COOPERATIVE TAGGING CENTER RELEASE AND RECAPTURE ACTIVITIES FOR SWORDFISH *(XIPHIAS GLADIUS)* : 1961-1996

SCRS/1996/149

Col.Vol.Sci.Pap. ICCAT, 46 (3) : 379-382 (1997)

Jones[1], *C.D.*

SUMMARY

A summary of tag release and recapture activities for Atlantic swordfish *(Xiphias gladius)* from the National Marine Fisheries Service's Cooperative Tagging Center (CTC) are reviewed for 1961-August 1996. Release and recapture data are evaluated by year and gear type. As of August, 1996, a total of 8,825 swordfish have been tagged and released, mainly in the western north Atlantic Ocean, and 267 recaptured through participants of the Cooperative Tagging Center. This represents a total historical recapture percentage of 3%. Swordfish are released year-round, with peak releases from July to October. Tag recaptures are summarized by years at-large and minimum movement in nautical miles. Selected swordfish movements are detailed. In 1995, the first documented trans-Atlantic recapture of a swordfish was recorded by the CTC.

RÉSUMÉ

Ce document présente un résumé des activités de marquage et de recapture de l'espadon de l'Atlantique (*Xiphias gladus*) menées par le *National Marine Fisheries Service's Cooperative Tagging Center* (CTC), entre 1961 et août 1996. Les données de marquage-recapture sont évaluées par an et type d'engin. En août 1996, 8825 espadons avaient été marqués et remis à l'eau, principalement dans l'Atlantique Nord-Ouest, et 267 avaient été recapturés par le CTC. Cela représente un pourcentage historique total de recapture de 3%. L'espadon est marqué toute l'année, mais principalement entre juillet et octobre. Le nombre d'années en liberté et les déplacements en milles nautiques sont indiqués. Certains déplacements font l'objet d'une étude plus détaillée. En 1995, le CTC a enregistré la première recapture transatlantique d'espadon.

RESUMEN

Se examina un resumen de actividades de marcado y recaptura de pez espada atlántico (*Xiphias gladius*) del "National Marine Fisheries Service Cooperative Tagging Center "(CTC)", entre 1961 y agosto de 1996. Los datos de marcado y recaptura se evalúan por año y por tipo de arte. En fecha de agosto 1996 se había marcado y liberado un total de 8.825 peces espada, principalmente en el Atlántico noroeste, habiéndose recapturado 267 por participantes en el "Cooperative Tagging Center". Esto representa un porcentaje de recaptura histórica del 3%. El pez espada se marca durante todo el año, pero sobre todo entre julio y octubre. Las recapturas se presentan por años en libertad y movimiento mínimo en millas marinas. Se detallan los movimientos de peces seleccionados. En 1995, el CTC registró la primera recaptura trasatlántica documentada de un pez espada.

[1] NOAA/NMFS Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida 33149, USA.

INTRODUCTION

The Cooperative Game Fish Tagging Program (CGFTP) was first initiated at Woods Hole Oceanographic Institution (WHOI) in 1954 to study bluefin tuna. In August, 1961, the first swordfish was released through the CGFTP. In 1973, the program became a combined effort between WHOI and the National Marine Fisheries Service (NMFS). The NMFS Southeast Fisheries Science Center (SEFSC) took over the program in 1980. In 1992, the CGFTP was re-named the Cooperative Tagging Center (CTC) in order to better reflect the recent expansion of tag release and recapture activities, data requests from other tagging agencies, and domestic and international tagging research needs. The CTC currently encompasses a variety of functions and responsibilities that center around maintaining and handling a large mark-recapture database for highly migratory species, including swordfish, from 1954 to the present. The objectives of this report are to summarize tag release and recapture data of swordfish for the period 1961 through August 1996.

