

## BILLFISH BYCATCH OBSERVER DATA OF THE U.S. SWORDFISH LONGLINE FLEET, ST. CROIX, U.S. VIRGIN ISLANDS - 1988 AND 1989

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## SUMMARY

In 1987 and 1988, U.S. registered swordfish longline vessels landed 247 MT (172 MT swordfish) and 362 MT (250 MT swordfish) of surface longline catch, respectively, on St. Croix for air shipment to the United States. The passively fishing, non-discriminatory longline gear also catches billfish other than swordfish (blue marlin - Makaira nigricans Lacepede, white marlin - Tetrapterus albidus Poey, longbill spearfish - Tetrapturus pfluegeri Robins and de Sylva, and Atlantic sailfish - Istiophorus albicans Latrille) as by-catch. Although registered U.S. vessels report billfish on daily logbook forms as required by law, sale of billfish in U.S. ports is not allowed under the U.S. Fishery Management Plan for billfish. Absent from weighout sheets and dealer records, size-specific billfish by-catch from swordfish longline vessels is relatively unknown and unavailable, except by onboard observer data.

Two trips were made as observer/crewman onboard a 15 m swordfish longline vessel from St. Croix, comprising 14 observer days (November 26 - December 1, 1988 and March 12 - March 20, 1989). Based on the total number of fish caught, the proportion of billfish caught was 5 percent for both trips. On average, one billfish was caught for every 336 hooks set. There were 14 blue marlin, two white marline and one spearfish caught, representing 82%, 12% and 6% of the total number of billfish caught respectively. Sixty-four percent of the blue marlin caught were live and released in good condition. Data from two observer trips and the total longline effort of the St. Croix swordfish fleet were used to provide preliminary estimates of the billfish caught by the fleet. These estimates were, 1,230 billfish in 1987 and 910 billfish in 1988.

## RESUME

En 1987 et 1988, les palangriers américains d'espadon enregistrés ont débarqué 247 TM (172 TM d'espadon) et 362 TM (250 TM d'espadon) de prises palangrières de surface sur St. Croix et transporté par avion aux Etats-Unis. La palangre qui pêche de façon non discriminatoire et passivement capture également des istiophoridés autres que l'espadon (makaira bleu - Makaira nigricans Lacepede, makaira blanc - Tetrapterus albidus Poey, "longbill spearfish" - Tetrapturus pfluegeri Robins et de Sylva et le voilier de l'Atlantique - Istiophorus albicans Latrille) en tant que prises accessoires. Bien que les navires américains enregistrés signalent de façon journalière les prises d'istiophoridés sur des livres de bord tel que la loi l'exige, la vente de cette espèce dans les ports américains est interdite par le "U.S. Fishery Management Plan" pour les istiophoridés. Les prises fortuites spécifiques de taille des palangriers d'istiophoridés, absentes des livres de bord et des registres des marchands, sont pratiquement inconnues et donc non disponibles, sauf les données d'observateur à bord.

Deux sorties ont été effectuées par des observateurs/équipage à bord d'un palangrier de 15m pêchant l'espadon à St. Croix, comprenant 14 jours d'observation (26 novembre - 1er décembre 1988 et 12 mars - 20 mars 1989). Sur la base du nombre global des poissons capturés, le pourcentage des istiophoridés capturés était de 5% pour les deux sorties. En moyenne, un istiophoridé était capturé chaque 336 lancers. Quatorze makaires bleus, deux makaires blancs et un "spearfish" ont été capturés, ce qui représente respectivement 82%, 12% et 6% du nombre total d'istiophoridés capturés. Soixante-quatre % des makaires bleus pris étaient vivants et relâchés dans de bonnes conditions. Les données des deux sorties d'observation et l'effort global palangrier de la flottille d'espadon de St. Croix ont été utilisés pour fournir des estimations préliminaires sur les istiophoridés capturés par cette flottille. Ces estimations s'élevaient à 1.230 istiophoridés en 1987 et à 910 en 1988.

