INCIDENTAL CATCH AND MORTALITY REPORT
FINAL REPORT
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DRAFT

Charles Roithmayr and Terry Henwood
NMFS, Mississippi Laboratories, Pascagoula, MS

The Incidental Catch and Mortality Project was implemented as part of the NMFS Marine Mammals and Endangered Species Program to evaluate the impacts of human activities on populations of sea turtles off the southeastern U.S. Primary emphasis of the project was directed toward assessment of the incidental catch of sea turtles during commercial shrimping activities. Additional efforts were expended to identify other sources of sea turtle harassment and injury which could be associated with man's activities. This report is a summary of information collected from August, 1979 through September, 1982.

METHODS

Trained fisheries observers were stationed aboard commercial shrimping vessels operating in the northern Gulf of Mexico and along the southeastern Atlantic seaboard (Figure 1). Efforts were made to allocate observer coverage to major shrimping grounds during peak seasons. Manpower and funding restrictions, however, resulted in widely dispersed efforts both spatially and temporally.

The sampling routine employed by NMFS observers follows: After the shrimp trawl catch was emptied on deck, any captured turtles were identified, examined for physical condition, measured, tagged and released. A standard station sheet was completed for each tow. The bycatch station sheet and bycatch length frequency sheets were completed from samples taken on the first tow of each fishing day. Additional station sheets were completed when the trawler moved to different grounds or if a change in the species

composition of the bycatch occurred. A fishing activity sheet was also prepared listing changes in engine RPM's as related to normal fishing operations. In addition to these duties, observers sampled discards of undersize shrimp and recorded observations of sea turtle and marine mammal sightings.

RESULTS AND DISCUSSION

Southeast Shrimp Trawl Fishery

The incidental catch and mortality rate of sea turtles is summarized by area in Table 1. Hours towed were standardized to reflect effort adjusted to a 100 ft headrope length net, and C.P.U.E. (catch per unit effort) was calculated based on this value. The total East Coast adjusted effort of 3,422 towing hours resulted in a C.P.U.E. of 8.6 turtles per 100 hours and a mortality of 10%. An adjusted effort of 7,764 trawling hours in the Gulf of Mexico resulted in a C.P.U.E. of 0.3 turtles per 100 hours towing and a mortality rate of 40%.

Species composition of turtles captured is summarized in Table 2. Loggerhead, *Caretta caretta*, sea turtles constituted approximately 97% of the total East Coast captures and 88% of the captures in the Gulf of Mexico. Of a total of 293 turtles caught on the East Coast, 4 were green (*Chelonia mydas*), 4 were Kemp's ridley (*Lepidochelys kempi*), and 3 were leatherback (*Dermochelys coriacea*). In the Gulf of Mexico, 2 Kemp's ridley and 1 leatherback sea turtle were captured.

Analyses of turtle captures by area, month and depth indicate that the majority of captures occur from April through November in depths less than 10 fathoms. In the Gulf of Mexico, 48% of the fishing effort occurred during these times and depth range which resulted in 83% of the turtle captures. On

the East Coast (excluding Port Canaveral), all effort occurred in depths of less than 10 fathoms. The months of April through November constituted 94% of the effort and 99% of the captures.

The size composition of loggerheads caught by shrimp trawlers indicates that they consist primarily of subadults. All green and most ridley turtles were less than 30.5 cm (12 inches) carapace length[1/] and were classified as juveniles. Two captured ridley turtles were classified as adults.

Figure 2 compares the shrimp trawling effort and associated C.P.U.E. of turtles for all fishing areas. The greatest amount of effort, 3,994 hours, occurred on the LA-MS-AL grounds and was associated with a C.P.U.E. of 0.4 turtles/100 hours. The highest C.P.U.E. occurred at Port Canaveral, FL where 18 turtles/100 hours were caught.

As indicated in Table 3, Gulf of Mexico shrimp vessels generally trawl for longer time periods (3.1 - 4.6 hours) than the East Coast fleet (2.1 - 2.6 hours). It has been demonstrated by Watson and Seidel, 1980, that a direct correlation exists between length of tow and turtle mortality. The increased mortality rates observed in the Gulf of Mexico are apparently related to longer tow times. The 40% mortality calculated from these data, however, is based on a comparatively small number of captures and remains suspect. The 10% mortality calculated for the East Coast, on the other hand, is probably a more accurate estimate because it is based on a larger number of captures.

