

AN UPDATE OF THE TAG RELEASE AND RECAPTURE FILES FOR ATLANTIC ISTIOPHORIDAE

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SUMMARY

*An update of the historical tag release and recapture files from western Atlantic tagging programs for Atlantic Istiophoridae (i.e. marlins and sailfish) are presented. Data sources include the National Marine Fisheries Service (NMFS) Southeast Fisheries Science Center's Cooperative Tagging Center (CTC), The Billfish Foundation (TBF), the South Carolina Marine Resources Division (SCMRD), and the National Marine Fisheries Service's shark tagging program. Data for Istiophoridae are available from 1954 to 1999 for the CTC, from 1990 to 1999 for TBF, from 1974 to 1999 for SCMRD, and from 1962 to 1999 for the NMFS shark tagging program. The data are presented by agency, species, gear type, and season for Atlantic blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*), and sailfish (*Istiophorus platypterus*).*

RÉSUMÉ

*Le présent document présente une actualisation des fichiers de marquage et de recapture des projets de marquage d'istiophoridés dans l'Atlantique ouest. Les sources de données comprennent le Cooperative Tagging Center (CTC) du Southeast Fisheries Science Center du National Marine Fisheries Service (NMFS), la Billfish Foundation (TBF), la South Carolina Marine Resources Division (SCMRD) et le programme de marquage de requins du National Marine Fisheries Service. Les données sur les istiophoridés sont disponibles de 1954 à 1999 pour le CTC, de 1990 à 1999 pour la TBF, de 1974 à 1999 pour la SCMRD et de 1962 à 1999 pour le programme NMFS de marquage de requins. Les données sont présentées par organisme, espèce, type d'engin et saison pour le makaire bleu (*Makaira nigricans*), le makaire blanc (*Tetrapturus albidus*) et le voilier (*Istiophorus platypterus*).*

RESUMEN

*Se presenta una actualización de los archivos históricos de liberación y recaptura de marcas de los programas de marcado del Atlántico oeste para los Istiofóridos atlánticos (marlines y pez vela). Las fuentes de datos incluyen el National Marine Fisheries Service (NMFS), el Southeast Fisheries Science Center's Cooperative Tagging Center (CTC), The Billfish Foundation (TBF), la South Carolina Marine Resources Division (SCMRD), y el programa de marcado de tiburones del National Marine Fisheries Service. Los datos para los istiofóridos están disponibles desde 1954 a 1999 para el CTC, desde 1990 a 1999 para la TBF, de 1974 a 1999 para la SCMRD y de 1962 a 1999 para el programa de marcado de tiburones del NMFS. Los datos para la aguja azul (*Makaira nigricans*), aguja blanca (*Tetrapturus albidus*) y pez vela (*Istiophorus platypterus*) del Atlántico se presentan por agencia, especie, tipo de arte y temporada.*

KEYWORDS

Pelagic fisheries, Tagging, Fishery statistics

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INTRODUCTION

Historically, the Cooperative Tagging Center (CTC), formerly known as the Cooperative Game Fish Tagging Program, has been the longest standing tagging program of its type in the world targeting highly migratory species, including Istiophoridae (Scott *et al.* 1990). The CTC was initiated by Frank Mather III in 1954 out of the NMFS Woods Hole Laboratory and the program was transferred to the Southeast Fisheries Science Center in 1978. Marlin and sailfish have always been among the primary target species of the CTC. In addition to the CTC, The Billfish Foundation (TBF) tagging program also targets istiophorids in the Atlantic Ocean, as well as other water bodies (Peel *et al.* 1998). Tagging programs that opportunistically tag billfish include the South Carolina Marine Resources Division tagging program (Davy 1994), and the National Marine Fisheries Service's (NMFS) shark tagging program (Kohler *et al.* 1998). The objective of this document is to provide a summary and update of the tag release and recapture records available from the primary Atlantic tagging programs targeting Istiophoridae, including blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*), and sailfish (*Istiophorus platypterus*). In addition, efforts were made to assemble all ancillary Atlantic billfish tagging data from secondary sources.