METHODS

An overall description of the CTC tagging program is given in Scott et al. (1990). Participants are given tagging kits which contain tags, report cards, and other items which are useful during the tagging event. The type of tags used has changed over the years, going from a stainless steel dart tag to a medical grade nylon double barb dart introduced by The Billfish Foundation (TBF) in 1990 and NMFS in 1995 (National Marine Fisheries Service, 1995). The TBF tag is similar to the latter, though the CTC streamer includes the Japanese characters for the word "reward" in an effort to increase recoveries from Japanese longline vessels. When the fish is tagged, the participant records the event on the tagging report card and mails it to the NMFS Miami Laboratory, where the data and angler information are entered, as reported, into the main database. Release data consists of species, date, location, size in length and weight (along with more specific descriptors), and gear type. When the fish is recaptured, the angler calls a toll-free number or mails in the information of the recapture (CTC address and number are printed on the streamer). This information is quality controlled, entered as reported into the database, and then coupled with the release information. If there are discrepancies in the release and recapture information (e.g., different species), every effort is made to correct the problem before the information is entered. Both the release and recapture participants receive a reward (tagging hat) and letter summarizing the dates, location of release and recapture, and size specifics of each tag event.

In this paper, minimum movements described are calculated in nautical miles using the release and recapture latitude and longitude coordinates. An algorithm developed by Shudde (1984) based on spherical geometry was used to compute minimum straight-line distance between the two coordinates. Since conventional tagging models represent a Eulerian approach to movement, no information is gained on the actual route taken by the fish to the recapture location. Hence, movements are the minimum distance route traveled and serve only to illustrate the overall location of the fish at recapture relative to the location at release.

RELEASE- RECAPTURE ACTIVITIES

Historical Release Activities

There are a total of 8,825 tag-released swordfish records in the CTC database: 8,232 (93%) were caught using longline gear, 461 (5%) on rod and reel gear, and 132 (2%) on other gears types, including harpoon, trawler, and other unclassified gears. Figure 1 shows the total number of releases, by year, for the period 1961 to August 1996. This plot demonstrates a substantial increase in tagging activity in the early 1990's. The majority of historical releases took place in the northwestern Atlantic Ocean and off of the U.S. east coast and Gulf of Mexico. A map of swordfish release points is given in Figure 2. Release activity is year-round, with slightly higher numbers of releases from July to October. Figure 3 illustrates the total number of releases by month.

Historical Recapture Activities

There have been a total of 267 swordfish reported captured: 176 (66%) were caught on longline gear, 44 (16%) on rod and reel, and 18% on other gear types, including harpoon, trawler, and other unclassified gears. Figure 4 shows the total number of recaptures by year for the period 1966 (year of first recapture) through August, 1996.

The historical recapture rate for all releases is 3%, with an average time at-large for a tagged fish of 756.5 days (2.07 years). A distribution of years at-large for recaptured swordfish is presented in Figure 5. The longest time at-large for a tagged swordfish was 5,501 days (15 years). This fish was released at 43°16'N 48°56'W on July 21, 1967 and recaptured at 46°47'N 59°50' W on August 12, 1982, a straight-line distance of 507 nm.

The majority of recaptures took place offshore of the North American east coast. The average minimum distance traveled by a recaptured swordfish is 464.4 nautical miles. Of the swordfish, 43% have been recaptured 100 nautical miles or less from the release point, 40% recaptured within 200 nautical miles, and 65% recaptured within 500 nautical miles from the release point. The 45 longest movements are listed in Table 1. The ten longest movements are illustrated in Figure 6.

The CTC has recently recovered the first reported trans-Atlantic movement of a swordfish. This is also the longest straight-line minimum movement that has been recorded by the CTC for this species (2,732 nm). Details of this tag-recapture event are listed in Table 1 (tag HM000291) and mapped in Figure 6.

LITERATURE CITED

National Marine Fisheries Service. 1995. Cooperative Tagging Center Annual Newsletter: 1993. NOAA Tech. Memo. NMFS-SEFSC-364, 29p.

