

1987 Swordfish Fishery Landings, St. Croix, U.S. Virgin Islands

WILLIAM TOBIAS
Government of the Virgin Islands
Department of Planning and Natural Resources
Division of Fish and Wildlife
Lagoon Street Complex, Room 203
Frederiksted, St. Croix
U.S. Virgin Islands 00840

ABSTRACT

Swordfish are the most widely distributed, pelagic billfish species occurring in all tropical, subtropical, and temperate seas from latitude 45°N to 45°S. Due to their highly migratory behavior, swordfish are managed as a single stock by the U.S. Department of Commerce, National Marine Fisheries Service. Funding was provided to the Department of Planning and Natural Resources, Division of Fish and Wildlife, by the National Marine Fisheries Service in 1987 to collect landings information on the swordfish fleet operating from St. Croix, U.S. Virgin Islands, via trip intercept or dealer interview methods. Data collected from the survey shows that 18 documented stateside vessels made 123 trips targeting swordfish and tuna. A total of 543,523 pounds of surface longline catch was landed on St. Croix (70% swordfish and 29% tuna), 98% (494,735 pounds) was shipped stateside and 2% (39,462 pounds) was sold locally. Average swordfish weight was 56.6 pounds. An additional 30,648 pounds of surface longline catch were landed by one locally-owned and registered vessel included 29% swordfish, 44% tuna, 12% marlin, 9% shark, 2% escolar and dolphin and 1% spearfish, wahoo and sailfish. St. Croix swordfish landings in 1987 represented approximately 23% of the total recorded Caribbean landings of swordfish.

INTRODUCTION

Distribution

Swordfish (*Xiphias gladius* Linnaeus) are the most widely distributed pelagic billfish species occurring in all tropical, subtropical and temperate seas from latitude 45°N to 45°S (Palko *et al.*, 1981). Their distribution and abundance are related to the environmental parameters of water temperature, ocean fronts or water mass boundaries, and food availability, as well as the biological parameters of growth and reproductive condition. Predominantly large female fish (> 90 kg) are found in surface waters of 18°C; smaller males and females prefer deeper waters. Spawning occurs in tropical waters where temperatures are > 20 – 22°C. Larval and juvenile swordfish are distributed in tropical and subtropical waters and migrate to higher latitudes as their size increases (Yabe *et al.*, 1959).

Background of the Fishery

Commercial swordfishing originated in the Northwest Atlantic as a seasonal summer harpoon fishery in waters from Canada to Long Island from the mid-1800's to early 1960's (Tibbo *et al.*, 1961). Significant swordfish catches by the Japanese tuna fleet and Norwegian shark fishery in the Atlantic resulted in exploratory longline fishing by Canadian and American fishermen (Beckett, 1971). By 1964, swordfish longlining had become well established as a year-round fishery as far south as Cape Hatteras, North Carolina.

Prior to 1970, the U.S. market was dominated by imports (> 7 million pounds compared to U.S. landings of 2 million pounds) (Lipton, 1986). In 1970, the U.S. Food and Drug Administration established guidelines limiting the permissible amount of methyl mercury in imported swordfish to 0.5 ppm. The establishment of acceptable methyl mercury levels in swordfish initiated the collapse of the Canadian fishery. Although domestic swordfish were not subject to inspection like foreign (imported) fish, fear of economic hardships, if their catches were impounded by the FDA for sampling and testing, forced the U.S. fishery underground.

Swordfish longlining was started in the Straits of Florida in 1975 by Cuban émigrés and quickly adopted by Florida fishermen (Guitart-Manday, 1975). The subsequent increase in the permissible level of methyl mercury in swordfish from 0.5 to 1.0 ppm by a Florida District Court resulted in an economic rebound of the fishery in 1978.

The Caribbean was indicated by Markle (1974), Bullis (1978), Grall *et al.* (1981) and Palko *et al.* (1981) as a major spawning area for swordfish. Efforts to explore this potential resource did not start until 1983 when increased fishing pressure and declining catch rates of swordfish in the Straits of Florida forced Florida-based longline vessels further south. As news of increasing good catches spread, the U.S. Caribbean swordfishing fleet quickly expanded in 1986 to an estimated 35 registered vessels, most from the south Florida area. Fishing effort was initially concentrated around the leeward islands (Puerto Rico to Dominica). Additional reports were received of Korean and Taiwanese vessels fishing in the same area (Caribbean Fishery Management Council, personal communication). Wood (1986) reported that swordfish represent a significant pelagic resource available to the Virgin Islands fishery. Catch rates of 2.85 fish per 100 hooks set (2.28 lb per hook) were reported. The dressed weight of the swordfish averaged 80.3 lb.

