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FINAL PROGRESS REPORT

Contract No. 40GANF700092

Amount of Contract: Federal \$15,000 Match -0- Total \$15,000

Project Title: Monitoring the large coastal shark stock of the western Gulf of Mexico

Contractee: Gulf & South Atl. Fisheries Development Foundation, Inc.

Contract Period: From: 21 July 1997 To: 31 July 1998

Monitoring the Large Coastal Shark Stock of the Western Gulf of Mexico

Background: Recent stock assessments (Anderson 1985, 1990; Parrack 1990; NMFS 1994, 1995, 1996) indicate that the large coastal shark stock is overfished. Various management strategies have been enacted for most states, and a federal shark fishery management plan was implemented in May 1993 for the U.S. Atlantic. Implementation of this Plan, in development for nearly a decade, was hampered by a lack of adequate data that could withstand the rigors of a detailed stock assessment.

Recognizing these data inadequacies, in 1994, the Gulf and South Atlantic Fisheries Development Foundation (Foundation) and the University of Florida jointly began a data collection program for the shark fishery and resource. The area covered by the Foundation's program contributes about 70% of the landings in the commercial fishery; the western Gulf of Mexico (Texas and Louisiana) contribute another 25%, but no fishery dependent monitoring occurs in this region. Currently, a fishery-independent resource survey conducted by NMFS represents the only monitoring for this region.

Additionally, the large-coastal shark stock is not restricted to U.S. waters; substantial landings occur in Mexico as well, although the specifics of this catch and landings is poorly understood. To address this need, the 1997 NMFS shark resource survey included Mexican waters as well as U.S. waters.

Work Performed: The Foundation recognized the importance of gaining a better understanding of this western Gulf of Mexico shark stock and the current fishery that occurs there, as well as understanding how this information relates to what is known about other areas of the US east coast. This study attempted to provide preliminary information concerning the shark stock and fishery of the western Gulf region.

Sampling consisted of two efforts: (1) participation in the 1997 NMFS resource survey during the summer of 1997, and (2) fishery dependent monitoring of the commercial shark longline effort of Louisiana during the winter fishing season of 1998. Fishery-dependent commercial monitoring was not possible during the summer of 1997, as the fishery closed on 21 July 1997; the date that this contract was issued. Thus, the NMFS Resource Survey cruise provided the only immediate opportunity to gather resource information in the western Gulf during the summer timeframe. A Foundation-contracted observer participated in all Gulf of Mexico segments of this survey: Leg I - Pascagoula, MS to Port Isabel, TX; Leg II - Port Isabel, TX to Veracruz, Mexico; Leg III - Pascagoula, MS to Key West FL. His participation in Leg III was voluntary and at no cost to the

contract, but provided information that could be compared to our fishery-dependent sampling conducted a month earlier in this same region.

With the start of the commercial fishing season in January 1998, the Foundation attempted to place a contracted observer aboard commercial shark longliners fishing in the western Gulf for as much as 20 sea-days. The vessel was compensated for the costs to feed and otherwise accommodate the observer. Data collection followed standard Foundation program protocols, and all data were incorporated into the Foundation's overall database. Results of both sampling efforts were compared, as appropriate, with information collected under other Foundation activities monitoring the commercial fishery of the Atlantic coast and the eastern Gulf of Mexico.

Results:

Summer 1997

For Leg I of the NMFS cruise (Pascagoula, MS to Port Isabel, TX), a total of 407 sharks of 12 species were captured and documented by our observer. Three species dominated the catch: Atlantic sharpnose (*Rhizoprionodon terraenovae*), blacktip (*Carcharhinus limbatus*), and blacknose (*C. acronotus*) sharks comprised 87% of the catch by number with 272, 43 and 41 individuals respectively. The Atlantic sharpnose shark was ubiquitously distributed throughout the region, and dominated the total catch. Although the blacktip and blacknose sharks were also found throughout the area, both were more common off Louisiana than Texas. In all, Leg I fished 94 longline sets consisting of 100 hooks fished for one hour. Forty-one sets off Mississippi and Louisiana produced 32 of the 43 blacktip and 24 of the 41 blacknose sharks, and 53 sets off Texas produced only nine blacktip and 16 blacknose sharks. The fourth most common species, the spinner shark (*C. brevipinna*), was also primarily taken off Mississippi and Louisiana; only 1 of the 19 total individuals was taken off Texas.