Scott, E.L., E.D. Prince, and C.D. Goodyear. 1990. History of the Cooperative Game Fish Tagging Program in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea, 1954-1987. Am. Fish. Soc. Symp. 7: 841-853.

Shudde, R.M., 1984. A non-iterative algorithm for Loran-C position determination, navigation. Jour. Inst. of Navigation 31(3):179-199.

Table 1. Specific release recapture information for the 45 longest minimum movements of tag-recaptured swordfish by the Cooperative Tagging Center (CTC). RelDate is the release date; RelLat is the release latitude; RelLon is the release longitude; RecDate is the recapture date; RecLat is the recapure latitude; RecLon is the recapture longitude. Numbers in parenthesis in tag number column correspond to 10 longest minimum movements illustrated in Figure 6.

Tag Number	RelDate	RelLat	RelLon	RecDate	RecLat	RecLon	Days at-Large	Distance (nm)
HM000291 (1)	10/7/94	38.33	73.5	11/1/95	37	15	390	2732
R297464 (2)	2/21/93	21.68	86.07	7/6/95	44.83	41.85	865	2573
R187810 (3)	2/5/90	27.92	76.92	9/20/91	47.58	40.39	592	2067
R346847 (4)	3/13/95	14.03	48.72	8/29/95	45.55	40.75	169	1934
R020469 (5)	8/6/92	43.85	46.35	3/20/94	28.5	80.33	591	1867
R316180 (6)	9/9/93	47.2	41.58	12/17/93	20.87	60.92	99	1838
R279217 (7)	6/25/92	43.25	44.5	3/14/93	18.45	63.93	262	1783
R320868 (8)	12/3/93	37	74.5	2/27/96	18	50.88	816	1688
R260799 (9)	7/14/91	41.98	54.5	9/6/95	26	81	1515	1619
R288144 (10)	6/25/92	43.5	43	1/9/94	20.57	56.9	563	1542
R347653	10/11/95	37.42	74.5	6/30/96	42.15	41.7	263	1529
R291676	11/1/92	36.18	74.73	9/9/95	45.33	43.17	1042	1524
R109208	9/15/87	17.67	64.17	9/13/90	42.83	62.63	1094	1512
R219984	7/30/91	39.63	71.97	2/12/92	16.53	64.17	197	1445
R317782	10/22/93	24.52	84.3	7/5/95	41.64	65.3	621	1396
R276779	2/11/92	20.7	57.04	8/29/93	42.83	59.67	565	1334
R289658	2/5/93	20.1	57.68	6/12/95	40.97	61.73	857	1269
R279214	5/15/92	38.5	68.33	8/9/93	43.93	41.33	451	1255
R084852	12/7/87	39.9	67.5	1/15/94	20	74	2231	1240
R279452	7/30/92	43.82	45.78	10/1/93	38.97	72.65	428	1238
R108837	12/10/87	40.42	66.9	4/20/89	20.55	72.62	497	1228
R017897	3/10/80	25	84	7/18/80	41.83	70	130	1226
R299426	11/7/92	39.43	74.67	6/2/95	21.47	85.5	937	1212
R041542	9/14/81	40.33	67	4/15/84	24.5	81	944	1182
R216431	3/27/91	13.48	70.25	5/4/94	31.55	78.35	1134	1172
R32 4386	1/25/94	26.12	79.98	7/28/95	41.55	65.73	549	1163
R262093	9/11/91	31.17	79.02	5/24/95	17	65	1351	1143
R275249	1/4/92	25.53	84.55	9/20/93	39.52	69.33	625	1136
R293465	12/2/93	37.1	74.5	3/11/96	21.13	85.88	830	1127
R273318	2/20/92	35.62	74.27	8/28/94	43.58	52.16	920	1124
R208156	3/9/91	31.85	77.78	6/26/93	41.27	58.16	840	1098
B001012	7/24/68	43.07	61.58	7/1/79	28.6	74.85	3994	1079
R210397	4/7/91	32.23	77.97	6/10/95	44.14	60.8	1525	1076
R056783	9/1/81	40.23	67.73	6/1/82	25.58	79.87	273	1068
R154155	3/15/90	26.75	79.72	6/25/90	40.52	67.08	102	1037
R218705	9/30/91	39.5	72	5/11/93	26.2	84.68	589	1020
R279126	8/25/92	40.03	68.67	10/13/93	26.5	79.93	414	987
R050817	7/12/92	43.25	42.73	6/1/94	40.5	64	689	962
R084887	2/1/88	40.3	66.47	12/19/92	24.57	64.71	1783	948
R071983	10/14/83	26.5	79.83	6/25/84	39.67	69.5	255	944
R274925	2/25/92	35.58	74.73	6/2/95	19.9	73.67	1193	942
R041730	8/27/81	39.85	69.93	5/24/82	26.47	79.58	270	936
R290925	1/14/93	27.33	66.17	8/16/93	42	71	214	911
R039927	2/27/80	24.33	83.53	7/23/80	36.87	74.58	147	882
R014600	1/27/81	39.45	67.02	4/15/81	28.5	78.58	78	872

