

A SUMMARY OF THE BILLFISH FOUNDATION'S TAGGING PROGRAM (1990-1996)

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SUMMARY

A historical review of the development of The Billfish Foundation's (TBF) tagging program is presented. From 1990-1996, a total of 30,146 billfish and swordfish have been tagged worldwide in the Atlantic, Indian, and Pacific Oceans. In the Atlantic, 8,272 sailfish, 6,380 blue marlin, and 4,388 white marlin have been tagged and 163, 29, and 49 have been recaptured (respectively) since 1990. Historical recapture percentages and long distance movement patterns of marlin and sailfish in the TBF tagging program are similar to those of the National Marine Fisheries Service Cooperative Tagging Center.

RÉSUMÉ

Une étude historique du développement du programme de marquage de la Fondation Istiophoridés (TBF) est présentée. De 1990 à 1996, 30.146 istiophoridés et espadons au total ont été marqués dans le monde, dans les océans Atlantique, Indien, et Pacifique. Dans l'Atlantique, 8.272 voiliers, 6.380 makaires bleus, et 4.388 makaires blancs ont été marqués, dont 163, 29, et 49 respectivement, ont été recapturés depuis 1990. Les pourcentages historiques de recapture et les caractéristiques du déplacement sur longue distance du makaire et du voilier issus du programme de marquage de TBF sont similaires à ceux du Centre de Marquage du National Marine Fisheries Service Cooperative.

RESUMEN

Es la historia del desarrollo del programa de marcado de la Fundación Marlines (Billfish Foundation, TBF). De 1990 a 1996 se marcó un total de 30.146 marlines y peces espada en todo el mundo, en los océanos Atlántico, Indico y Pacífico. En el Atlántico se marcaron 8.272 peces vela, 6.380 agujas azules y 4.388 agujas blancas, habiéndose recuperado desde 1990, 163, 29 y 49 respectivamente. Los porcentajes históricos de recaptura y los desplazamientos a larga distancia de marlines y peces vela en el programa de marcado de la TBF son similares a los del "National Marine Fisheries Service Cooperative Tagging Center".

1. INTRODUCTION

The U.S. government began its Atlantic Cooperative Game Fish Tagging Program in 1954, with the National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center (SEFSC) Miami Laboratory assuming sole responsibility for funding and operation of the program in 1980 (Scott *et al.* 1990). The program was re-named the Cooperative Tagging Center (CTC) in 1992. Bluefin tuna (*Thunnus thynnus*) were the initial target species, but the program rapidly expanded to other highly migratory species, including blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*), sailfish (*Istiophorus platypterus*), longbill spearfish (*Tetrapturus pfluegeri*), and swordfish (*Xiphias gladius*).

A growing concern for the status of billfish, coupled with the establishment of minimum size limits through implementation of the U.S. Atlantic Billfish Management Plan in 1988, provided the impetus for a significant increase in volunteer tagging efforts by U.S. billfish anglers. However, as the number of volunteer participants increased, the SEFSC's ability to provide tags and staff time necessary to meet increased tagging program needs did not. This situation often resulted in the tagging equipment needs of volunteer participants of the CTC not being met.

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To better provide for volunteer angler participation and to enhance NMFS tagging data collection efforts, The Billfish Foundation (TBF) and NMFS entered into an agreement in 1990 whereby TBF would be an official tagging program "cooperator." This agreement included the development of a better tag, sale and distribution of tagging equipment for Atlantic Billfish by TBF, and sharing of the TBF release and recapture data with NMFS through timely transfer of computer files. Every effort was made to develop the TBF tagging program with the same guidelines as the NMFS tagging program.

Billfish tag development was done jointly by both organizations. Tag development efforts focused on providing a more biologically compatible anchoring and application mechanism compared to the standard stainless steel streamer used by NMFS since the program was initiated in 1954. Following a number of years of research and development, the result was a hygroscopic nylon anchor with double barbs (Figure 1), which has since shown superior retention qualities in double tagging studies conducted by both organizations (Jones *et al.* 1995). The TBF tag was developed as an intermuscular anchor mechanism, instead of relying on anchoring in-between the pterigiophores, as did the stainless steel tag. Additional tag performance research has also resulted in the development of miniaturized version of the TBF tag for smaller species (Jones *et al.* 1995). Most recently, NMFS has discontinued use of the steel anchor tag, except in continuation of double tagging studies, and now uses essentially the TBF double barb nylon design for all highly migratory species.