The data indicate that turtle captures in the Gulf of Mexico are less frequent than on the East Coast. It is believed that the impact on Gulf turtles, however, may be much greater because of the large fleet (4,750 trawlers) and the long (3-4 hours) tows. Any extrapolation of incidental catch and

1/straight line

mortality data to include the entire Gulf of Mexico shrimp fleet would result in substantial turtle catch and mortality estimates.

Significant numbers of endangered and threatened sea turtles are taken in fisheries other than the shrimp trawl fishery; and also during activities by man other than fishing, such as channel dredging, power plants, and oil pollution.

Other Fisheries

Longline fishing for swordfish and tuna is becoming increasingly common by U.S. commercial fishermen. The number of Texas longline trips totaled 135 in 1980. Unconfirmed reports indicate that leatherbacks are caught on the hooks that float near the surface. Information concerning sea turtle capture is being documented by NMFS observers aboard Japanese tuna longline vessels in the Gulf of Mexico and on the eastern U.S. seaboard (Fig. 3). The incidental catch of marine turtles by 24 vessels in the Gulf during the three month period February, March and April, 1979 was estimated at 96. Most of the turtles were unidentified, 84%; while 16% were identified as leatherback turtles (Thompson, P.A., Jr., 1981). Table 4 shows the catch, mortality and species composition of turtles observed in the period 1979-81. Twenty-three of the 31 turtles hooked in the Gulf were identified as leatherbacks. Thirty-one of the 49 turtles caught in the Atlantic were loggerheads. The mortality of turtles, all species, was 35% in the Atlantic and 6% in the Gulf.

Recreational fishing impacts turtle populations. Texas rod and reel fishermen have hooked juvenile (tagged and untagged) and subadult Kemp Ridley turtles while fishing in the surf and on piers. Speargun fishermen also catch hawksbill and green turtles in the northwest Gulf of Mexico. (H.H. Hildebrand, 1980).

Fixed large mesh gill nets operating in South Carolina and North Carolina catch sea turtles when set for sturgeon and shark. The number of loggerhead turtles caught in South Carolina in 1979 was 66; the mortality in some instances was as high as 56% (Weatherly, 1979).

Four turtles were observed tangled in gill nets set for sturgeon in North Carolina. The report did not identify the species or state if they were dead or alive (Crouse, 1982). It did mention that fishermen tended the nets to release turtles with little or no mortality.

Two pound nets, or fish traps, in Narragansett Bay, Rhode Island captured 21 sea turtles between June and October, 1981. Of the total, 13 were leatherback and 8 were loggerhead (Shoop, 1981). All turtles were alive and free of entanglement in the webbing. One pound net operating in the Chesapeake Bay captured two Ridley and three loggerhead turtles during four days of observation in June, July, and August, 1981 (J. Musick, VIMS pers. comm.). All animals were alive when released. Three hundred and forty eight (348) sea turtles were found in 13 Chesapeake Bay pound nets from May through November, 1980 (Lutcavage, 1981). The mortality was 18% and was due to entanglement and drowning in the webbing. Three species were reported including loggerheads, leatherback and the Ridley. Most were loggerheads but the percent species composition was unreported.

Other Activities by Man

Data collected by NMFS and U.S. Corps of Engineers observers during dredge vessel operations in Port Canaveral Channel, Florida, from July through December, 1980 showed that the incidental catch of marine turtles amounted to 78, with a mortality of 96%, (Oravetz, C.A., 1980). Since these data represent only those turtles actually observed, a conservative estimate of the actual total would be three to four times this number. Most of the turtl

subadult loggerheads of which the majority had been killed. Three live greens were also observed. Table 5 is a summary of the catch and mortality of turtles observed on the dredge during 150 hours of observation. Only 2 of 12 whole turtles seen were alive.

Screens on saltwater intake systems of coastal power plants collect live and dead turtles. The average annual incidental catch for one power plant in Florida was 134 (range 84-179) during the three-year period 1977-79, (Wilcox, R., 1979). Most turtles were loggerhead; other species included green, leatherback, and hawksbill. The average annual mortality was 10%. The total number of turtles caught in 1981 was 104; (Table 6) the mortality was 7%,loggerhead contributed 66%; green 31%; leatherback 2% and ridley 1% (Herrema, pers. commun.).

Eleven turtles, including loggerhead, green and hawksbill, were also captured at three other Florida power plants located at Port Everglades, Turkey Point and Cape Canaveral between May 1980 and February 1981. Five of the animals were found dead on or near the water intake screens, (Herrema, 1981).