Figure 1. Total number of swordfish tagged per year, by participants of the Cooperative Tagging Center (CTC), 1961 - August 1996.

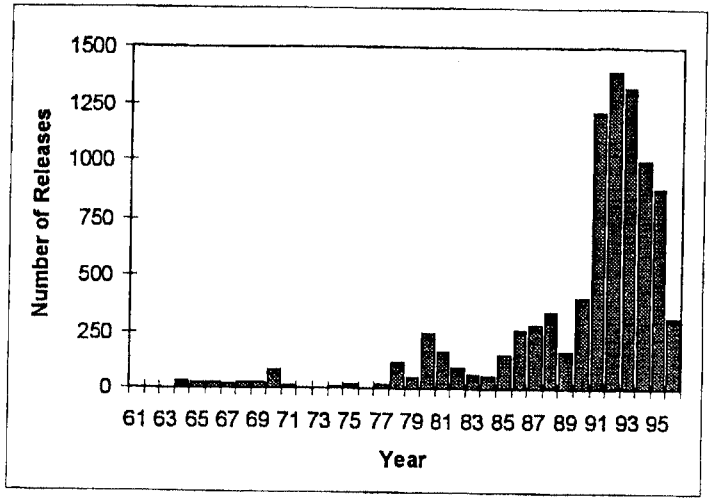

Figure 2. Release points of tagged swordfish (N = 8,825) in the north Atlantic Ocean.

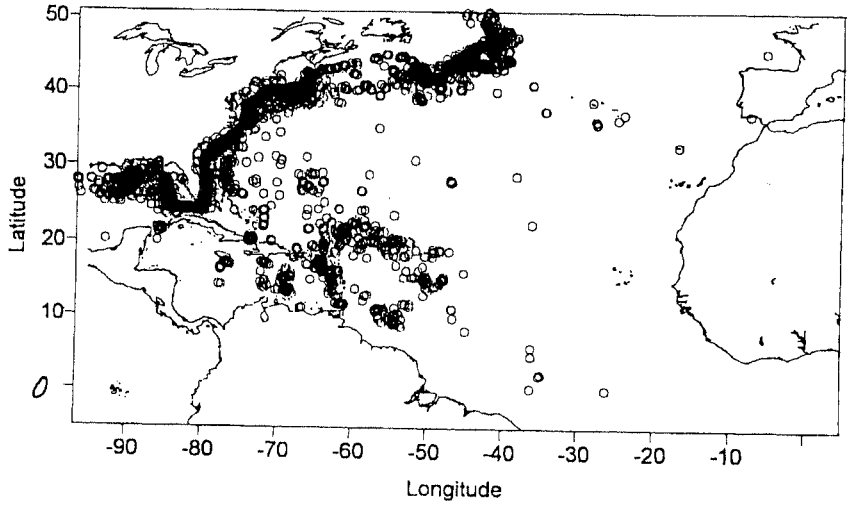

Figure 3. Monthly releases for swordfish, recorded by the Cooperative Tagging Center (CTC), 1961- August 1996.