Following numerous modifications to TBF release cards and revisions to the historical computer files of the TBF tagging data base, TBF's tagging system and computer format are now compatible with NMFS tagging system. Tagging data base compatibility now allows TBF release and recapture files to be sent to NMFS on a quarterly basis, to be integrated into the larger Atlantic wide tagging data base archived at the Southeast Fisheries Center. The tagging data base at the Southeast Fisheries Center is certainly one of the most comprehensive sources of billfish tagging data in the world.

2. THE BILLFISH FOUNDATION'S TAGGING PROGRAM

The TBF's tagging program is relatively young and represents far fewer releases and recaptures per species, when compared to the NMFS CTC. However, the TBF tagging program during its first 6 years has already illustrated: (1) greater opportunity for volunteer angler tagging participation; (2) wider distribution of large quantities of tags in the Atlantic and elsewhere; and (3) increased data collection, which enhances the NMFS CTC database and overall knowledge of billfish movements and migrations. For example, since the inception of the program, 30,146 billfish and swordfish have been tagged with TBF tags and released by both recreational and commercial fishermen. Thus far, the majority of tags (Table 1) have been deployed in the Atlantic (19,838), followed in number by the Pacific (8,820), and the Indian Ocean (1,488). While the tag release activities in the Atlantic and Pacific Oceans have progressively increased each year since the program was initiated in 1990 (Figure 2), the release activities in the Indian Ocean have decreased in the last several years. The 1994 TBF release activity for istiophoridae and xiphiidae in the Atlantic (about 5,500 releases, Figure 2) compares favorable to the 7,300 release for these species in 1994 for the CTC.

In the Atlantic, 8,272 sailfish, 6,380 blue marlin, 4,388 white marlin, and 60 longbill spearfish have been tagged in the TBF program since 1990 and 163, 29, 49, and 0 have been recaptured, respectively (Table 2). In addition, 738 swordfish were also tagged, mostly by U.S. longline fishermen, and 11 swordfish have been recaptured. The TBF recapture percentages (Table 2) associated with blue and white marlin (0.45%, 1.12%), sailfish (1.97%), and swordfish (1.49%) are similar to the recapture percentages of the NMFS CTC (Jones and Prince, 1996). For example, the historical NMFS CTC recapture percentages for blue and white marlin (0.64% and 1.8%) are slightly higher than for the TBF program, while sailfish recapture percentage is slightly lower (1.7%). The TBF recapture percentage for swordfish is about half that realized by the NMFS CTC (2.9%).

Movements of selected TBF tag recaptures for blue marlin, white marlin, sailfish, and swordfish are illustrated in Figures 3-6. Although trans-Atlantic or trans-equatorial movements for these species have not been documented through the TBF tagging program, overall long distance movements patterns within the western Atlantic and Caribbean Sea are very similar to those documented by the NMFS CTC (Jones *et al.* 1995). For example, movement of a white from the northeast Atlantic to near the equator (Figure 4), movements of sailfish from the Mexican Caribbean to Venezuela (Figure 5), and movements of swordfish from the central Caribbean to the northeast Atlantic all cover substantial distances. It is also interesting to note that the NMFS version of the TBF tag (HM series) recently documented the first trans-Atlantic movement of an Atlantic swordfish (released off U.S. northeast coast and recaptured in the Bay of Biscay).

3. SUMMARY

Although the TBF tagging program is still relatively young, substantial tag release and recaptures of istiophoridae and xiphiidae have been accomplished in the Atlantic and Pacific Oceans, particularly in the most recent years. By 1994, the TBF release activities for istiophoridae and xiphiidae had increased to about 75% of the release activities compared to the CTC for the same year. Tagging activity in the Indian Ocean has not been nearly as active as in the other water

bodies. In terms of performance of the TBF tagging program, the recapture percentages for marlin, sailfish, and swordfish are similar to the results of the NMFS CTC. In addition, overall long distance movement patterns of TBF recaptures appear to be similar to those documented in the NMFS CTC.

4. LITERATURE CITED

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Table 1. Tagged released billfish (*Istiophoridae* and *Xiphiidae*) for the Atlantic, Pacific and Indian Oceans from The Billfish Foundation database (1990-1996).

Fish species	Atlantic	Pacific	Indian	Total
Black Marlin	0	1015	18	1033
Blue Marlin	6380	838	45	7263
Sailfish	8272	5188	1286	14746
Striped Marlin	0	1666	131	1797
Spearfish	60	111	3	174
Swordfish	738	2	5	745
White Marlin	4388	0	0	4388
Total	19838	8820	1488	30146

Table 2. Tag released and recaptured billfish (*Istiophoridae* and *Xiphiidae*) in the Atlantic Ocean from The Billfish Foundation database (1990-1996).

