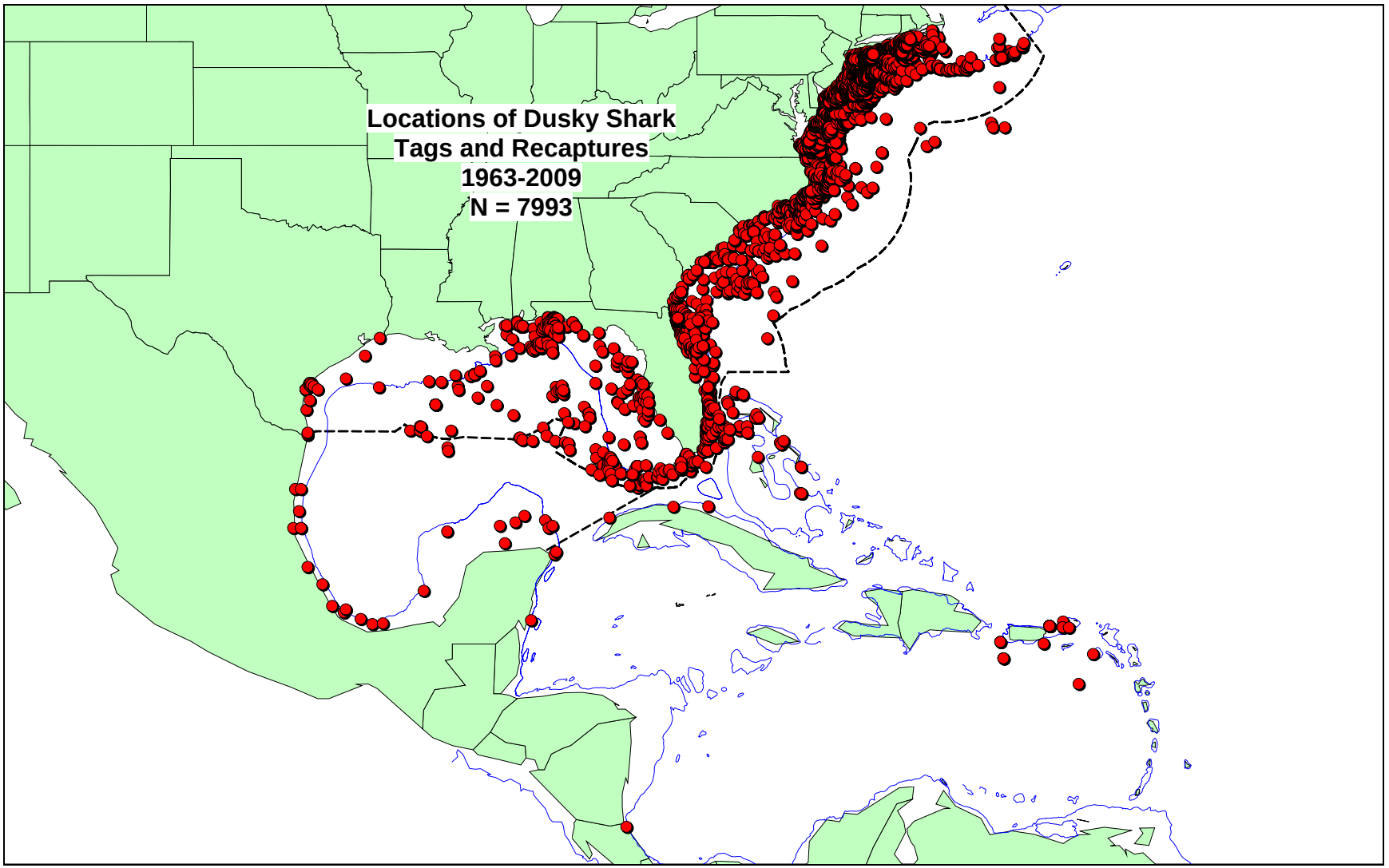

Figure 9. Dusky shark recaptures, 1963-2009.