Oil spills are a major threat to small sea turtles. Six juvenile green and one juvenile Ridley were found on Texas beaches during a 12-day period during the IXTOC oil spill. (Rabalais and Rabalais, 1980). All but two were dead and heavily covered with oil. The chances of finding such small turtles, 4.1 to 21.1 cm (1.6 to 8.3 inches), in the oil spill itself and on the beaches are very small and the total mortality is unknown.

Figures 4 and 5 review the status of incidental catch and mortality

of sea turtle information in the south Atlantic and the Gulf of Mexico. It should be noted that no information is being collected from the Louisiana and Florida inshore shrimp and finfish fisheries and the west Florida (panhandle) shrimp trawl fishery in the Gulf of Mexico.

CONCLUSIONS

NMFS observers aboard commercial shrimp trawlers in the northern Gulf of Mexico and southeastern U.S. have documented sea turtle captures and mortality over a total of 7,711 hours of trawling effort since late 1979. Large variations in capture rate and mortality occur according to area and season. Catch per unit effort data indicate that sea turtle captures are more frequent along the eastern seaboard than in the northern Gulf of Mexico. Mortality rates, however, may be higher in the Gulf of Mexico.

Besides the shrimp trawl fishery, the incidental capture and mortality of sea turtles has also been documented for the Japanese tuna longline fishery in the Gulf and Atlantic; recreational hook and line fishing in the northwest Gulf; the gill net fishery for sturgeon and shark in South Carolina and North Carolina; and pound nets in Narragansett Bay, Rhode Island and Chesapeake Bay. Mortality rates for fishing grounds where more than 20 turtles were captured were found to be high for the Georgia, Florida shrimp trawl fishery, 25%;for the Chesapeake pound net fishery, 18%; for the Japanese tuna longline fishery, 35% and the gill net fishery for sturgeon in South Carolina, 56%.

Other activities by man which affect sea turtles and were documented include power plants in Florida, oil pollution in Texas, and channel dredging

in Florida.

The average annual mortality rate for turtles captured at the water intake screen in the St. Lucie power plant was 10% while dredging the channel in Port Canaveral resulted in a mortality rate of 96% based on the capture of 78 turtles. The mortality of small turtles found on the Texas beaches after the IXTOX oil spill could not be accurately determined but was probably significant.

RECOMMENDATIONS

Future efforts must be directed at determining turtle captures in Gulf estuaries, bays and sounds where no data are being collected. The impact of the inshore shrimp fisheries on subadult turtles and, particularly, ridley turtles, may be significant, and must be assessed before reasonable estimates of turtle mortality can be derived. In addition, observer effort needs to be devoted to assessing the impact of U.S. commercial swordfish and tuna longlines on turtle stocks in the Gulf and Atlantic.

Additional information should be gathered at other channel dredging sites where turtles may be present. The very high mortality observed at Port Canaveral shows that a significant impact exists between turtles and channel dredges. Monitoring for turtles at power plants, pound nets, gill nets and oil impacted beaches could reduce the mortality in areas which have been identified in this report. Redesigning pound nets and installing barrier devices in front of the water intake screens at power plants would also reduce the incidental catch and mortality of sea turtles.

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TABLE 1. Summary of sea turtle incidental catch, actual effort, effort adjusted to a standard net size, C.P.U.E. based on standardized effort, number of dead turtles and percent mortality, 1979-81.

FISHING GROUND	TURTLES CAUGHT	HOURS EFFORT	EFFORT ADJUSTED TO A 100 FT NET	C.P.U.E. TURTLES/100 HRS	NUMBER DEAD	PERCENT MORTALITY
EAST COAST						
S.C.	86	1104	1801	4.8	12	13
GA. - FL.	28	436	631	4.4	7	25
FL, Port Canaveral	179	614	989	18.1	13	7
SUBTOTAL	293	2154	3421	8.6	32	10
GULF OF MEXICO						
FL, Key West	3	350	457	0,7	0	0
LA-MS-AL	14	3033	3994	0.4	6	42
TX, Sabine-Matagorda	7	1975	3154	0.2	3	42
TX, Brownsville	3	200	159	1.9	2	67
SUBTOTAL	27	5558	7764	0.3	11	40
GRAND TOTAL	320	7711	11,185	2.8	43	13

TABLE 2. Species composition of turtles captured aboard cooperative shrimp trawlers, August, 1979 - September, 1981