## INTRODUCTION

## RESUMEN

En 1987 y 1988, los palangreros norteamericanos matriculados que persiguen el pez espada desembarcaron 247 t (172 de pez espada) y 362 t (250 t de pez espada) de la captura de palangre de superficie, respectivamente, para su envío aéreo desde St. Croix a Estados Unidos. La pesca pasiva con palangre no discriminatoria también captura marlines además de pez espada (aguja azul - Makaira nigricans, Lacepede; aguja blanca - Tetrapturus albidus, Poey; Tetrapturus pfluegeri, Robins y de Sylva, y pez vela atlántico - Istiophorus albicans, Latrille, como captura secundaria. Aunque los barcos matriculados en Estados Unidos informan sobre las capturas de marlines, anotándolas a diario en los cuadernos de pesca, tal como está legislado, según el "Fishery Management Plan for Billfish", la venta de marlines en los puertos norteamericanos no está permitida. Ausente de los impresos de peso y registros de los comerciantes, la talla específica capturada por los palangreros que se dirigen al pez espada sigue siendo relativamente desconocida, y no se puede disponer de datos, excepto los que facilitan los observadores a bordo.

Se llevaron a cabo dos viajes con un observador/tripulante a bordo de un barco palangrero de 15 metros dirigido al pez espada, en St. Croix, que abarcó 14 días de observación (26 noviembre - 1 diciembre, 1988, y 12 marzo - 20 marzo, 1989). Basándose en el número total de peces capturados, la proporción de marlines fue del 5% en ambos viajes. Como promedio, se capturó un marlin por cada lance de 336 anzuelos. Se obtuvieron 14 agujas azules, dos agujas blancas y un Tetrapturus pfluegeri, que representó el 82%, 12% y 6% del número total de marlines capturados, respectivamente. El 64% de las agujas azules capturadas estaban vivas, liberándose en buenas condiciones. Los datos de los dos viajes de observadores, y el esfuerzo total de palangre de la flota de pez espada de St. Croix se utilizó para proporcionar buenas estimaciones preliminares de los marlines capturados por la flota. Estas estimaciones eran de 1230 marlines en 1987 y de 910 marlines en 1988.

Swordfish (Xiphias gladius Linnaeus) have been actively pursued by surface longline methods in the tropical Atlantic since the mid-1960's (Guitart-Manday, 1964; 1975). Gear modifications that have occurred through the development of the fishery in the Straits of Florida in 1975 and the Caribbean Sea in 1983 have been discussed by Berkley, et. al. (1981) and Tobias (In press), respectively. The surface longline gear passively drifts with the prevailing current catching fish encountered during its period of deployment. As such, the gear is nondiscriminatory and the catch is comprised of pelagic fish species including other billfish, tunas and sharks (Berkley et. al., 1981; Wood, 1986, Tobias, In press).

By 1987, the United States Caribbean swordfish longline fleet had expanded to more than 35 vessels ranging in size from 11-55 m. Ports on St. Croix, U.S. Virgin Islands, became popular with captains of primarily south Florida vessels 14-17 m in length (Taniguchi, 1987). St. Croix's popularity was due to several important factors. Located 167 km southeast of San Juan, Puerto Rico, St. Croix's proximity to the southern Caribbean fishing grounds saved two days travel time per trip. Air shipment of catch directly to the United States was possible via major air carriers. After some initial problems, the U.S. Food and Drug Administration (FDA) reclassified St. Croix as a U.S. port; therefore, not requiring inspection and detainment of swordfish shipments.

Data collected by Tobias (In press) on the catch composition of stateside fish shipments from St. Croix in 1987 show that billfish other than swordfish do not appear on weighout sheets or dealer records. Due to the non-discriminatory nature of the swordfish longline gear, the amount of gear deployed and the time required for haulback of the gear during daylight hours, it is believed that billfish, such as blue marlin (Makaira nigricans Lacepede), white marlin (Tetrapturus albicans Poey), spearfish (Tetrapturus pfluegeri, Robins and De Sylvania) and sailfish (Istiophorus albicans Latrille), may make up a substantial portion of the swordfish longline bycatch. This report presents billfish bycatch data from two observer trips onboard a St. Croix-based swordfish longline vessel. Estimates of billfish bycatch are also made for the 1987 and 1988 landings of the St. Croix swordfish fleet.