A somewhat different species composition with lower catch rates was found during the Texas segment of Leg I. Whereas 56% of the hooks (or hook-hours) of effort were expended off Texas, only 47% of the sharks (190 out of 407 total) were caught in this region. Of interest was the first appearance of the fifth most common species, the sandbar shark (*Carcharhinus plumbeus*), in the catch off the Galveston area; this species continued to occur at a regular but low frequency as the cruise proceeded south to Port Isabel. All totalled 11 sandbar sharks were caught off Texas, actually outnumbering the blacktip shark catches; however, based on historical literature for this area (Baughman and Springer 1951; Branstetter 1986; Cody et al. 1986), this does not accurately reflect species abundance and composition for the region. In any event, this species, which is the dominant target of the commercial fishery along the Atlantic coast and in the eastern Gulf, is a very small contribution to the fishery effort Louisiana waters. At least based on these limited data, the species may contribute more to Texas-area fishing, but Texas does not have a large-scale directed shark fishery; their landings are usually less than 5% of the total quota on an annual basis. This disjunct distribution may be caused to some degree by the differing habitat offered in the north-central Gulf of Mexico stemming from the effects of the Mobile Bay, Mississippi River, and Atchafalaya River outfalls. Many other fish species also share this type of disjunct distribution across the northern Gulf, with a more continuous southern Gulf distribution stretching from Florida to the Yucatan peninsula, through the Bay of Campeche, and into Texas waters.

Leg II of the cruise was aborted after initial sampling in waters off northeast Mexico. After a total of 34 sets in south Texas-U.S. waters and Mexican waters, only 14 sharks had been caught: 6 Atlantic sharpnose, 4 scalloped hammerhead, 2 sandbar, and 2 tiger sharks. Although limited in quantity, this catch again illustrated the contiguous occurrence of the sandbar shark along the western Gulf coast of both countries.

Leg III, originally intended to survey Mexican waters, was restructured to survey the eastern Gulf of Mexico, and participation on this Leg (at no cost to the contract) actually provided us with the opportunity to generate some nearly direct comparisons of catches between this fishery independent survey and our other fishery

dependent observer efforts which had occurred about one month before. The commercial fishery was only open for 21 days during July of 1997, and our eastern Gulf observer was only able to document the catches on one fishing trip in the area. That trip, fished nearly 3300 hooks on four sets in the central part of the coast. The NMFS cruise, covering the entire west Florida coast during late August and early September, made 66 sets (i.e. 6600 hooks). Both the fishery dependent and fishery independent efforts were dominated by the sandbar shark which comprised 55% and 52% of the catches respectively. The second and third most common species, tiger and nurse sharks, also had similar percent contribution. The fishery independent effort did have a more diverse catch of miscellaneous occurring species; this should be expected considering the areal extent of the survey compared to the fishery dependent data.

Winter 1998

The Foundation made arrangements for an observer to monitor the catches of directed commercial shark longliners working out of Louisiana during the first semi-annual commercial fishing season of 1998. This effort was initially intended to encompass as many as 20 sea days during the opening part of this fishing season. The observer was on-site in Louisiana for 20 days between 15 January and 3 February, but logistic constraints reduced the actual sampling to 10 sea days. In part, this stemmed from extremely unusual and harsh weather conditions that limited fishing not only in Louisiana, but throughout the Atlantic coast of the United States during the same time period. Secondly, although our local liaison believed that he could make arrangements with several longliners to participate in our survey, he was unsuccessful in getting substantial cooperation. Finally, the observer was placed on a single vessel from which all the data were collected.

It should be noted that when the observer arrived in Louisiana, he spent his first few days in a dedicated attempt to contact additional vessels and secure additional participation. He was unsuccessful, in part, because of some local enforcement proceedings that had recently affected commercial fishers in the region. Even though our activities were totally unrelated to those events, the observer was a stranger to this fishing community, and none of the fishers were directly familiar with the Foundation's shark observer program; thus many were skeptical of the observer's intent, and none would permit him to monitor their fishing activities. Nevertheless, the 10 days of data collected by the observer were aboard a typical shark fishing vessel, and those data are likely representative of regional fishing effort, at least during the timeframe that the observer was in the region.

Overall, the observer monitored the catch and effort of 6 longline sets, totalling 2,470 hooks that caught 556 sharks (Table 1). The catch was dominated (>80%) by three species: the large-coastal blacktip shark, *Carcharhinus limbatus*, with 279 specimens caught, followed by two small-coastals - the Atlantic sharpnose shark, *Rhizoprionodon terraenovae*, and the blacknose shark, *C. acronotus*, with 124 and 60 individuals respectively. This catch composition is very similar to the catches reported by Russell (1993) for the directed shark fishery she observed in 1989 and 1990. Length frequencies (Figure 1) indicated that both adolescent and adult blacktip sharks were taken, whereas most of the small coastals were adults. Because of the sandbar shark's dominance in the catch from other regions, its minimal contribution is noted here; all five fish were immature (85-125 cm FL). Of ancillary interest was the catch of spinner sharks (*C. brevipinna*); all 29 were taken on a single set in waters much deeper than the rest of the fishing effort, and blacktip shark catches on this set were much lower. Conversely, on all the remaining sets, made in waters of half the depth of Set #1, no spinner sharks were taken, and blacktip sharks dominated. These data mirror previous findings (Branstetter 1981, 1986, 1987) of a partial depth segregation between two species that are often thought to be ecologically similar.