	LOGGERHEAD	GREEN	RIDLEY	LEATHERBACK	TOTAL
EAST COAST					
SC	83	2	1	-	86
GA-FL	25	-	-	3	28
FL, Port Canaveral	174	2	3	-	179
TOTAL	282	4	4	3	293
PERCENT	97	1	1	1	100
GULF OF MEXICO					
FL, Key West	3	-	-	-	3
LA-MS-AL	13	-	-	1	14
TX, Sabine-Matagorda	5	-	2	-	7
TX, Brownsville	3	-	-	-	3
TOTAL	24	0	2	1	27
PERCENT	88	-	8	4	100

Turtles captured aboard other vessels and tagged by NMFS observers:

FL, Port Canaveral* - 1 green, 1 ridley

LA-MS-AL* - 1 ridley

TX, Sabine-Matagorda* - 1 green, 1 loggerhead

*These turtles are not included in Table 2.

TABLE 3. Average tow time of cooperative (NMFS) shrimp trawlers by area, August 1979 - September 1981.

EAST COAST	
SC	2.6
GA-FL	2.1
FL, PORT CANAVERAL	2.5
GULF OF MEXICO	
FL, KEY WEST	4.6
LA-MS-AL	3.1
TX, SABINE-MATAGORDA	4.2
TX, BROWNSVILLE	4.6

Table 4. Species Composition, Incidental Catch & Mortality of Sea Turtles by Japanese Tuna Longliners, 1979-80-81

	T. CATCH[3]	DEAD
ATLANTIC [1]		
LEATHERBACK	0	-
GREEN	5	0
LOGGERHEAD	31	14
UNIDENTIFIED	13	3
SUBTOTAL	49	17
GULF OF MEXICO[2]		
LEATHERBACK	23	1
GREEN	0	-
LOGGERHEAD	1	-
UNIDENTIFIED	7	1
SUBTOTAL	31	2
TOTAL	80	19

1 FISHING AUG. TO DEC. 1000-1500 FM
2 FISHING FEB. TO APR. 800-1800 FM
3 PARTIAL DATA; BASED ON 20% COVERAGE

.ble 5. Summary of Incidental Catch and Mortality of Sea Turtles by Dredge Vessel[1/], Pt. Canaveral, 7/14-8/2/80

WHOLE ANIMALS	DEAD	LIVE
LOGGERHEAD	8	1
GREEN	1	1
UNIDENTIFIED	1	0
TOTAL	10	2
PARTS		
FLIPPER	6	
HEAD	3	
VISCERA	4	
FLESH	1	
SHELL	2	
EGG	1	

1/ Dredge time 150 hours.

Table 6. Summary of Sea Turtles Captured at St. Lucie, Florida, Power Plant Screen, 1978-81

SPECIES	1978	1979	1980	1981
LOGGERHEAD	139	179	100	69
GREEN	6	3	6	32
LEATHERBACK	3	0	0	2
RIDLEY	0	0	0	1
HAWKSBILL	1	0	0	0
TOTAL	149	182	106	104