## METHODS

Data on billfish bycatch were obtained by the author participating as observer/crewman aboard a U.S. registered 15 m swordfish longline vessel. Two trips were made, November 26 to December 1, 1988 (six sets) and March 12 to March 20, 1989 (eight sets). Data collected included information on latitude and longitude of set, water temperature, wind speed and direction, wave direction and height, gear length, depth range, hook and floatline length, bait, number of hooks, number of lightsticks, number of floats and catch description. Measurements of lower jaw fork length (LJFL) and weight (estimated) were made on each fish (bycatch and target species) brought onboard and fish sex determined. The condition (living or dead) of each fish when brought to the vessel was also recorded. Live billfish and other species were tagged whenever possible by the vessels's captain.

## RESULTS and DISCUSSION

Figure 1 shows the general area fished by the St. Croix-based U.S. swordfish vessels. A typical set for vessels 14-17 m in length consisted of 50 km of mainline and 420 hooks.

Catch composition for the vessel trips observed for the November 1988 and March 1989 are shown in Tables 1 and 2, respectively. A total of 2,352 hooks were set on the six-day trip in November 1988 (Table 1), resulting in the catch of 75 swordfish, 38 tuna, 12 shark, nine billfish and 36 other non-commercial fish (i.e., batrays). In relation to the total number of fish caught, the percentage of swordfish, tuna, shark, billfish and others was 44%, 22%, 7%, 5% and 22%, respectively. During this trip, one billfish other than a swordfish, was caught per every 261 hooks set.

A total of 3,276 hooks were deployed over eight days fishing for the March 1989 observer trip (Table 2). The catch was comprised of 105 swordfish, 20 tuna, 25 shark, eight billfish and 20 other fish. The percentage of swordfish, tuna, shark, billfish and other species caught was 59%, 11%, 14%, 5% and 11%, respectively. Based on the total number of hooks deployed, one billfish was caught for every 410 hooks set.

The catch composition and catch condition of billfish species caught in November 1988 and March 1989 swordfish longline observer trips are shown in Table 3. A total of 17 billfish were caught in 14 observer days, nine blue marlin during the November 1988 trip and five blue marlin, two white marlin and one spearfish during the March 1989 trip. Of the 14 blue marlin caught, nine (64%) were alive and in good condition when brought to the boat. One of the two white marlin caught (50%) was live and in good condition when brought to the boat. The only spearfish caught was hauled in dead. No sailfish were caught. Relative to the total billfish caught, the percentage of blue marlin, white marlin and spearfish was 82%, 12%, and 6% respectively.