METHODS

Descriptions of the CTC and TBF tagging programs are given in Scott *et al.* (1990) and Peel *et al.* (1998), respectively. The tags used by the CTC have changed over the years. Initially, a stainless steel dart tag was used in the CTC from 1954-1995. A medical grade double barb nylon dart tag, developed jointly by NMFS and TBF, was introduced by TBF in 1990 and adopted by the CTC in 1995. Since that time, TBF and CTC have been using the same tagging equipment. The South Carolina Division of Marine Resources (SCMRD) has used the stainless steel dart tag since the program began in 1974 (Davy 1994). The NMFS shark tagging program, operated out of the Narragansett laboratory, has also used a stainless steel dart tag since its inception (1962), but this tag was modified using a legend on the capsule that contained the tag number and return address of the agency (Kohler *et al.* 1998).

Analyses were made of the primary and secondary tagging agencies in order to summarize the release and recovery files for Istiophoridae by species, year and gear. In addition, data are also presented that summarize release information by month to access seasonality of tagging activities.

RESULTS

Table 1 summarizes the release and recovery records for blue marlin, white marlin, and sailfish from the CTC and TBF tagging programs. A total of 41,957 blue marlin, 41,115 white marlin, and 94,299 sailfish have been tagged and released in the Atlantic Ocean by the CTC and TBF tagging programs since 1954. A total of 565 blue marlin have been recovered from both agencies, yielding a combined recapture rate of 1.35%. The CTC recapture rate for blue marlin (0.98%) is almost half the TBF recapture percentage (1.84%, Table 1). The 837 recaptured white marlin have a combined recapture rate of 2.03% from both agencies. The TBF recapture rate for white marlin (2.55 %) is also considerably higher than the CTC recapture rate for this species (1.87%) (Table 1). For sailfish, the combined recapture rate from both agencies is 1.52%. For sailfish, the CTC recapture rate (1.86%) is slightly higher than the TBF recapture rate (1.62%).

Table 2 summarizes the release and recovery records for blue marlin, white marlin, and sailfish from the SCNRD. A total of 811 blue marlin, 322 white marlin and 1,120 sailfish were released with 8, 4 and 7 recoveries respectively. The recapture rate for blue marlin was 0.99%, for white marlin 1.24% and for sailfish 0.63%.

Billfishes tagged incidentally in the SCMRD and NMFS shark tagging program represent much smaller tagging efforts for all billfish species compared to the CTC and TBF tagging programs. For example, only 1,360 blue marlin, 1,865 white marlin, and 1,328 sailfish have been tagged by SCMRD

and NMFS shark tagging programs since 1962. The numbers of tag recaptured billfish, by species, were also small and included a total of 19 blue marlin, 7 white marlin, and 13 sailfish from both the SCMRD and NMFS shark tagging programs. Tag-recapture rates from incidentally-tagged billfish compare to the larger tagging efforts of the primary programs, with the possible exception of the sailfish tag-recapture rate of 2.88% from the NMFS shark tagging program.

Historical tag release and tag recaptures by agency

The historical tag released and recaptured billfish by species and agency are presented in Figure 1. The increasing trend in release and recapture activities of the CTC and TBF are similar for all species. The CTC release activities gradually increased from 1954 through the mid-1990s for all species and then declined steadily through 1999. This same period was characterized by an increasing trend in TBF release activities for all billfish species (Figure 1a-c). Increasing trends were also evident for recapture activities for both the CTC and TBF throughout the time series (Figure 1d-f). Similarly, release activities of the SCMRD increased from 1985 to the present (Figure 2a) while recoveries remained relatively low (Figure 2b).

Seasonality of tag release activities

Figure 3 illustrates the tag release activities for blue marlin, white marlin, and sailfish from the CTC and TBF by month. Sailfish tag release activities take place primarily during November, December, and January, although a substantial amount of sailfish tagging is also accomplished in April and May. The south Florida fishery for sailfish dominates both the CTC and TBF databases. Tag-release activity for the marlins from both agencies occur primarily during the summer months (July, August, and September).

Gear types

The dominant gear type for tag release activities of the primary tagging programs was rod and reel, followed by longline gear (Table 4, Figure 3a-c). Few billfish were released by hand lines, gill nets, and trawl nets. The Billfish Foundation data base did have relatively large numbers of tag released billfish where gear type was not specified, although these releases were presumably the result of rod and reel tagging efforts.