Fish species	Release	Recapture	% recapture
Blue Marlin	6380	29	0.45%
Sailfish	8272	163	1.97%
Spearfish	60	0	0.00%
Swordfish	738	11	1.49%
White Marlin	4388	49	1.12%
Total	19838	252	1.27%

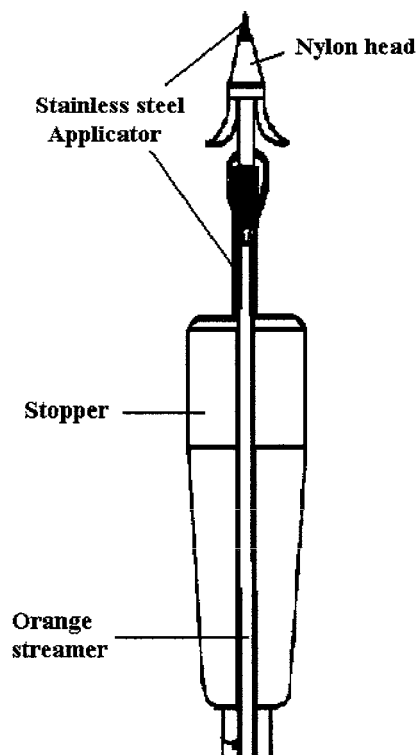


Fig. 1. The Billfish Foundation tag HM type.

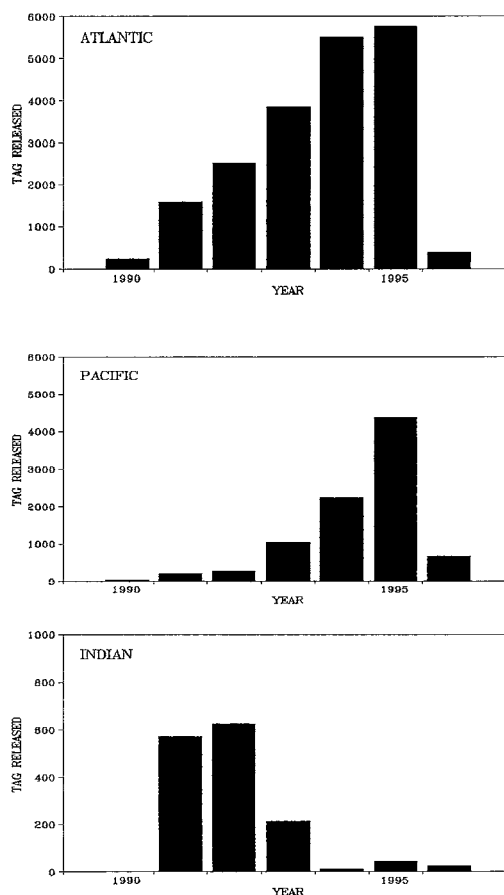


Fig 2. Tag released by ocean from the Billfish Foundation, 1990-1996. (*) Asterisk indicates partial data.

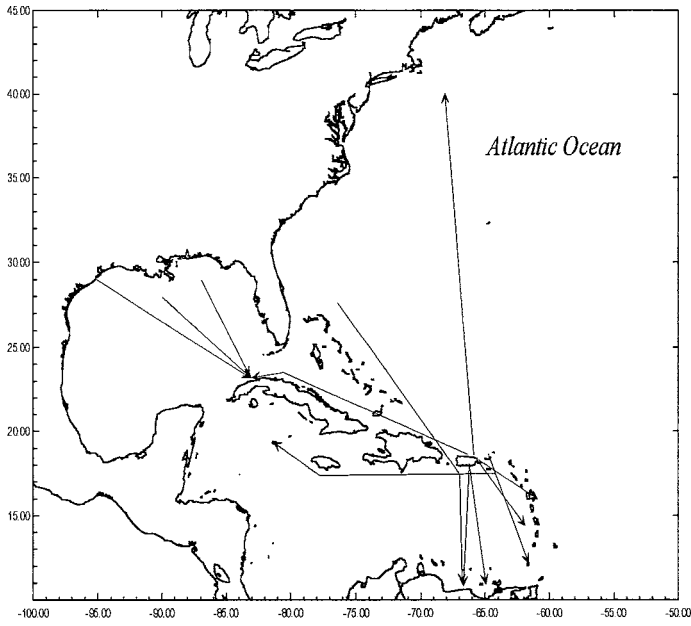


Fig. 3. Movement of selected tag recaptured blue marlin (*Makaira nigricans*) from The Billfish Foundation database (1990-1996).

