TAG AND RELEASE OF JUVENILE SWORDFISH OFF VENEZUELAN INDUSTRIAL LONGLINE VESSELS

Freddy Arocha[1] and Eric D. Prince[2]

SUMMARY

A tagging program was started by the pelagic longline observer program in Venezuela to tag and release juvenile swordfish from industrial longline vessels fishing off Venezuela and adjacent waters. A total of 68 juvenile swordfish (40-105 cm LJFL) were successfully tagged and released from October, 1996, to August, 1998. Most the tag-released fish came from the central coast, between 64° and 70°W. The majority of the individuals tagged were 85 and 100 cm LJFL, and weighed about 8 kg round weight. The observers who conducted the tagging indicated that all of the released fish were in good condition and had survived the tagging. A new miniaturized nylon anchor dart tag (NMFS series SW tag) was used on most of these releases because of the small average size of the swordfish involved and the need to minimize trauma to juvenile size fish.

RÉSUMÉ

Un projet de marquage a été mis en route par le programme d'observateurs sur palangriers au Venezuela pour marquer et relâcher des juvéniles d'espadon pris par des palangriers industriels pêchant au large du Venezuela et dans les eaux adjacentes. En tout, 68 espadons juvéniles (40-105 cm de LJFL) ont été remis à l'eau porteurs de marques entre octobre 1996 et août 1998. La plupart de ces poissons provenaient de la côte centrale, entre 64° et 70° de longitude ouest. Ils mesuraient en majorité de 85 cm à 100 cm de LJFL, et pesaient environ 8 kg de poids vif. Les observateurs qui ont effectué le marquage ont signalé que tous les poissons relâchés étaient en bon état, et avaient survécu au marquage. Une nouvelle marque à dard avec ancre en nylon (série SW du NMFS) a servi pour la plupart de ces marquages à cause de la taille moyenne réduite des espadons concernés et de la nécessité de minimiser les traumatismes infligés aux juvéniles.

RESUMEN

El observador de un programa de palangre pelágico en Venezuela inició un programa para marcar y liberar pez espada juvenil de los barcos palangreros industriales que faenan en aguas frente a Venezuela y en aguas adyacentes. Se marcó y liberó con éxito un total de 68 peces espadas juveniles (40-105 cm LJFL) desde octubre de 1996 a agosto de 1998. La mayor parte de los peces marcados y liberados procedían de la costa central, entre 64° y 70°W. La mayoría de los individuos marcados medían entre 85 y 100 c, LJFL, y pesaban en torno a 8 kg peso vivo. Los observadores que llevaron a cabo el marcado indicaron que todos los peces liberados estaban en buen estado, y que habían sobrevivido a la experiencia del marcado. En la mayor parte de estos marcados se utilizó una nueva marca-dardo, con una nueva ancla de nylon miniaturizada (marca de la serie SW de NMFS) dado el promedio de peces espada de pequeña talla implicados, y la necesidad de minimizar el trauma de los peces de talla juvenil.

1 Departamento de Biología Pesquera, Instituto Oceanográfico de Venezuela, Universidad de Oriente, Apartado de Correos No. 204, Cumaná 6101, Venezuela.

2 National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149, USA.

INTRODUCTION

A recent study in swordfish reproductive dynamics hypothesized a general life history strategy for the species in the northwestern Atlantic (Arocha, 1997). This study indicated that larval cohorts from the group that spawns off the southwestern Sargasso area from December to May will most likely be transported into the Caribbean through the Lesser Antilles and the Windward Passage. Juvenile swordfish transported in this way then use the Caribbean waters off Venezuela as a nursery area due to the high productivity in the region, until sexual maturity is reached. After sexual maturity, specimens would move north, either to spawn and/or feed in more productive areas, as indicated by tagging records (Jones *et al.*, 1996). However, only four tagged recaptured records indicate a south to north movement pattern, from the Caribbean and central western Atlantic waters to Puerto Rico and Southeastern U.S. coasts.