The primary gear type for tag recapture activities varied (Table 3d-f). Further analyses demonstrated that the CTC and TBF yielded very different results. For example, the primary gear for tag recaptures for the CTC for most species was rod and reel, although longline and gillnet gear in some cases yielded substantial recaptures. Gillnets were a dominant recapture gear for marlins in the TBF program and this is most evident in recent years.

DISCUSSION

Continued increases in tag release and recapture activities of the primary Atlantic tagging programs throughout the time series has resulted in an improved ICCAT Atlantic-wide tagging database for Istiophoridae. These improvements have taken place despite a reduction in the available tagging equipment distributed through the CTC in recent years (due to budget constraints). The Billfish Foundation has compensated for these shortages, allowing the Atlantic-wide program to progress. Jones and Prince (1998) also confirmed statistically significant increases in istiophorid tag release and tag-recapture rates in the southeast Caribbean Sea after implementation of the ICCAT Billfish Tagging Program (IBTP) in this area. Implementation of the IBTP consisted mostly of establishing outreach activities to publicize the program in known billfishing areas.

Historically, tag-recapture rates for istiophorids have been below 2% from all major tagging agencies operating in the world oceans (Scott *et al.*, 1990; Pepperell, 1990; Miyake, 1990; Murray, 1990; Van

Der Elst, 1990). However, some improvements in tag recapture/reporting percentages for Istiophoridae are evident by examining the evolution of the CTC. For example, Scott *et al.* (1990) reported that tag recapture percentages in the CTC through 1989 for blue marlin, white marlin, and sailfish were 0.04%, 1.7%, and 1.4%, respectively. Improvements in tag recapture/reporting percentages for the CTC were initially noted by Jones and Prince (1998), who reported tag recapture/reporting percentages had increased to 0.64% for blue marlin, 1.8% for white marlin, and 1.7% for sailfish by 1996. Further improvements in CTC tag recapture/reporting are presented in this paper, including 0.98% for blue marlin, 1.87% for white marlin, and 1.86% for sailfish. It is interesting to note that the initial TBF recapture/reporting percentages observed by Peel *et al.* (1998) after 6 years of operation of the TBF tagging program have improved. Blue marlin have increased from 0.45% to 1.84%, white marlin have increased from 1.12% to 2.55%, while sailfish have decreased slightly from 1.97% to 1.62% (Table 1). The Billfish Foundation recapture percentage of 2.55% for white marlin represents a milestone in the sense that this is the first tag recapture percentage reported by an ocean-wide program that has exceeded 2%. In addition, the reporting of tag recaptured billfish by gillnet is a relatively recent event and is limited to a small, isolated artisanal gillnet fishery off Venezuela (see SCRS/00/76). The fact that an artisanal fishery could account for up to 80% of Atlantic-wide tag recaptures for blue marlin in 1999 demonstrates the potential effectiveness of implementing proper outreach activities for improving tag recapture/reporting percentages.

The continued improvement of Istiophorid tag recapture/reporting percentages is likely. Proper identification of critical billfish fisheries, implementation of outreach procedures in these areas (Jones and Prince 1998), and improved tagging equipment that reduces tag-shedding rates are all contributing to the success of the program. Atlantic-wide implementation of outreach procedures has also been aided by the development of the ICCAT Tag Recovery Network (ITRN) in 1998. Although the ITRN was established primarily to assist bluefin tuna archival tag recoveries, conventional tag recoveries, including those for billfish, have also benefited. For example, there has been an increase in reporting of marlin tag recaptures from longline gear, particularly from the Spanish longline fleet in recent years, and this can be attributed directly to the ITRN.

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Table 1. Release and recoveries for blue marlin, white marlin and sailfish from the NMFS Cooperative Tagging Center (CTC) and The Billfish Foundation from 1954-1999.

Billfish Tag Releases and Recaptures by Agency

Species	Agency	Initial Release	1st Recapture	Re-release	2nd Recapture	% Recaptured
Blue Marlin	NMFS CTC	23,692	229	20	3	0.98
	The Billfish Foundation	18,265	336	6		1.84
White Marlin	NMFS CTC	31,315	587	49		1.87
	The Billfish Foundation	9,800	250	13		2.55
Sailfish	NMFS CTC	65,496	1,209	106	9	1.86
	The Billfish Foundation	28,803	466	46		1.62
Total billfish		177,371	3,077	240	12	1.73

Table 2. Releases and recoveries for blue marlin, white marlin and sailfish from the South Carolina Department of Natural Resources from 1962-1999.

