

Blue Marlin, *Makaira nigricans*, Movements in the Western North Atlantic Ocean: Results of a Cooperative Game Fish Tagging Program, 1954-88

W. N. WITZELL and E. L. SCOTT

Introduction

The Cooperative Game Fish Tagging Program was created in 1954 as a joint effort between fisheries scientists and fishermen to provide information on the movements of various pelagic fish species occurring throughout the western central Atlantic Ocean (Scott et al., In press). Present tagging efforts target the following pelagic species: Blue marlin, *Makaira nigricans*; white marlin, *Tetrapturus albidus*; sailfish, *Istiophorus platypterus*; swordfish, *Xiphias gladius*; bluefin tuna, *Thunnus thynnus*; yellowfin tuna, *Thunnus albacares*; and bigeye tuna, *Thunnus obesus*). All of these pelagic species have high recreational values, but the blue marlin is undoubtedly the most prestigious to capture. In fact, an entire multi-million dollar industry has evolved around this single "rare event" species.

Determining the migration patterns of these species is necessary for formu-

The authors are with the Oceanic Pelagic Resources Division, Miami Laboratory, Southeast Fisheries Center, National Marine Fisheries Service, NOAA, 75 Virginia Beach Drive, Miami, FL 33149.

ABSTRACT—Blue marlin, *Makaira nigricans*, tag and recapture data are summarized for 1954-1988. During this period, 8,447 fish have been tagged and only 30 (0.35 percent) have been returned. Results of the tagging program indicate that blue marlin not only travel considerable distances (7,000 km from the U.S. Virgin Islands to the Ivory Coast of West Africa), but have remained at large for up to 8 years. Seasonal movements, however, are difficult to determine accurately.

lating sound management strategies, as mandated by the Magnuson Fishery Conservation and Management Act of 1976, and the Atlantic Billfish Fishery Management Plan (USDOC, 1988). Migration patterns of many of these fish are emerging through rigorous tagging efforts and subsequent recaptures. However, the seasonal movements of blue marlin have not been well documented due to its exceptionally rare event status. This paper summarizes the available tag and recapture data for blue marlin in the western north Atlantic Ocean from 1954 to 1988.

Tagging Methods and Results

The basic mechanism and methodology of tagging large pelagics has been adequately described by Squire (1987) and Scott et al. (In press) for Pacific and Atlantic marlins, respectively, and is only briefly summarized here. Tagging equipment (tags, tag report cards, tag insertion poles, and instructions) are distributed upon request to interested fishermen. These anglers are instructed to insert the stainless steel dart tag anteriorly beside the dorsal fin when the fish is brought alongside the boat. After



A marlin is tagged beside the dorsal fin.