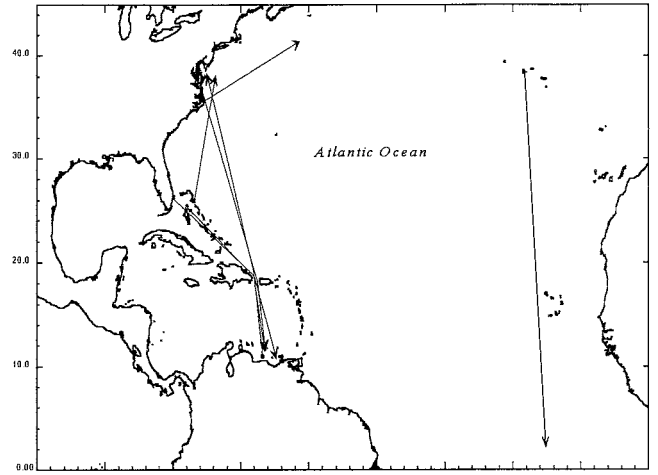


Fig. 4. Movement of selected tag recaptured white marlin (*Tetrapturus albidus*) from The Billfish Foundation database (1990-1996).

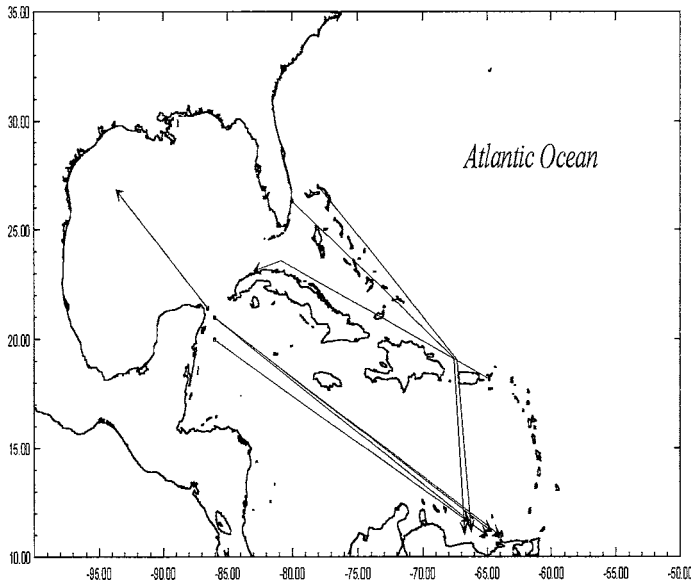


Fig. 5. Movement of selected tag and recapture Sailfish (*Istiophorus platypterus*) from the TBF database (1990-1996).

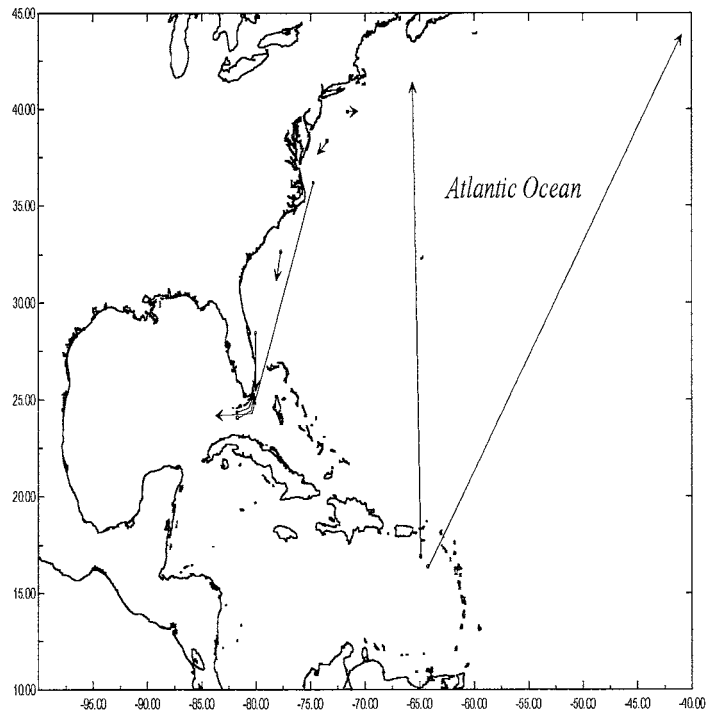


Fig. 6. Movement of selected tag recaptured swordfish (*Xiphias gladius*) from The Billfish Foundation database (1990-1996).