By contrast, the relative abundance of these species differed substantially from the NMFS fishery independent survey results from the same area. Most, if not all, of our observer data and the data from Russell (1993) was generated between 89°00'W and 91°00' W. When considering the effort expended by NMFS in this region, the actual number of sets was small and the catch was small, except for the dominant species, the Atlantic sharpnose

shark which comprised over 75% of the sharks caught (57 of 75 total sharks). Blacktip sharks were the second most common species taken, with 10 individuals.

These differences may be attributable to two factors: (1) the NMFS survey was conducted in summer whereas our observer data was collected in winter, and (2) obvious differences in the purpose of fishery independent and fishery dependent efforts. Factor (1) still would not account for the difference in the NMFS' data compared to Russell's (1993) results which included both summer and winter sampling. The differences are most likely due to the different focus on the fishing effort. The NMFS survey may be a better representation of the faunal abundance and species contribution in the region, but it would not represent the catch in the fishery, and conversely fishery dependent data should in no way be considered direct evidence of relative abundance. This drives home the point about the value and need for both sampling efforts in any stock assessment procedure; dependency on one without the other may lead to some very inaccurate conclusions.

Conclusions

Since 1994, the Foundation/University of Florida observer program has generated the most substantial biological and fishery database in existence for the shark stock of the northwest Atlantic, however that survey only includes the area from North Carolina through Gulf Florida. Recognizing that Louisiana lands ~20% of the total large-coastal quota, and that the faunal composition of the region was very different compared to the eastern Gulf and South Atlantic areas (known from historical fishery independent and fishery dependent surveys), the Foundation also recognized that its survey was not completely representative of the entire directed commercial shark fishery. This project has allowed us to confirm that the species composition and catch in the western Gulf of Mexico fishery is distinctly different from that of the eastern Gulf and the Atlantic coast.

Relatedly, the fishery is currently managed under a multi-species stock "unit", and that "unit" is considered to be overfished, and substantially depressed in abundance compared to historical levels. On a species-by-species basis however, some species are not considered to be showing signs of overfishing; this is true of the blacktip shark (NMFS 1996). In 1996, management actions reduced commercial quotas by half, based on the overall condition of the multi-species "stock"; this action was predicated on the dominance of the sandbar shark in the fishery and the poor condition of that species' population as indicated by the recent stock assessments. On the other hand, these two species have very different life history strategies, and they have different abilities to respond to fishing pressure.

Placing generic restrictions on the fishery as a whole, without consideration of the species content of those regional fisheries and the condition of the individual "stocks" of those various species, may be impacting some segments of the fishing community unnecessarily; especially those segments of the shark fishery that target the the lesser impacted species, such as the blacktip shark. A more species-specific fishery management strategy which accounts for regional variations in stock composition and life history characteristics of the species would be beneficial.

Louisiana Winter 1998

CPUE = sharks per 10,000 hook-hr

Set #	Month	Avg Depth (fm)	Avg Temp (C)	Set Lgth (n. miles)	Hooks	Soak Hours	Hook Hours	Total Sharks	CPUE	Large Coastal CPUE	CP CPUE	CL CPUE	CM CPUE	CA CPUE	RT	CPUE	
19806001	1	55		4.5	421.0	17.1	7192.1	96	133.5	46	64.0	9	40.3	0	0.0	8	11.1
19806002	1	25	20.3	3.3	340.0	12.9	4391.7	84	191.3	51	116.1	49	0	0	18.2	25	56.9
19806003	1	26.5	19.3	6.7	448.0	16.0	7168.0	93	128.7	68	94.9	66	0	20	27.9	5	7.0
19806004	1	26.5	20.6	5.2	410.0	14.2	5628.8	86	147.5	75	128.7	75	0	7	12.0	4	6.9
19806005	1	25	19.6	5.5	435.0	16.2	7902.5	141	178.4	53	67.1	45	0	22	27.6	66	83.5
19806008	1	25	19.1	5.6	416.0	15.6	6496.5	56	86.2	37	57.0	35	0	3	4.8	18	24.6
Total		30.5	19.8	5.1	2470.0	84.0	35979.6	556	144.4	330	87.9	279	29	60	15.1	124	31.7
Average					411.7	15.7	6496.6				1.2	75.9	6.7				