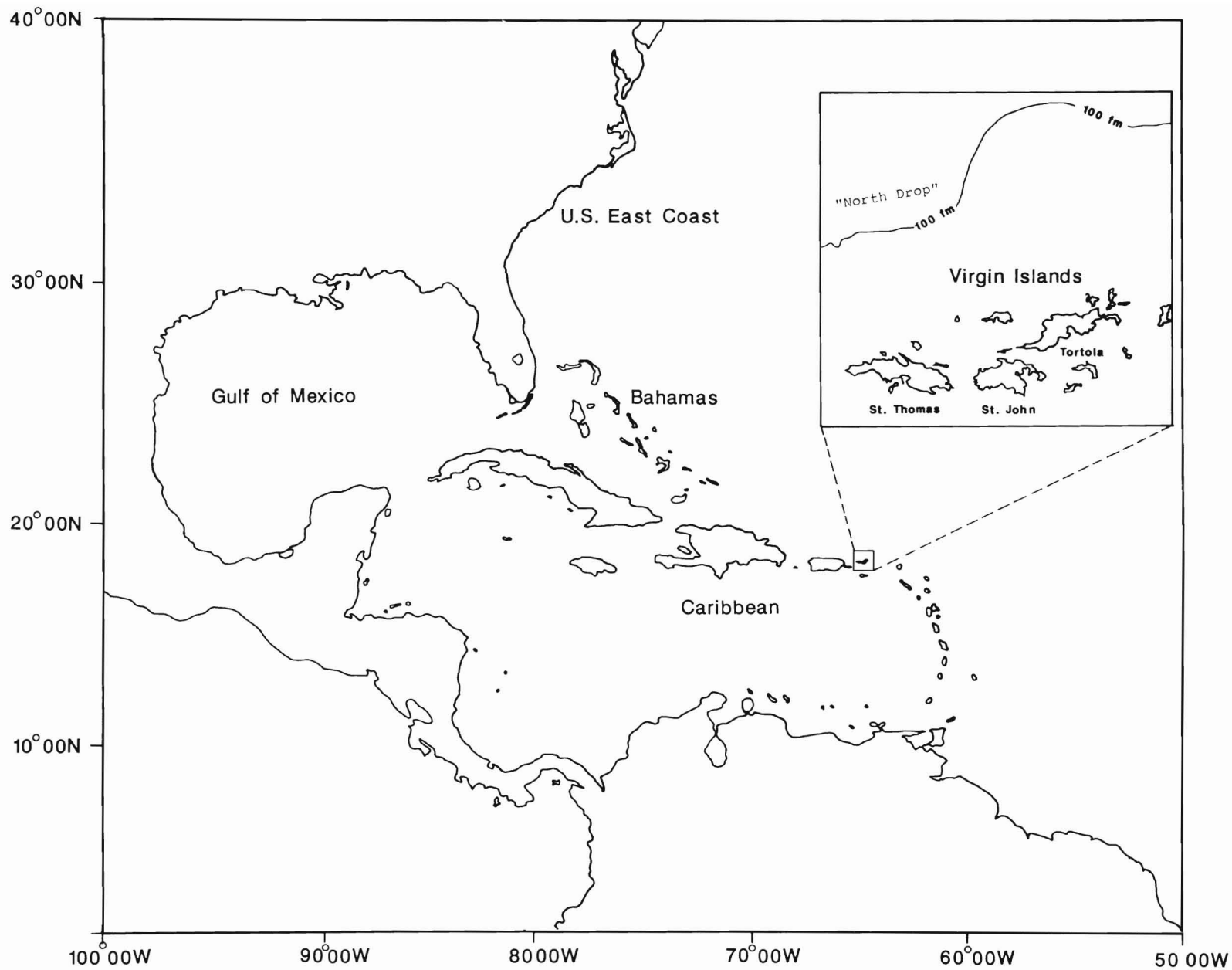


Figure 1.—Areas and locations of the NMFS Cooperative Game Fish Tagging Program for blue marlin.