Billfish Tag Releases and Recaptures by the South Carolina Department of Natural Resources

Species	Released	Recaptured	% recaptured
Blue Marlin	811	8	0.99%
White Marlin	322	4	1.24%
Sailfish	1,120	7	0.63%
Totals	2,253	19	0.84%

Table 3. Gear types used for tag release activities of blue marlin, white marlin, sailfish and other unspecified billfish species for the Cooperative Tagging Center and The Billfish Foundation.

Billfish Tag releases by gear type and agency

Agency	Species	Gear							Total
		Gillnet	Hand line	Longline	Purse seine	Rod & Reel	Trawl Net	Un-specified	
NMFS CTC	Blue marlin	0	5	1,389	1	22,208	0	89	23,692
	White marlin	0	0	2,776	9	28,475	6	49	31,315
	Sailfish	0	1	955	1	64,466	0	73	65,496
	Other billfish	0	0	203	0	573	0	2	778
The Billfish Foundation	Blue marlin	1	0	71	0	5,628	0	12565	18,265
	White marlin	0	0	137	0	2,541	0	7122	9,800
	Sailfish	17	0	113	0	6,915	0	21758	28,803
	Other billfish	0	0	2	0	179	0	359	540
Totals		18	6	5,646	11	130,985	6	42,017	178,689