COMMERCIAL SHRIMP VESSEL OBSERVER LOCATIONS

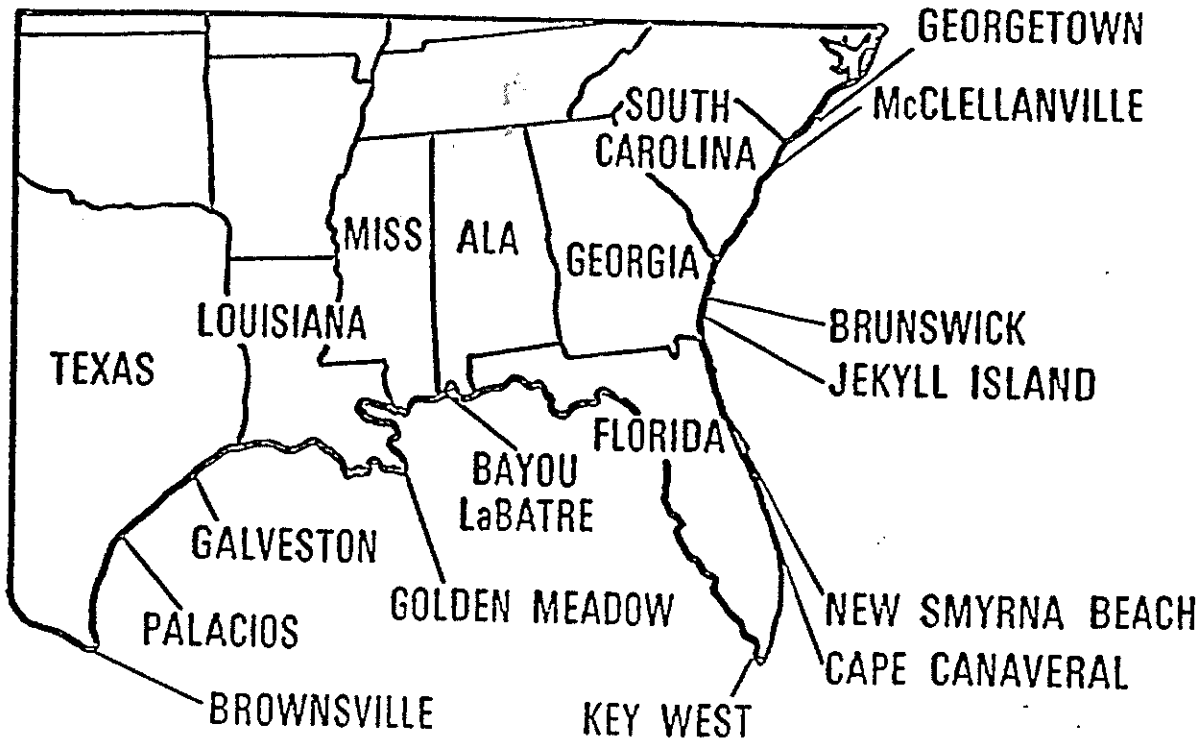
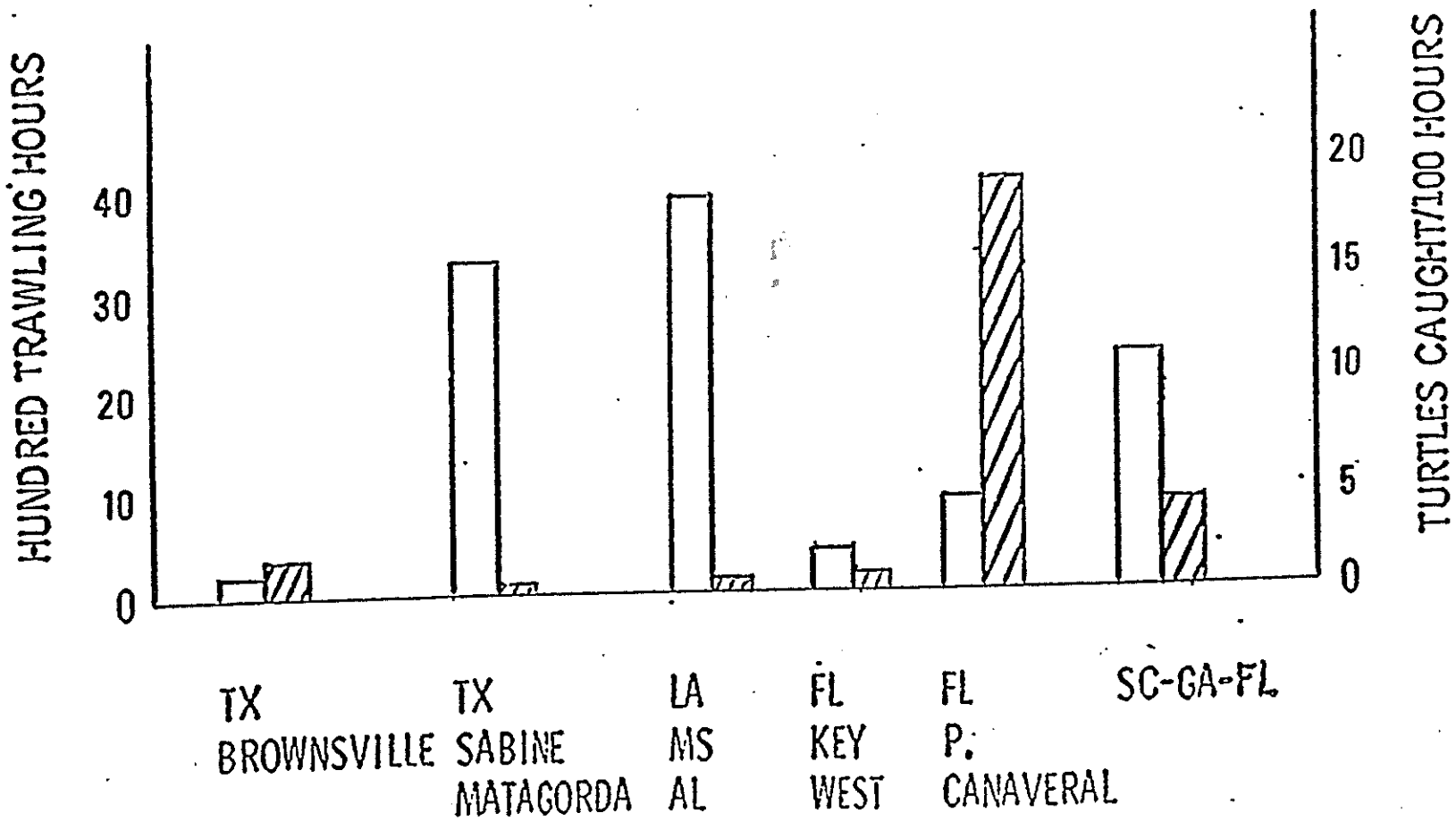