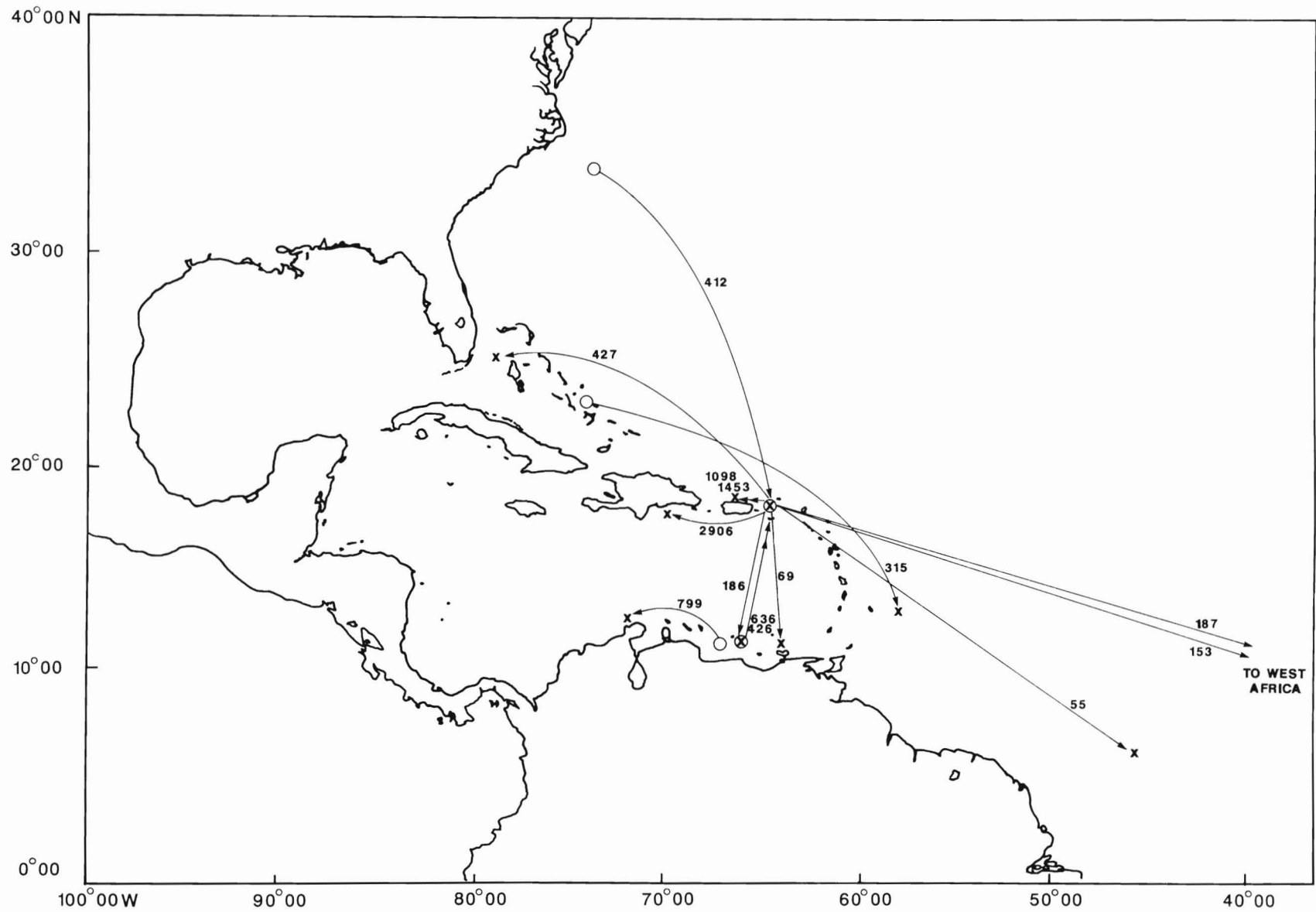


Figure 2.—Blue marlin tag/recaptures in the Caribbean from the NMFS Cooperative Game Fish Tagging Program, 1954-88. Numbers indicate days fish were at large. Note: Arrows are not intended to indicate routes taken by the tagged fish, but only as a visual aid to differentiate tagging and recapture sites. O = tagging location; X = recapture location.