Because of the opportunity of having a pelagic longline observer program in Venezuela (established through the ICCAT Enhanced Research Program for Billfish) and the willingness of captains and crews to participate in tagging experiments, a pilot study was carried out in late 1996 to examine the feasibility of tagging juvenile swordfish from industrial longline vessels in the region. With positive pilot study results and the support from ICCAT's Enhanced Research Program for Billfish, an expanded tagging program to tag and release juvenile swordfish was started in January of 1997. The purpose of the program is to tag as many juvenile swordfish as possible. Releases were restricted to those swordfish that are observed alive when brought along side Venezuelan industrial longliners fishing in the Caribbean and adjacent waters. The duration of the program will depend on the availability of adequate tags and the cooperation of captains and crews on the vessels. It is expected that this effort will contribute to our knowledge of juvenile swordfish movements in the western central Atlantic, and to allow further evaluation of swordfish movement patterns from Caribbean Sea nursing grounds.

Information is presented for individual swordfish successfully tagged and released during the first 18 months of the program, including the geographical location of release, as well as the seasonal size distributions of the released fish.

METHODS

A total of 68 juvenile swordfish (40 – 105 cm LJFL - estimated) were successfully tagged and released from October 1996 to August 1998. Five specimens were tagged with ICCAT's TG tuna tags, and another five were tagged with BF series tags from The Billfish Foundation. The remaining 58 individuals, were tagged using a special miniaturized version of the HM tag (SW series has a 50% reduction in anchor size) which was recently introduced by the NMFS Cooperative Tagging Center. This tag is constructed of medical-grade nylon with dual barbs and is used with a stainless steel applicator for tag placement (Jones *et al.*, 1995). The anchor of the SW tag was designed to be secured in the dorsal musculature, and by using medical-grade nylon, the rejection rate of the tag by the fish was expected the be significantly reduced. Use of a smaller size anchor (i.e. SW tag) was considered critical to minimize tagging trauma as the average size of juvenile swordfish involved in this study were judged to be to small for the larger tags issued by ICCAT, The Billfish Foundation, or NMFS for adult tuna, swordfish, and billfish.

The tagging procedure used varied according to the vessel , condition of the sea, and the condition of the fish. In most cases, the fish was brought as close as possible to the boat and the tag was placed above the lateral line and posterior to the head and gill plates without taking the fish out of water. However, on occasion fish were pulled out of the water to have a better angle when placing the tag and for estimating size and weight. This was only done when the size and condition of the fish permitted easy handling. Once tagged, the leader was cut close to the hook, or in other occasions the hook was removed. Notes on the condition of the tag-released fish and other factors potentially affecting survival were made by observers.

Lengths and weights were normally estimated by the observer, who recorded lower jaw fork length (LJFL) in centimeters (cm). However, captains occasionally provided estimates of weight in pounds. All estimated weights in pounds were later converted to kilograms.

Release information was recorded on the tag release report cards (Fig. 1) distributed as part of the NMFS Cooperative Tagging Center (CTC) tagging kit. These data are submitted to the Western Atlantic Coordinator of the ICCAT Enhanced Research Program for Billfish on a quarterly basis. The data are then quality controlled and entered as part of the CTC data base. The updated CTC data base is submitted to ICCAT once each year.

RESULTS

The majority of the individuals were tagged and released off the central coast of Venezuela, between 64°and 70°W (Fig. 2), in areas where most of the Venezuelan longline fishing for swordfish takes place. Specific fishing locations are between and around the offshore island passages, and over deep basins off the central Venezuelan coast. Other tag and release locations included an area off the Guajira Peninsula (northeast of 72°W), and off Guyana and Suriname in the Atlantic Ocean. The individuals tagged and released of the Guajira Peninsula were in the length range of 90 - 101 cm LJFL, while those tagged off Guyana and Suriname ranged in size from 59 - 105 cm LJFL (Table 1).