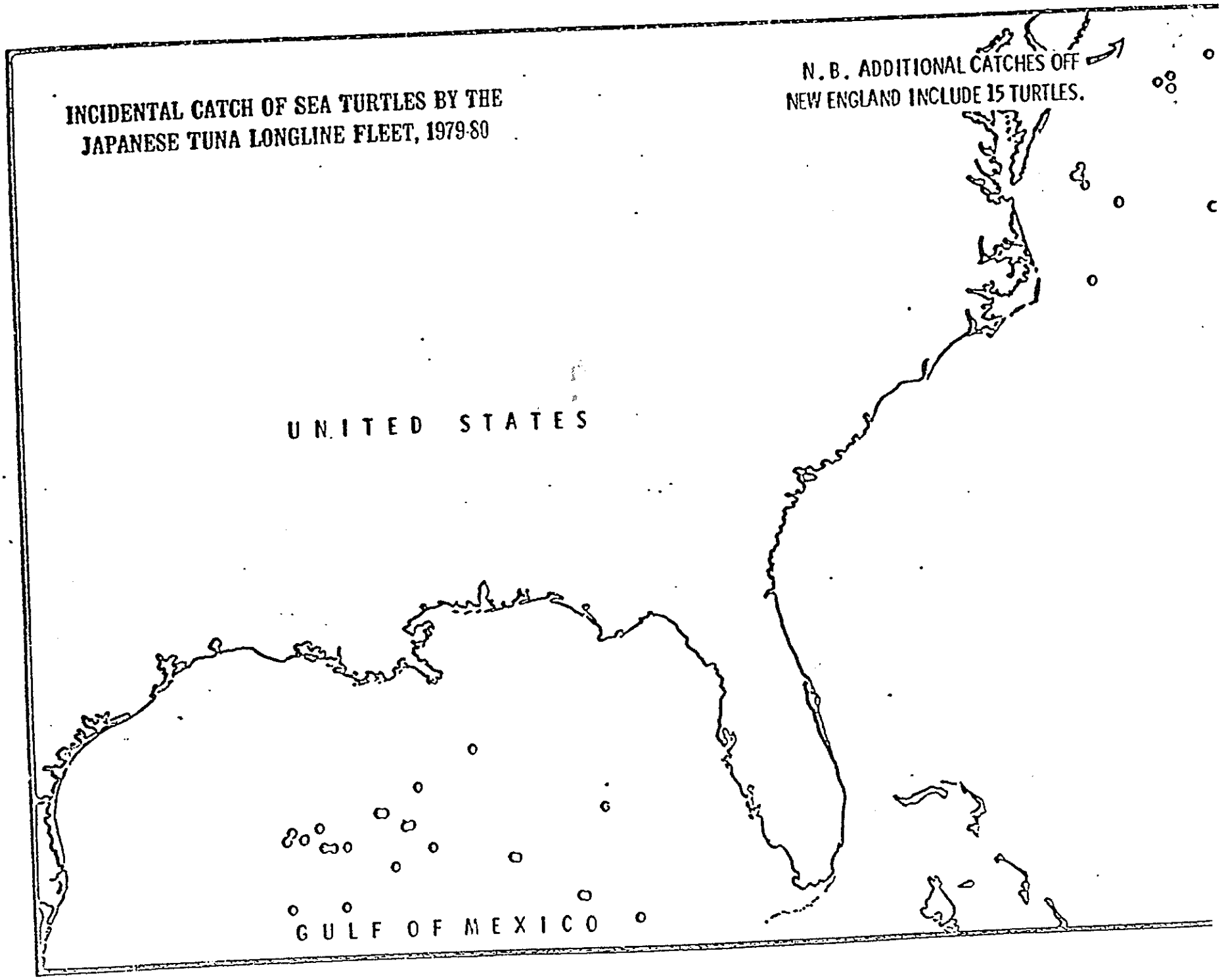
FIGURE 1

DISTRIBUTION OF TRAWLING EFFORT AND CPUE BY AREA, TX TO SC, 1979-80-81



EFFORT - NO. OF TRAWLING HOURS ADJUSTED TO 100 FT NET

CPUE - NO. TURTLES CAUGHT PER 100 HOURS OF TRAWLING


INCIDENTAL CATCH OF SEA TURTLES BY THE
JAPANESE TUNA LONGLINE FLEET, 1979-80
N.B. ADDITIONAL CATCHES OFF
NEW ENGLAND INCLUDE 15 TURTLES.
UNITED STATES
GULF OF MEXICO