Species Composition of Catch During Louisiana Winter 1998 Sampling

Species	Caught	Carcass	Other Kill	Tagged or Released
Sandbar	5	4	0	1
Blacktip	278	278	1	0
Bignose	1	1	0	0
Spinner	29	29	0	0
Lemon	1	0	0	1
Scallop	3	0	3	0
Great Hammer	12	1	11	0
All. Sharpnose	124	0	121	3
Blacknose	60	56	3	1
Smooth Dogfish	41	26	13	0
FL Smoothhound	1	0	1	0
Total	556	397	153	6
Lg Coastal	330	313	15	2
Sm Coastal	184	56	124	4
Pelagics	0	0	0	0
Other	42	28	14	0

Length-frequency of shark species taken in Louisiana fishery, Winter 1998

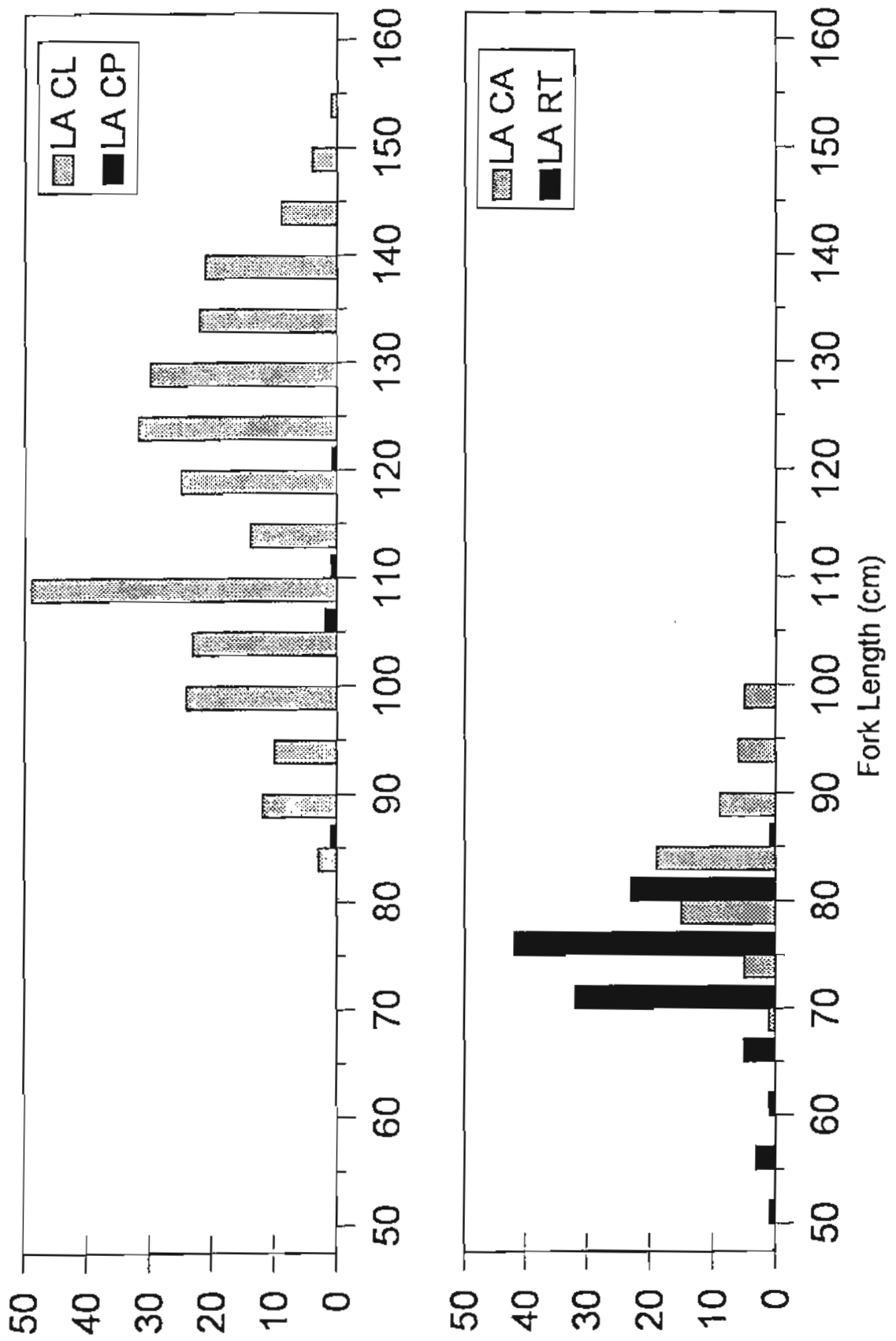


Figure 1