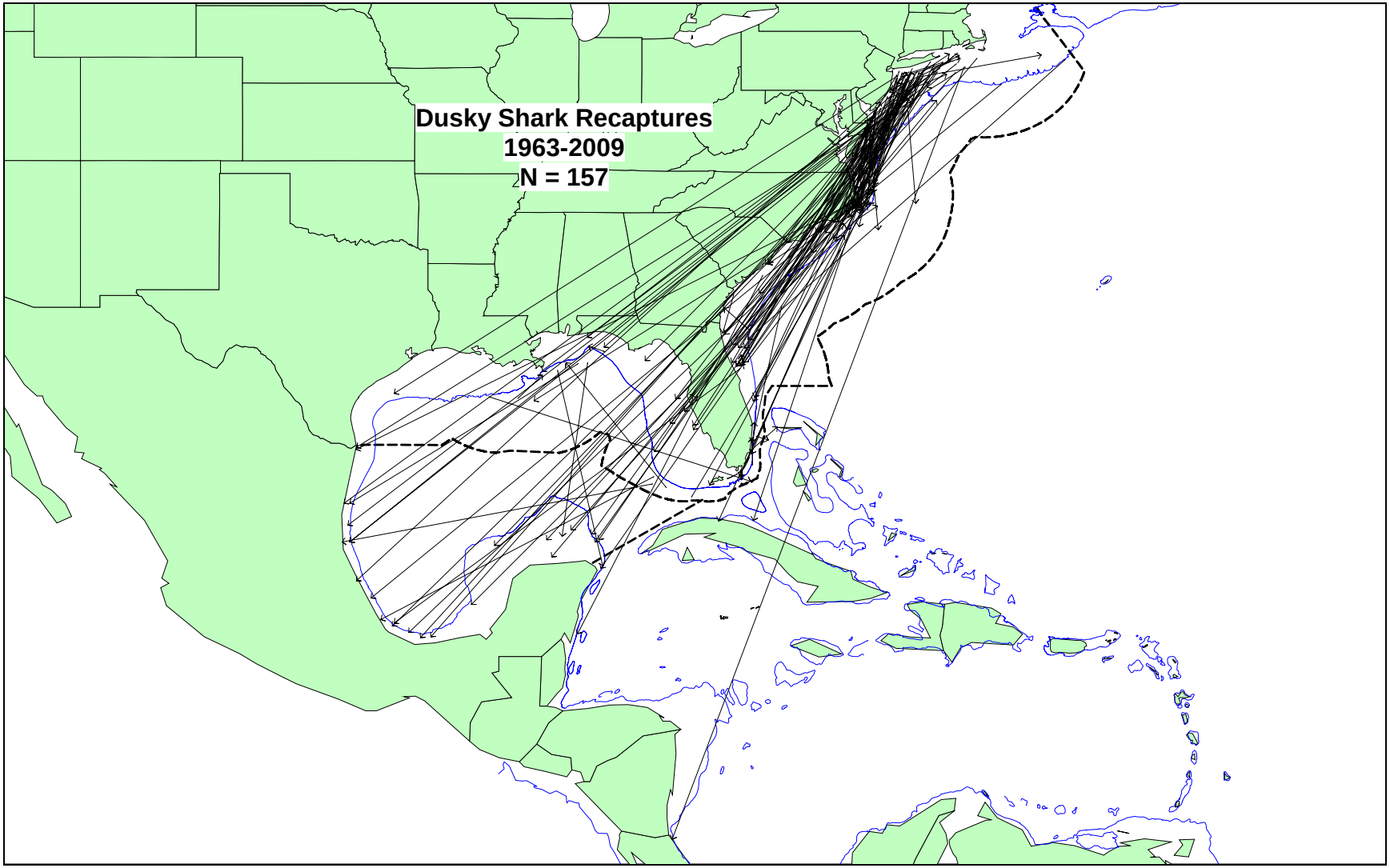

Figure 10. Length frequencies for Blacknose Sharks – sexes combined, males, and females.