By 1987, the pursuit of swordfish and tuna species (bigeye-*Thunnus obesus* and yellowfin-*Thunnus albacares*) in virgin waters with larger, longer range vessels expanded the fishery through the windward islands to Venezuela. Individual stateside companies sought permits with various island countries for fishing rights within their territorial waters. After observing significant catches

of swordfish and tunas from their territorial waters and realizing the potential of this pelagic resource, island countries such as Barbados, Aruba, St. Lucia, Trinidad and Grenada have requested assistance from U.S. companies in establishing a local fishery.

St. Croix-based Fleet

During 1987, 18 surface longline vessels landed their catch on St. Croix for air shipment to the states. The majority of these vessels were home-based in south Florida. Vessel size ranged from 45 – 55 ft powered by either a single or twin 300 hp diesel engines with auxiliary generators to provide power for major electric components such as lights, saltwater ice makers, and electronics. The vessels are constructed of fiberglass or steel and manufactured in the southeastern United States. Typically, they have a fuel capacity of 1,800 – 2,500 gallons and a range of 1,000 – 1,400 miles. Vessel cost ranges from \$150 – 175,000 unrigged and \$225 – 250,000 rigged. The vessels are manned by a captain and three crew members.

GEAR AND METHODS

The longline gear and methods employed are similar to those described by Berkeley *et al.* (1981) for the Florida commercial swordfish fishery; however, monofilament is used exclusively for the main line and hook lines (gangions). Vessels in the 45 – 55 ft range deploy 25 – 30 miles of main line comprised of 730 lb test monofilament. Approximately 400 hooks (9/0 – 12/0 big game hooks) are clipped on to the main line at intervals of 375 – 400 ft using swivel “snap-on” clips. Gangions are made of single strand 300 lb. test monofilament and vary in length from 60 – 300 ft. Each hook is baited with a one-pound squid and a chemical “cyalume” light stick, used as an attractant, which is secured above the bait with a rubber band. High density, bullet-shaped foam buoys with dropper lines of 30 – 120 ft are clipped on to the main line at intervals of every two to four hooks, suspending the main line at the desired depth. Fishing depth can be varied by:

- changing buoy dropper lines,
- changing the distance between buoys to allow more or less sag in the mainline, or
- changing the gangion lengths.

“High flyer” poles with radar reflectors and/or strobe lights are placed at either end and at intervals along the main line to locate the gear. The main line is stored on a hydraulically-operated, level-wind spool. Gangions are stored on smaller hydraulically-operated spools and buoy dropper lines are stored on a

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Table 1. Average cost per trip for a 45-55 ft. swordfish longline vessel.* Data based on nine sets and two days travel for one vessel.

ITEM	COST/DAY	COST/TRIP
Food	\$75	\$825
Fuel	146	1,606
Bait	441	3,969
Lightsticks	546	4,914
Hooks	83	747
Monofilament line	119	1,071
Oil	3	30
Ice machine rental	20	220
Insurance	69	763
Misc.	<u>18</u>	<u>200</u>
Sub. Total	\$1,520	\$14,345
Dockage/water power**	16	176
Air freight/trucking	<u>45</u>	<u>500</u>
TOTAL	\$1,581	\$15,021

* = Average cost of operation for one swordfish longline vessel may or may not be representative of the fishery as a whole.
 ** = Prorated charge based on \$480/month.

spool or separately in a container.

The gear is usually set at sunset in the desired fishing area. Main line is played off the spool, over the stern, and the first high flyer is attached. Gangions, floats, and high flyers are snapped on at desired intervals as the vessel moves ahead slowly. As the main line goes out, hooks are baited and light sticks attached to the leaders with rubber bands (Berkeley *et al.*, 1981). After the set has been made, the vessel drifts with the gear nearby. Haul-back begins at dawn and the setting procedure is reversed. Fish are dressed and iced down during haul-back of the gear. Trips average 10 – 12 days including two days travel time. The general area fished is shown in Figure 1.

TRIP EXPENSES

The average trip expenses for one 45 – 55 ft swordfish vessel operating from St. Croix are shown in Table 1. Daily costs average \$1,500 and trip costs average \$15,000 for an 11-day trip (nine sets and two days travel). Light sticks (33%), bait (27%), and fuel (11%) account for more than 70% of the total trip expenses.