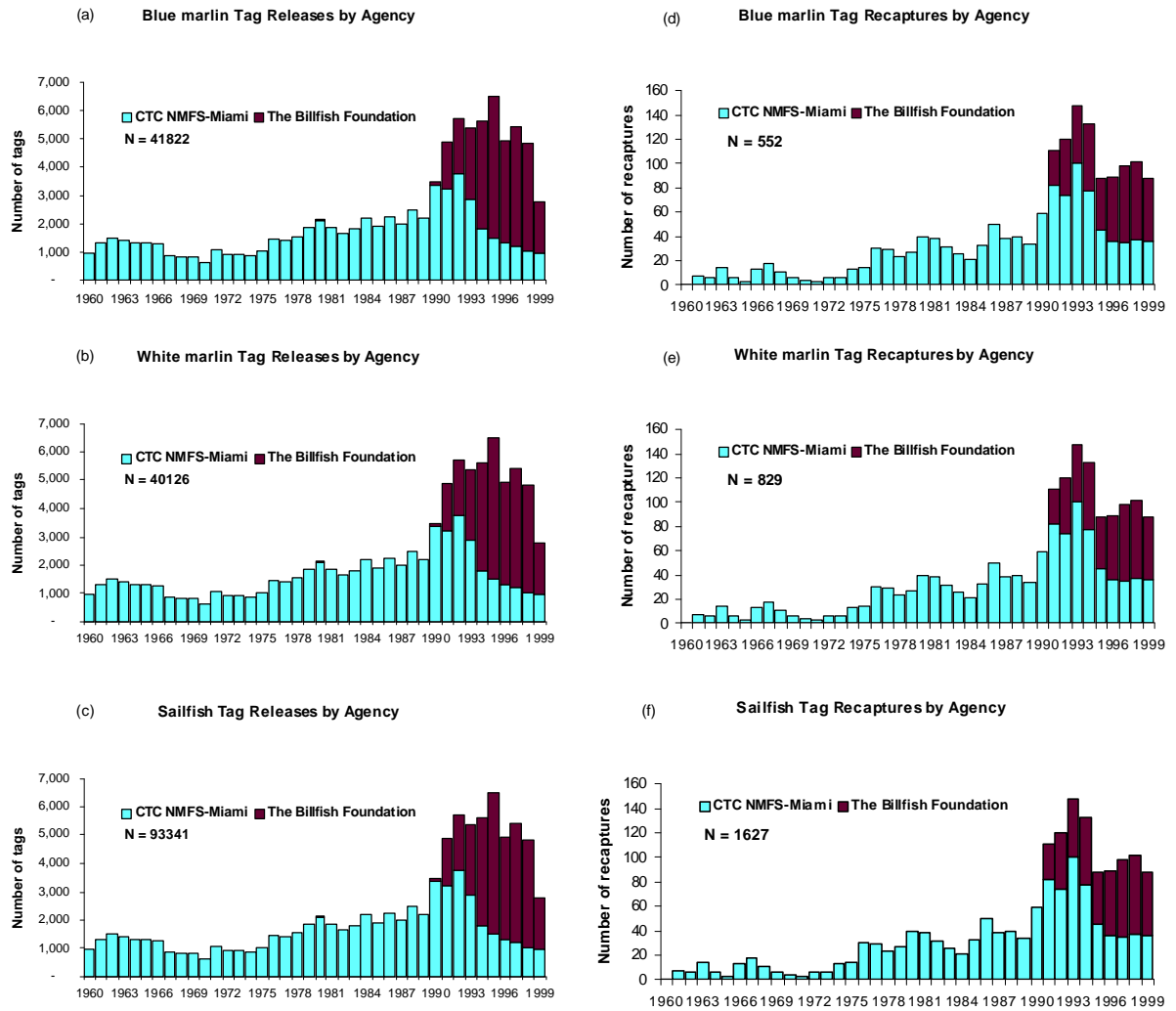


Figure 1. Numbers of releases (a-c) and recaptures (d-f) from the Cooperative Tagging Center (CTC) and The Billfish Foundation (TBF) from 1960-1999.

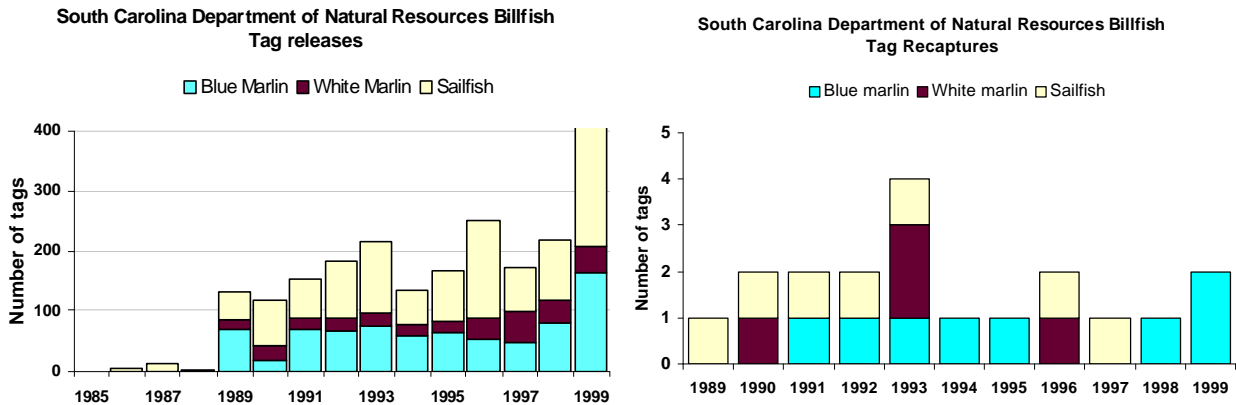


Figure 2. Numbers of releases (a) and recaptures (b) from the South Carolina Marine Resources Division from 1985-1999.

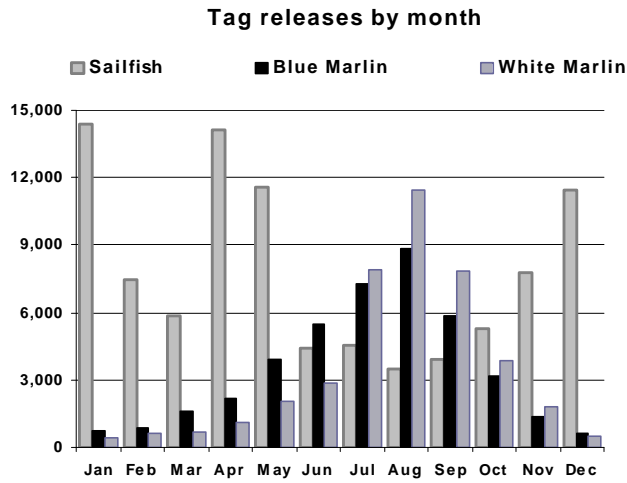


Figure 3. Releases by month for blue marlin, white marlin and sailfish tagged by the Cooperative Tagging Center and the Billfish Foundation from 1954 to 1999.