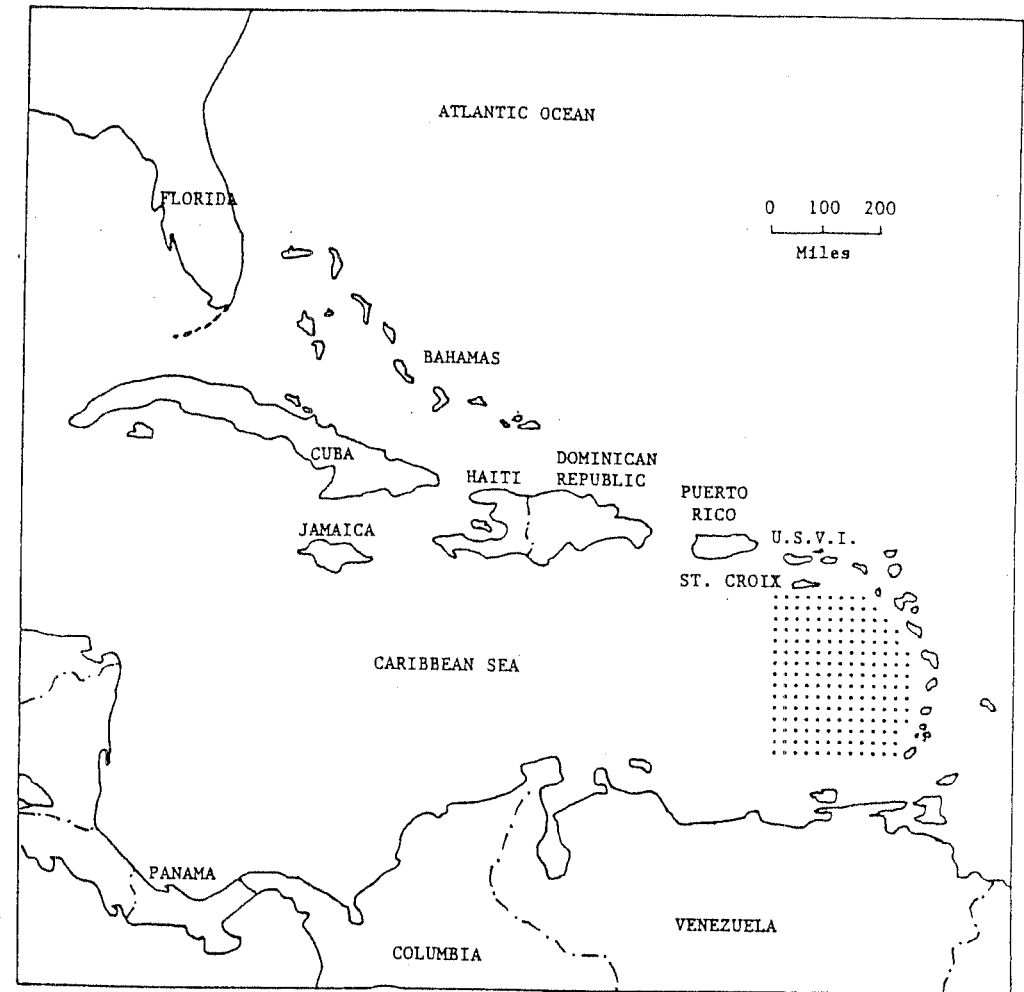


FIGURE 1. General location of area fished for swordfish by St. Croix-based U.S. swordfish vessels - ..... Map from Edwards et. al., 1989.

TABLE 1. Catch composition from observed longline sets, November 26 - December 1, 1988.

DATE	# HOOKS SET	SPECIES CAUGHT				
		Swordfish	Tuna	Shark	Billfish	Other
11-26-88	420	9	10	2	4	4
11-27-88	420	16	8	3	0	3
11-28-88	336	14	1	2	0	3
11-29-88	336	10	6	2	1	8
11-30-88	420	15	9	1	3	13
12-01-88	420	11	4	2	1	5
TOTALS: N=6	2,352	75	38	12	9	36
Percentage of total catch		44%	22%	7%	5%	22%

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TABLE 2. Catch composition from observed longline sets, March 13-20, 1989.

DATE	# HOOKS SET	SPECIES CAUGHT				
		Swordfish	Tuna	Shark	Billfish	Other
03-13-89	420	15	0	2	2	2
03-14-89	420	13	1	2	1	1
03-15-89	420	7	2	2	1	2
03-16-89	380	11	3	1	0	4
03-17-89	398	19	6	3	0	4
03-18-89	398	9	1	5	1	2
03-19-89	420	18	4	5	2	2
03-20-89	420	13	3	5	1	3
TOTALS: N=8	3,276	105	20	25	8	20
Percentage of total catch		59%	11%	14%	5%	11%

TABLE 3. Catch composition and condition of billfish species caught on the swordfish longline sets observed, November 26 - December 1, 1988 and March 13-20, 1989.