STATUS OF INCIDENTAL CATCH AND MORTALITY OF SEA TURTLE INFORMATION — SOUTH ATLANTIC

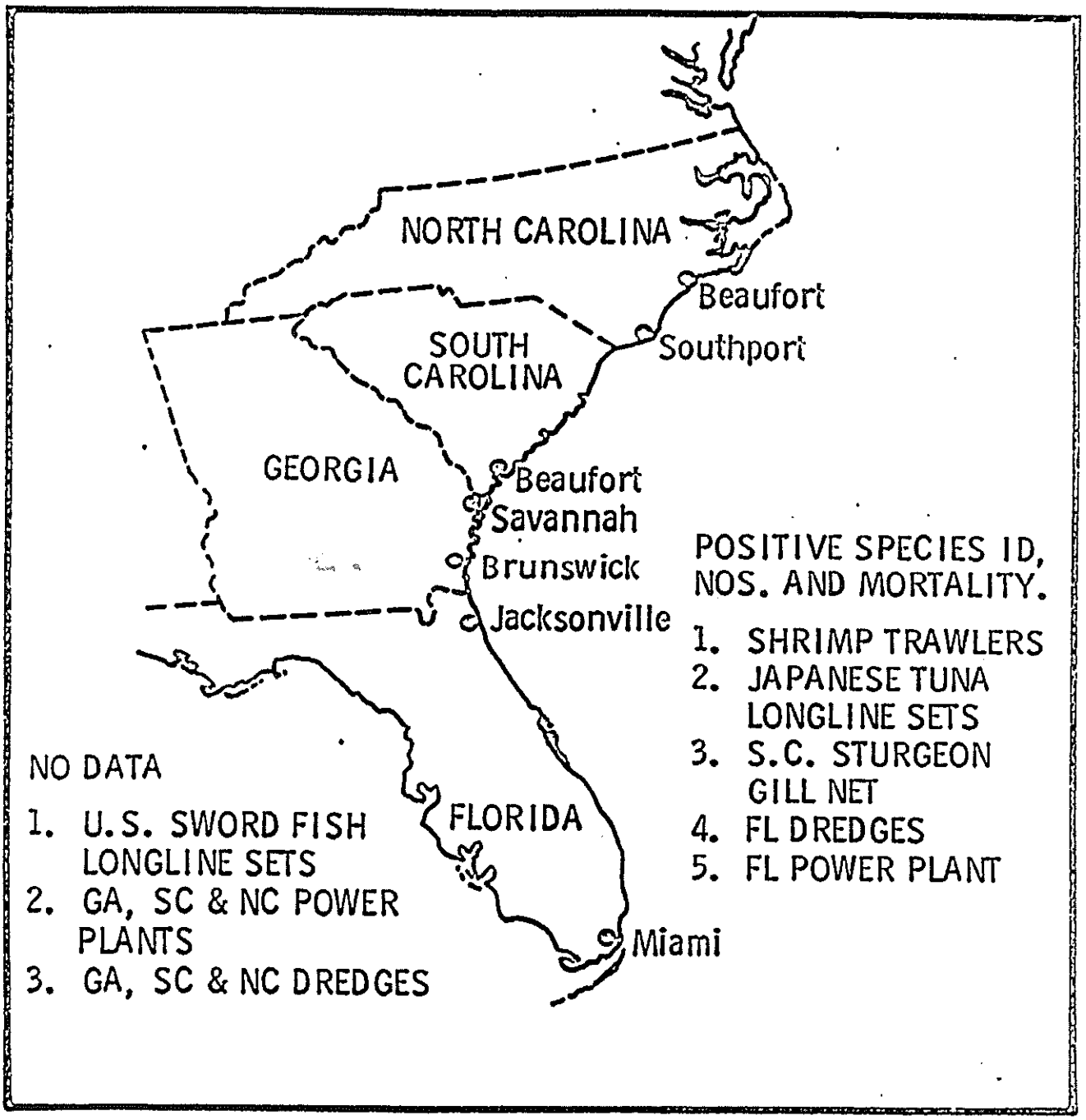