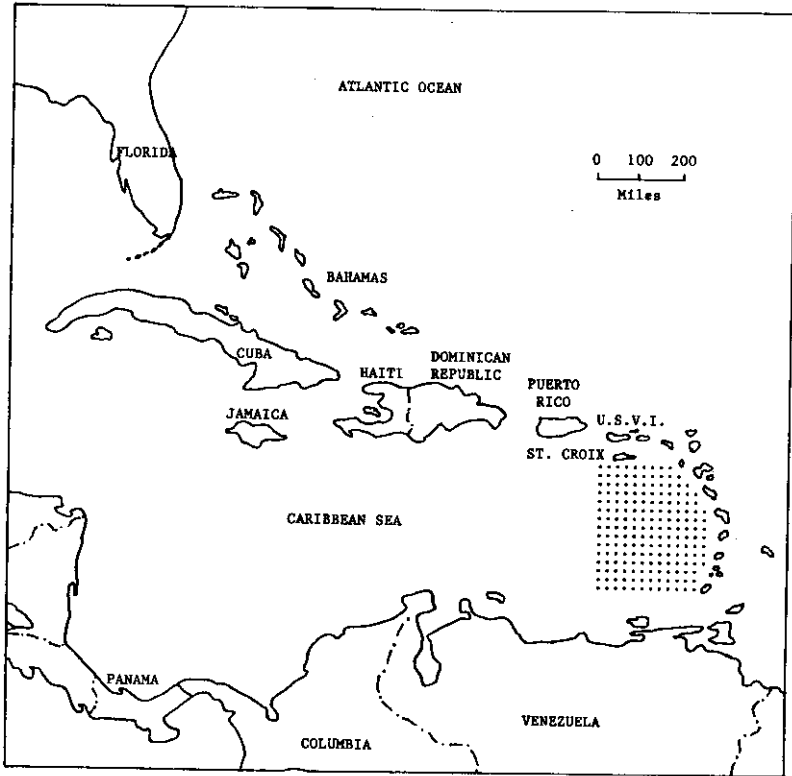


Figure 1. General location of area fished for swordfish by St. Croix-based U.S. swordfish vessels indicated by black, dotted grid. Map from Edwards *et al.*, 1989.

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Table 2. St. Croix 1987 swordfish landings and size composition.

Month	Landings Dressed Wt.	Mean Wt.	Total No.	% < 50 Lb.	No. < 50 Lb.
January	15,487	74.1	209	38.8	81
February	72,196	85.6	843	30.0 *	253*
March	81,160	77.1	1,053	32.9	346
April	12,172	47.7	255	56.1	143
May	5,304	58.9	90	50.0	45
June	15,446	51.7	299	59.2	177
July	18,803	49.2	382	66.5	254
August	17,398	41.6	418	61.7	258
September	17,585	48.8	360	55.0	198
October	20,487	49.2	416	50.2	209
November	44,569	35.4	1,259	33.4	420
December	59,258	60.0	987	41.4	409
TOTAL	379,865	56.6	6,571	42.5	2,793

*data set incomplete for February

LANDINGS DATA

Landings data were collected from dealer logbooks and site sampling. A total of 18 stateside vessels and one local St. Croix vessel made 208 longline trips in 1987, accounting for 6,571 swordfish weighing 379,865 lb dressed weight (Table 2). Mean weight of the fish was 56.6 lb. More than 50% of the swordfish caught from April through October were > 50 lb with July and August producing the greatest numbers (66.5% and 61.7%, respectively). Throughout the year an average of 47.9% of the swordfish were < 50 lb.

A total of 543,523 pounds of surface longline catch was landed by stateside vessels on St. Croix, 98% (494,735 lb) was shipped stateside and 2% (39,462 lb) was sold locally. The catch composition of stateside fish shipments is shown in Table 3. Seventy percent of the shipment by weight were swordfish, 29.5% tuna, and 0.5% shark. The percentage of yellowfin tuna and bigeye tuna was approximately 60% and 40%, respectively. One vessel re-rigged for bottom longlining in April as indicated by the catch of snapper and grouper.