Blacknose Shark (*Carcharhinus acronotus*)

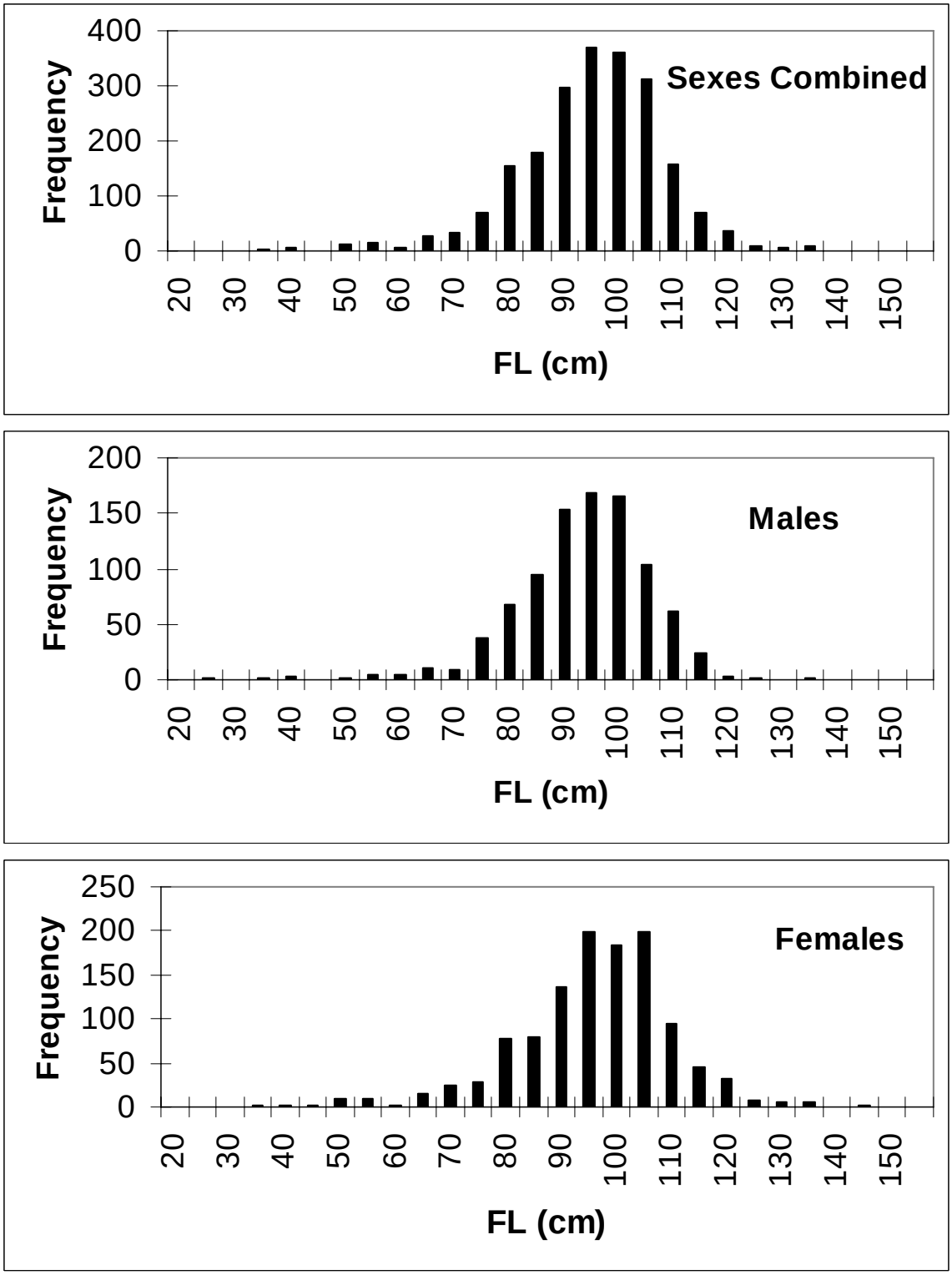

Figure 11. Length frequencies for Blacknose Sharks by region – sexes combined.