The estimated size frequency distribution illustrates that the majority of the individuals tagged and released were 85 and 100 cm LJFL (Fig. 3 a). Most of these specimens weighed around 8 kg whole weight, as illustrated in the estimated weight distribution (Fig. 3 b). Only one fish less than an estimated 60 cm LJFL, weighting an estimated 2 kg, was tagged and very few fish tagged exceeded an estimated 10 kg in weight. The small average size of these tag released swordfish reinforced our feeling that a small tag was necessary to insure survival and minimize tagging trauma. The estimated seasonal size distributions show a predominance of tagged fish

during the third quarter, while the number of tagged released fish in rest of the year remains relatively stable (Fig. 4). In the first and fourth quarters of the year, the estimated size of tagged individuals tends to include the larger size classes (> 70 cm LJFL), while the estimated size distribution in the third quarter is more evenly distributed. The smallest and largest individuals tended to be tagged during the second quarter.

The observers indicated that most of the tag released fish were in good condition. Upon release, many of the fish would swim close to the boat for about 2-3 minutes, thereafter; the fish would dive and rapidly swim away. On a few occasions, the tagged fish would swim sideways only to recuperate a few minutes later and then aggressively swim away, showing no signs of exhaustion or visible damage.

LITERATURE CITED

Arocha, F. 1997. The reproductive dynamics of swordfish *Xiphias gladius* L. and management implications in the northwestern Atlantic. PhD Dissertation, University of Miami. 383 p.

Jones, C. D., D. Rosenthal, M. Judge, and E. D. Prince. 1996. Cooperative Tagging Center Annual Newsletter: 1996. NOAA Tech. Mem. NMFS-SEFSC-391, 22 p.

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Figure 1. Tag release card issued by the NMFS Cooperative Tagging Center includes all the information required to document the tag release event.

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OMB Approved No 0648-0009

FISH TAGGING REPORT (PLEASE PRINT)

Please complete applicable items and return card today Otherwise tagging is of no value

TAGGING DATE	LOCALITY	TAG NO. SW 00475
SPECIES	LENGTH (Est) IN	WEIGHT (Est) LB
ANGLER	CAPTAIN	
ADDRESS	ADDRESS	
CITY/STATE/ZIP	CITY/STATE/ZIP	
FISH TAGGED ☐ IN BOAT ☐ IN WATER	☐ LANDING NET	
FISH CONDITION	HOOKS REMOVED ☐ YES ☐ NO, LEADER CUT	
SEND MORE TAGS TO ☐ CAPTAIN ☐ ANGLER	QUANTITY	CLUB

This Repon is authorized by U.S.C.P.L. 86-359. While you are not required to respon[illegible] cooperation is needed to make the results of this survey comprehensi[illegible]urate, and timely.

Figure 2. Map showing locations of juvenile swordfish tagged and released by observers on board Venezuelan industrial longline vessels, 1996-1998.

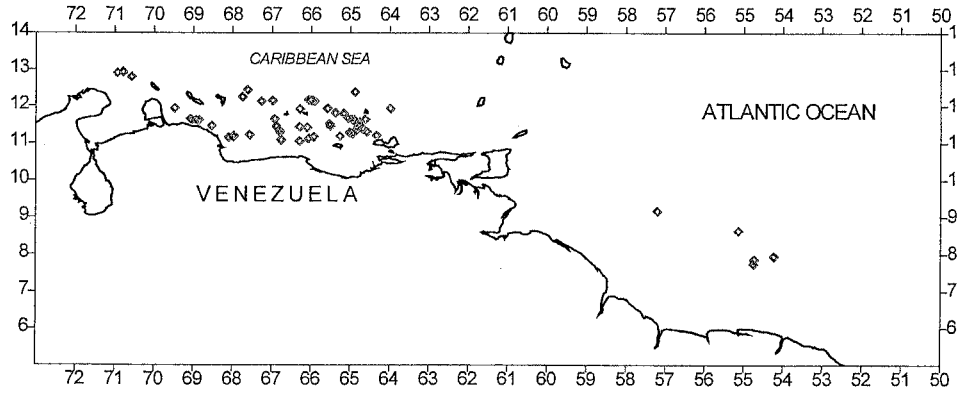

Figure 3. Length (A) and weight (B) frequency distributions of the numbers of tagged-released juvenile swordfish (SWO), 1996-1998. Lower jaw fork length (LJFL) is in centimeters (cm) and whole weight is in kilograms (kg).