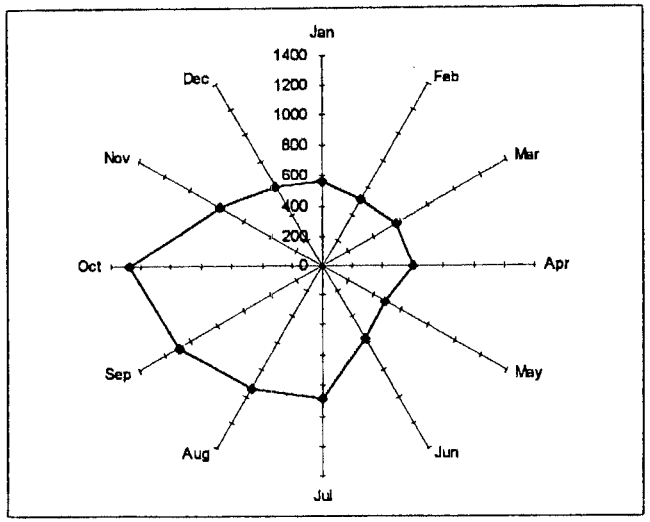

Figure 4. Number of swordfish recaptures reported by year, by participants of the Cooperative Tagging Center (CTC), 1966- August 1996.

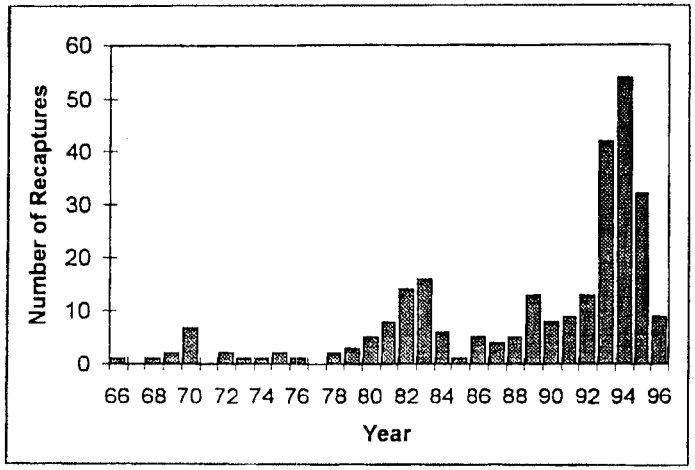

Figure 5. Distribution of years at-large for all recaptured swordfish by the Cooperative Tagging Center (CTC), 1966 - August 1996.

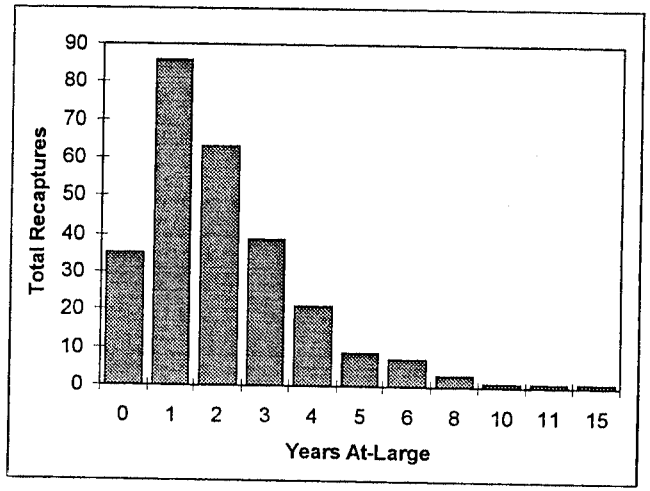

Figure 6. Ten longest minimum movements of tag-recaptured swordfish by the Cooperative Tagging Center (CTC). Number at recapture point corresponds to specific release-recapture information listed in Table 1.