Table 4 shows the catch composition of St. Croix-based longline vessels sold locally. Sixty-two percent comprised swordfish with an average weight of 24 lb (1,001 fish weighing 24,350 lb). Swordfish less than 24 lb in size, called "rats", do not command a premium price stateside and are not considered worth the airfreight costs to send. However, they are easily sold locally to restaurants lacking storage space for larger fish. Tuna represents 25% of the catch sold locally. Dolphin, attracted to the surface gear and the vessel and caught by the

Table 3. Catch composition of stateside fish shipments from St. Croix in 1987. Data includes tuna from one local vessel. Locally sold catch is not included. (* = Mixture of yellowfin and bigeye tuna; ** = Albacore tuna; *** = Mako shark; YF = yellowfin tuna; BI = bigeye tuna)

Month	No. Trips	No. Vessels	Swordfish #	Swordfish Wt.	YF Tuna #	YF Tuna Wt.	BI Tuna #	BI Tuna Wt.	UNK Tuna* #	UNK Tuna* Wt.	Shark*** #	Shark*** Wt.	Snap Group Wt.	
Jan.	6	4	151	12,619					34	3,027				
Feb.	23	11	612	68,869	1	88	2	118	22	1,509	2	393		
Mar.	19	10	885	75,534	4	368	10	783	83	7,558	1	185		
Apr.	16	6	120	7,815					8	737			7,931	
May	6	6	30	2,742										
Jun	7	3	248	14,310	54	4,206	41	3,528			2	286		
July	4	3	346	18,067	69	5,441	81	7,307						
Aug.	5	3	372	16,535	112	9,089	41	3,787	16	1,518				
Sept.	6	5	333	16,760	128	9,840	49	4,269	1	42**				
Oct.	8	4	358	19,552	158	12,752	54	4,892			1	99		
Nov.	10	5	1,109	42,302	341	26,750	154	13,015			2	315		
Dec.	13	8	839	56,608	171	12,493	156	13,094			3	534		
Total	123	18	5,403	345,713	1,038	81,027	588	50,792	163	14,391	11	1,812	7,931	1,395

Table 4. Catch composition of St. Croix-based longline vessels sold locally. (* = yellowfin and bigeye tuna; ** = rainbow runner; YF = yellowfin, BI = bigeye tuna, BF = blackfin tuna, AL = albacore)

Month	Swordfish #	Wt.	YF		BI		BF		AL		UNK.		Dolphin #	Wt.	Wahoo #	Wt.	Escolar #	Wt.	Marlin #	Wt.	Shark #	Wt.	Other** #	Wt.		
			#	Wt.	#	Wt.	#	Wt.	#	Wt.	#	Wt.														
Jan.	23	580					8	71			3	142	7	217	1	52										
Feb	197	6,833					4	30			21	859	43	937												
Mar	135	3,742					1	7			17	1,154	214	1,121	3	132										
Apr.	92	1,988									10	136	15	341	1	38	3	175	10	512						
May	58	2,455									8	708	4	71	1	27										
Jun.	51	1,136									9	677	4	99	5	113										
Jul.	36	736									16	1,092	5	100	3	78										
Aug.	34	463	4	282	1	88	5	46			18	1,417			9	165										
Sep.	24	744									4	298			5	113										
Oct.	55	849													1	34	3	81					1	14		
Nov.	150	2,267	14	942			4	45			4	186	3	82			1	44					2	315		
Dec.	146	2,557	13	931	1	105			7	324	12	155	11	256	7	115							1	55		
Total	1,001	24,350	31	2,155	3	323	22	199	7	324	122	6,824	307	3,258	38	914	4	219	10	512			3	370	1	14

crew during haul-back of the longline with handline or rod and reel, represent 8% of the by-catch sold locally.

Monthly catch data for one locally-owned and operated St. Croix swordfish longline vessel, a converted 37 ft sportfisherman, is shown in Table 5. A total of 8,802 lb of swordfish and 13,597 lb of tuna were landed by this vessel in 1987, in addition to 8,249 lb of other surface by-catch species. The data reflect an effort targeting for swordfish from January through April, followed by a gear change to bottom longlining for snapper and grouper from May through August. Surface longlining was again started in August with emphasis on tunas for the remainder of the year.

A comparison of catch composition by weight for stateside vessel landings versus the one local St. Croix vessel landings is shown in Table 6. Stateside vessel landings were represented by 70% swordfish and 29% tuna, compared to 29% swordfish and 44% tuna on the local vessel. The difference is primarily due to the daytime sets concentrating for tuna by the St. Croix vessel. The high percentage of marlin caught by the St. Croix vessel (12%) is also a result of daytime tuna sets. Shark, dolphin, and escolar represented 9%, 2% and 2% respectively, of the St. Croix vessel landings. By-catch landings of the stateside vessels, fish other than the target species—swordfish and tuna, accounted for only 1% of the total landings.