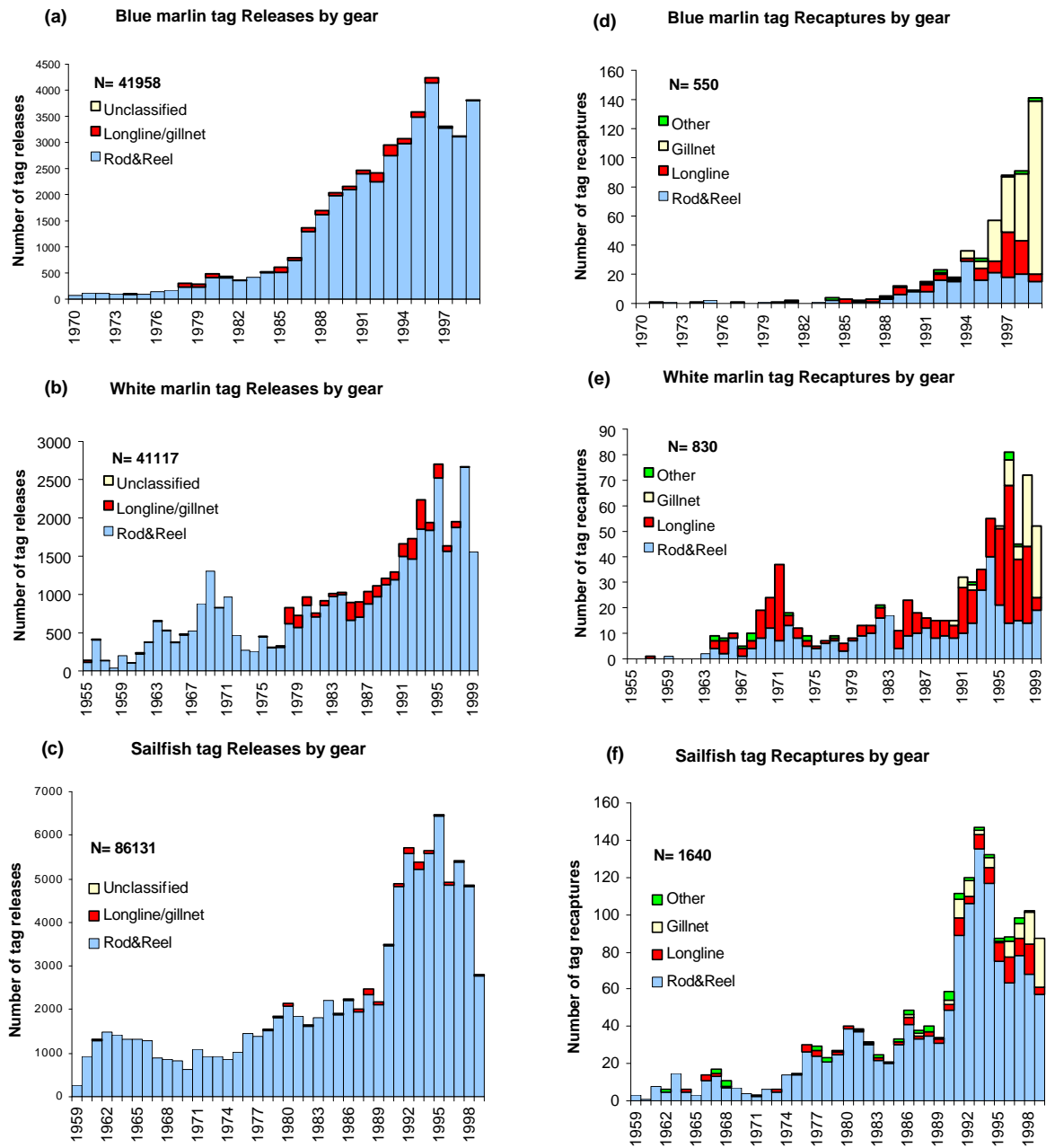


Figure 4. Tag releases (a-c) and recaptures (d-f) by longline, gillnet, rod and reel, and unclassified gear type for blue marlin, white marlin and sailfish.