DATE	BILLFISH SPECIES					
	Blue Marlin		White Marlin		Spearfish	
	live	dead	live	dead	live	dead
11-26-88	3(1*)	1				
11-29-88	1					
11-30-88	1	2				
12-01-88	1*					
03-13-89	1*					
03-14-89		1				1
03-15-89		1				
03-18-89	1*					
03-19-89			1*	1		
03-20-89	1					
TOTALS	9(4)*	5	1*	1	0	1
Percentage of Billfish Catch	82%		12%		6%	

\* indicates fish tagged

The amount of billfish bycatch caught on swordfish longline vessels will vary depending on the fishing location, fishing experience of the captain, fishing season, amount of time the gear fishes during the day, lunar phase, meteorological conditions and ocean current patterns. Wood (1986) reported 14 blue marlin, one white marlin and two sailfish caught in 78 longline sets from October 1984 to December 1985 with the percentage of billfish catch 5%, 4% and 7% respectively, relative to the entire catch. This accounts for one billfish for every 294 hooks set. Fifty percent of the blue marlin were alive and released. Both the white marlin and two sailfish caught were boated dead. Proportion of the catch calculated for marlin (undetermined species), spearfish and sailfish from one local St. Croix swordfish vessel was 9%, 1% and 4% respectively (Tobias, In press).

In 1987 and 1988, U.S. swordfish vessels landed 247 mt (172 mt swordfish) and 362 mt (250 mt swordfish) of surface longline catch, respectively, on St. Croix for air shipment to the United States (Tobias, In press). The observer data presented in this paper allows the following calculations to estimate the total billfish by-catch from the St. Croix swordfish fleet for 1987 and 1988. These estimates are also separated by species for each year.

In 1987, 18 vessels landed catch on St. Croix from 123 swordfish longline trips.

Assuming:

- 123 trips x 8 fishing days/trip = 984 fishing days
- 984 fishing days x 420 hooks/day = 413,280 hooks set
- 413,280 hooks set x one billfish/336 hooks set = 1,230 billfish caught (261 + 410/2)

Therefore:

- 1,230 billfish x 0.82 proportion of billfish that were blue marlin = 1,009 blue marlin
- 1,230 billfish x 0.12 proportion of billfish that were white marlin = 148 white marlin
- 1,230 billfish x 0.06 proportion of billfish that were spearfish = 74 spearfish
- 1,230 billfish x 0.004 proportion of billfish that were sailfish = 5 sailfish

In 1988, 19 vessels landed catch on St. Croix from 91 swordfish longline trips.

Assuming:

- 91 trips x 8 fishing days/trip = 728 fishing days
- 728 fishing days x 420 hooks/day = 305,760 hooks set
- 305,760 hooks set x one billfish/366 hooks = 910 billfish

Therefore:

- 910 billfish x 0.82 proportion of billfish that were blue marlin = 746 blue marlin
- 910 billfish x 0.12 proportion of billfish that were white marlin = 109 white marlin
- 910 billfish x 0.06 proportion of billfish that were spearfish = 55 spearfish
- 910 billfish x 0.004 proportion of billfish that were sailfish = 4 sailfish

Assuming a survival rate of 50-70% for blue marlin caught on longline gear (Wood, 1986; CFMC, 1987; Edwards, 1989), an estimated 505-767 blue marlin caught in 1987 and 373-567 blue marlin caught in 1988 would have been released live. The lack of adequate observer data on white marlin, spearfish and sailfish caught on longline gear preclude making survival rate determinations for these billfish species. Estimates of total billfish catches and survival presented in this paper are tenuous since only a small proportion (1%) of the total swordfish longline effort off St. Croix was sampled.

Data presented by Brandon (1985) show that water adjacent to the U. S. Virgin Islands are some of the most productive in the world for blue marlin. As a result, the recreational billfish fishery annually contributes more than five million dollars into the U. S. Virgin Islands' economy. The potential for conflict between recreational and commercial fishermen has been decreased with the development of a U. S. Billfish Management Plan directed at conserving the resource for the recreational fishery (CFMC, 1987). However, at present, a sufficient database does not exist on billfish bycatch to determine if these management measures are sufficient to maintain the fishery. As an example, observer data presented in this paper represent less than one percent of the fishing days of the swordfish vessels on St. Croix for the combined 1987 and 1988 years. To fully understand the impact of the Caribbean swordfish longline fishery in terms of bycatch on billfish populations and to provide accurate baseline data for resource managers, an observer program should be developed to encompass annual data collection in sufficient quantity for the Caribbean swordfish longline fishery.

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