SHIPPING

Swordfish and tuna destined for stateside market are handled by a local agent for airfreight shipment on wide-body commercial airlines or on private charter flights. Prior to shipment, each fish is weighed and identified with a tag containing the vessel's initials, fish species and weight. The fish are then packed in plastic-lined, insulated containers with a capacity of 2,600 – 3,000 lb and trucked to the airport. Local shipments may be sent to neighboring Virgin Islands by interisland freighter in insulated styrofoam containers with a capacity of 200 lb.

FISH PRICES

Table 7 shows the ex-vessel swordfish and tuna prices for the months of August and December, 1987. August is typically a time when the market is flooded with a surplus of fish and prices are low, while December represents a period of fewer fish and higher prices. More than 70% of the swordfish landed during both periods are from the medium-priced category 2 and 3 fish while approximately 25% are category 1 top dollar fish. Tuna reflect the same summer/winter stateside price trend as swordfish; however, at no time of the year does top grade tuna represent more than 10% of the vessel's catch.

Based on 1987 Caribbean swordfish landings of 1,677,000 compiled by the National Marine Fisheries Service, Southeast Fisheries Center (John Hoey,

Table 5. Longline catch records for one locally-owned and operated St. Croix swordfish vessel, 1987. (Catch reflects the effort on one vessel and may or may not be representative of the fishery as a whole).

Month	Trips	Swordfish		Tuna		Dolphin		Marlin		Shark	Escobar	SP.		SA.		Snap Group	
		#	Wt.	#	Wt.	#	Wt.	#	Wt.			Fish	Wt.	Fish	Wt.		Wt.
Jan.	15	35	2,288	9	321	18	208	5	471	4	168	2	45	2	65		
Feb.	10	34	1,494	7	163	9	158	8	689	16	813	2	118	1	42	1	
Mar.	10	33	1,884	14	487	3	66	5	382	8	807	3	189	4	165		
Apr.	6	43	2,369	5	217	2	45	15	826	5	409	4	228			2,049	
May	7	2	107							2	29					971	
Jun.	6									1	7					814	
Jul.	6															1,997	
Aug.	6	12	400	31	2,246									2	82	484	
Sep.	5	3	81	42	3,012			5	373	7	375			1	26		
Oct.	5	3	86	37	2,911	2	41	5	352	2	130						
Nov.	4	4	93	32	2,422	2	19	5	335	3	35	2	131				
Dec.	5	2	93	29	1,819	2	70	2	148	2	90	1	52		1	16	
Total	85	167	8,802	206	13,597	38	607	50	3,575	50	2,863	12	718	7	252	2	61
																5	173
																5,501	2,525

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Table 6. Percent composition of St. Croix surface longline fishery landings, 1987. Data based on weight.

Species	PERCENT COMPOSITION (%)	
	Stateside Vessels	Local Vessel
Swordfish	70	29
Tuna	29	44
Marlin	< 0.1	12
Shark	< 0.5	9
Dolphin	< 1	2
Escolar	< 0.1	2
Wahoo	< 0.5	< 1
Spearfish	< 0.1	< 1
Sailfish	< 0.1	< 1
Other	< 0.1	< 1

Table 7. Ex-vessel swordfish and tuna prices, 1987. (Swordfish categories are based on size: Cat. 1 > 100 lbs., Cat. 2 = 50-99 lbs., Cat. 3 = 25-49 lbs., Cat. 4 = 0 - 24 lbs. Tuna Grades are based on quality.)

CATCH DESCRIPTION		PRICE PER POUND		PERCENT CATCH	
		August	December	August	December
Swordfish whole	Cat. 1	4.25	5.00	24	27
	Cat. 2	3.50	4.75	53	52
	Cat. 3	3.00	4.25	20	18
	Cat. 4	2.50	2.50	3	3
Tuna fish whole	Gra. 1	3.00	3.50	4	10
	Gra. 2	2.50	3.00	6	10
	Gra. 3	1.75	2.25	24	74
	Gra. 4	1.50	1.25	31	6
	Gra. 5	1.25	-	11	-
	Gra. 6	.75	-	24	-

personal communication), St. Croix 1987 landings of 379,865 pounds represents 23% of the recorded Caribbean catch.

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