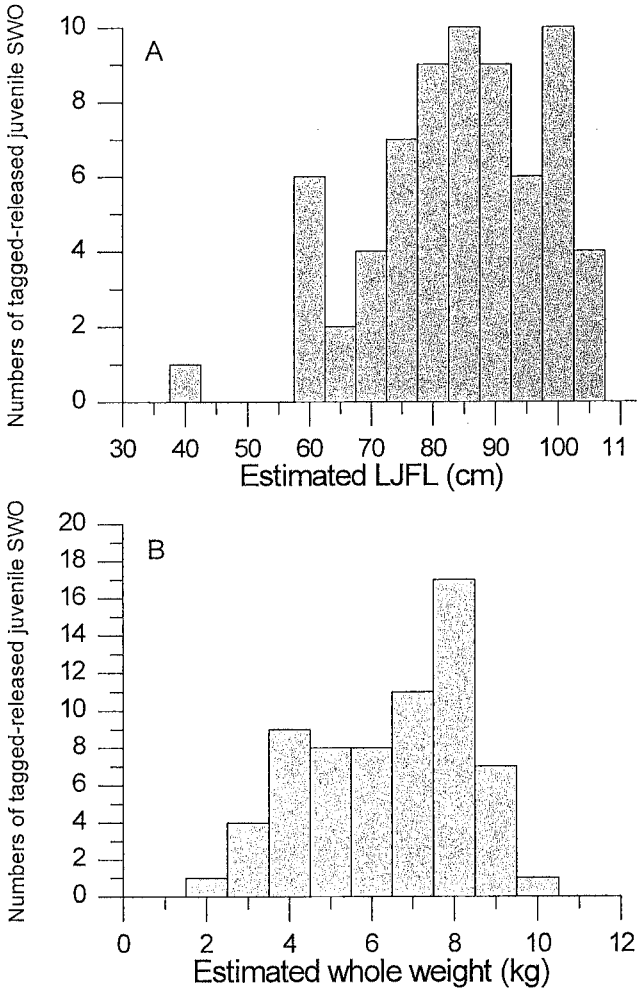

Figure 4. Percent quarterly length (lower jaw fork length, LJFL) frequency distributions of tagged-released juvenile swordfish (SWO) released from Venezuelan industrial longline vessels, 1996-1998.

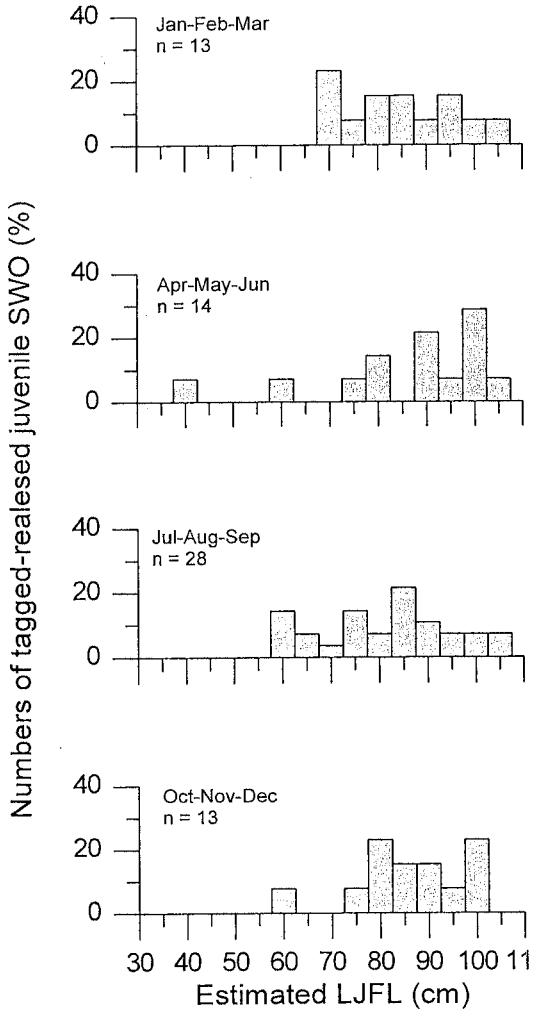

TABLE 1. Release information of tagged juvenile swordfish from Venezuelan industrial longline vessels, including the release location, estimated lower jaw fork length (LJFL) in centimeters (cm), estimated whole weight in kilograms (kg), tag number, and tagging date (1996-1998). * Indicates the converted estimated weight from lbs to kg.