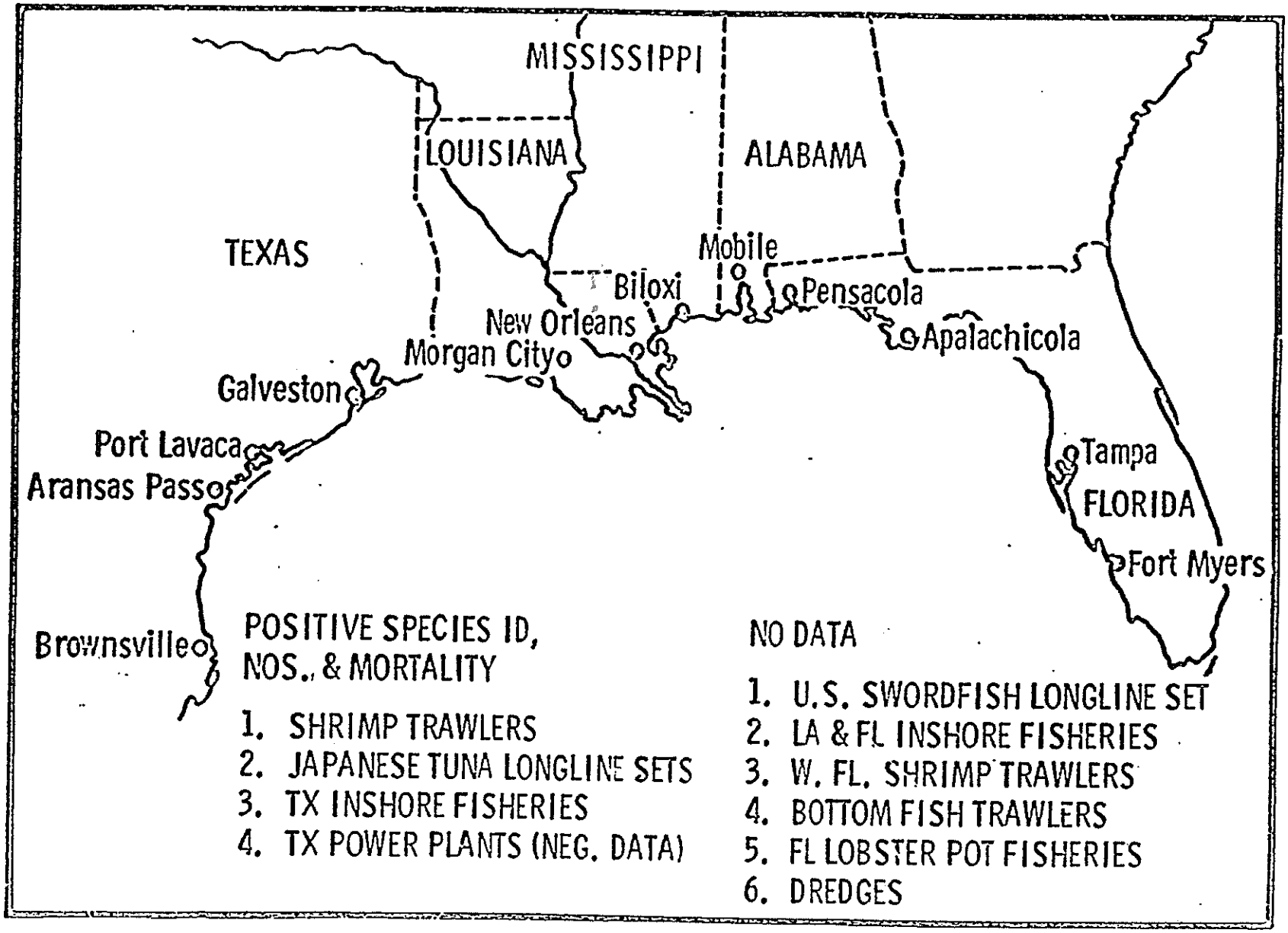


FIGURE 4

STATUS OF INCIDENTAL CATCH AND MORTALITY OF SEA TURTLES INFORMATION — GULF OF MEXICO