Blacknose Shark (*Carcharhinus acronotus*)

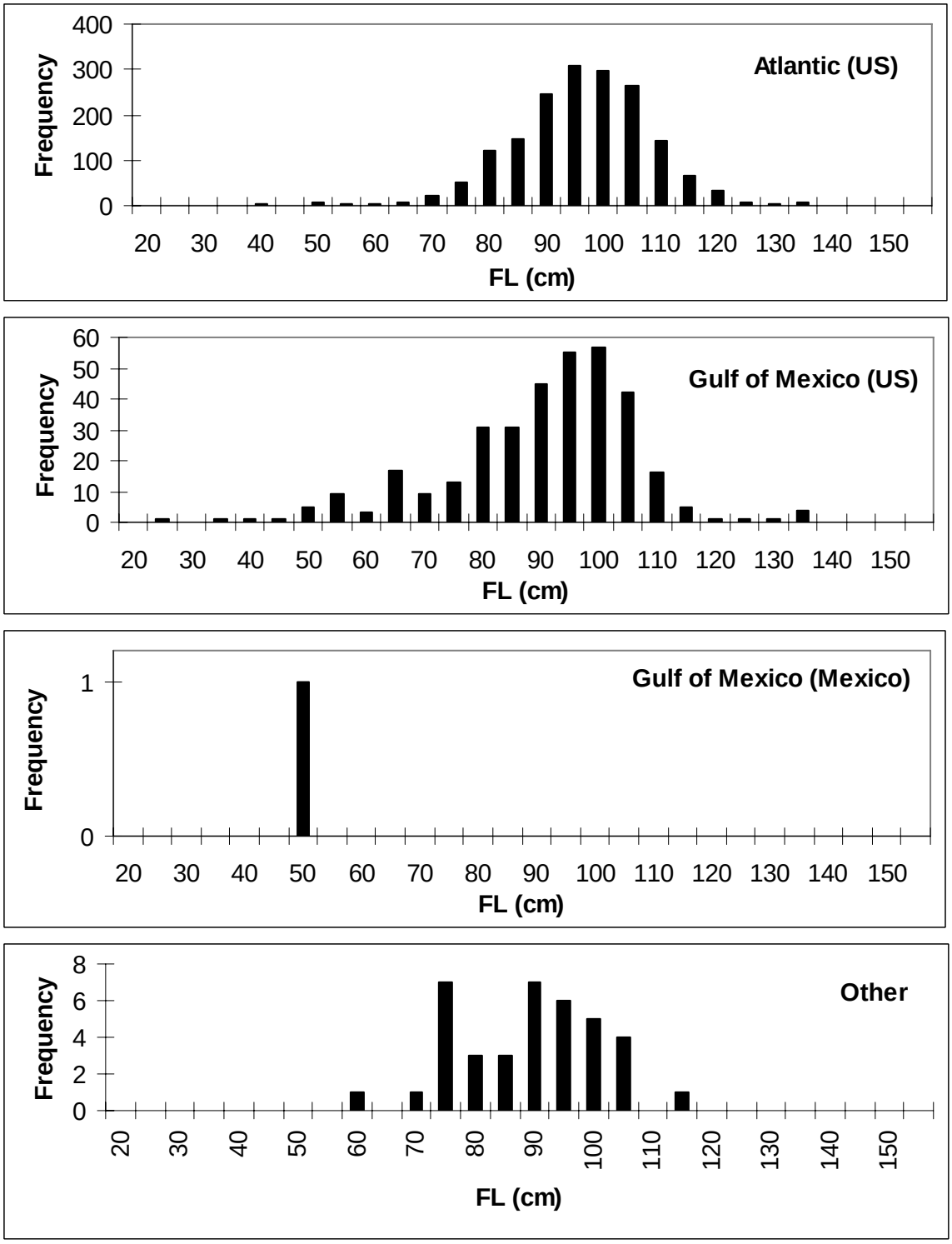

Figure 12. Locations of blacknose shark tags and recaptures, 1965-2009.