LONGITUDE	LATITUDE	LJFL cm	WHOLE WT kg	TAG No.	DATE
57.2	9.2	59	4	TG 03606	Oct-96
64.0	11.9	73	6	TG 03668	Nov-96
66.0	12.1	66	4	TG 03687	Jan-97
66.1	12.2	69	5	TG 01541	Jan-97
65.9	12.1	72	5	TG 03678	Jan-97
66.1	11.4	81	7	BF 01397	Feb-97
66.1	11.4	86	8	BF 01383	Feb-97
66.1	11.4	84	8	BF 01384	Feb-97
66.1	11.4	76	7	BF 01385	Feb-97
68.5	11.5	78	7	BF 01394	Mar-97
69.5	11.9	74	8*	SW 00497	Apr-97
70.9	12.9	90	5	SW 00493	Apr-97
67.8	12.3	94	5	SW 00494	Apr-97
67.6	12.5	87	5	SW 00496	Apr-97
66.9	11.7	100	6	SW 00498	Apr-97
54.2	8.0	80	7	SW 00480	May-97
66.3	11.1	100	9	SW 00482	May-97
66.3	11.4	100	10	SW 00484	May-97
55.1	8.6	80	6	SW 00481	Jun-97
64.6	11.6	103	7	SW 00411	Jul-97
64.7	11.4	84	4	SW 00412	Jul-97
65.0	11.3	72	3	SW 00415	Jul-97
64.8	11.4	80	5	SW 00416	Jul-97
65.6	11.9	75	3	SW 00413	Jul-97
66.3	11.9	73	3	SW 00414	Jul-97
67.3	12.1	102	7	SW 00418	Jul-97
66.8	11.4	69	5	SW 00483	Aug-97
66.8	11.4	74	7	SW 00485	Aug-97
66.8	11.3	56	3	SW 00487	Aug-97
66.8	11.1	92	8	SW 00486	Aug-97
65.3	11.2	94	5	SW 00419	Sep-97
66.1	11.1	100	6	SW 00476	Sep-97
65.9	11.2	87	9*	SW 00420	Sep-97
65.9	11.2	87	9*	SW 00421	Sep-97
64.8	11.5	84	9*	SW 00422	Sep-97
64.9	11.5	83	8*	SW 00423	Sep-97
64.9	11.6	84	9*	SW 00424	Sep-97
64.9	11.6	82	8*	SW 00425	Sep-97
65.1	11.7	100	7	SW 00477	Sep-97
65.0	11.6	80	7*	SW 00478	Sep-97
65.1	11.7	82	8*	SW 00500	Sep-97
69.1	11.7	89	5	SW 00443	Oct-97
69.0	11.6	80	8*	SW 00444	Oct-97
68.9	11.6	81	9*	SW 00445	Oct-97
68.9	11.6	79	6*	SW 00446	Oct-97
67.6	11.2	100	5	SW 00447	Oct-97
66.0	12.2	93	9*	SW 00448	Oct-97
65.5	11.5	100	5	SW 00449	Oct-97
65.5	11.5	97	5	SW 00450	Oct-97
68.1	11.2	86	8	SW 00488	Nov-97
68.0	11.2	76	7	SW 00489	Nov-97
68.0	11.2	82	7	SW 00490	Nov-97
64.6	11.3	92	8	SW 00071	Feb-98
67.0	12.2	100	8	SW 00286	Feb-98
66.9	11.5	70	2	SW 00287	Feb-98
54.7	7.9	94	4	SW 00288	Mar-98
54.8	7.8	105	5	SW 00289	Mar-98
70.8	12.9	101	7	SW 00290	May-98
70.6	12.8	100	7	SW 00291	May-98
65.0	11.3	40		SW 00014	Jun-98
65.0	11.3	60		SW 00015	Jun-98