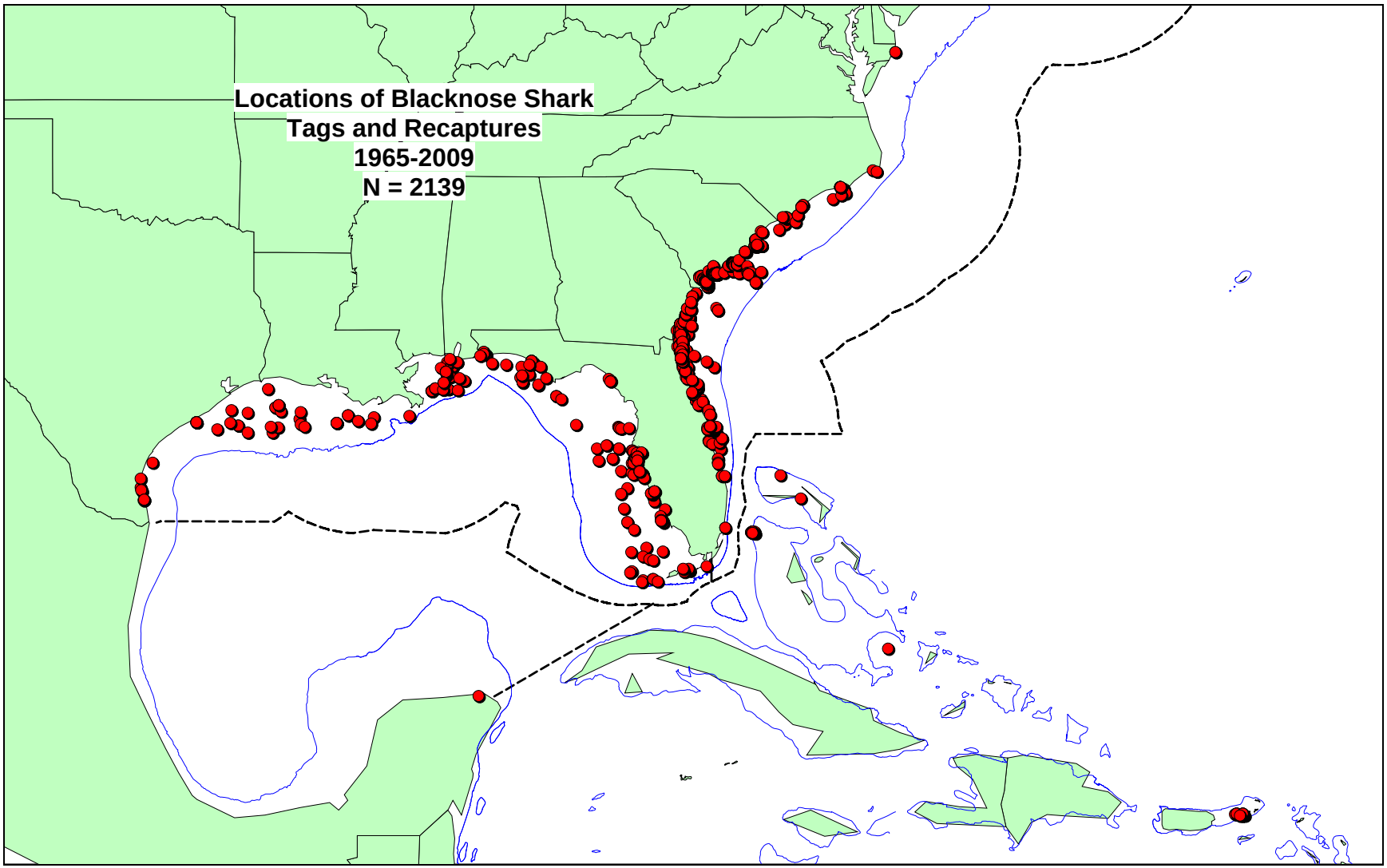

Figure 13. Blacknose shark recaptures, 1965-2009.