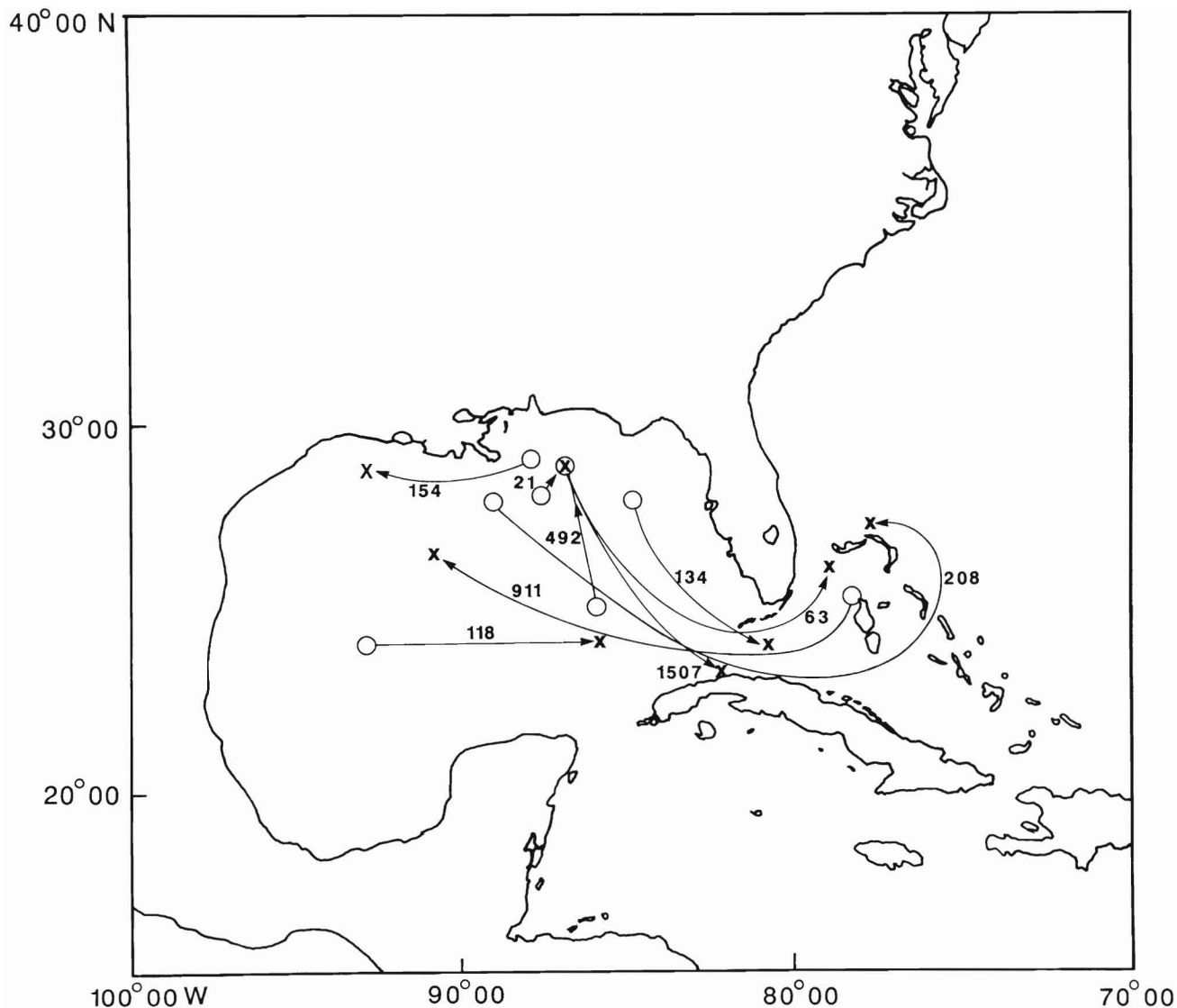


Figure 3.—Blue marlin tag/recaptures in the Gulf of Mexico and Bahamas areas from the NMFS Cooperative Game Fish Tagging Program, 1954-88. Numbers indicate days fish were at large. Note: Arrows are not intended to indicate routes taken by tagged fish, but only as a visual aid to differentiate tagging and recapture sites. O = tagging location; X = recapture location.

tagging a fish, the angler then fills out a tagging report card with the following requested information: Species, date, location, estimated length and weight, condition, bait, and the angler's and captain's names and addresses. The completed cards are then returned to the National Marine Fisheries Service (NMFS) for processing. Subsequently, the same basic information is requested of any angler returning a tag.

From 1954 through 1988, 8,447 blue marlin have been tagged. Return information has been received for only 30 (0.35 percent) of the number tagged. This extremely low return rate is undoubtedly due to a variety of factors, the most likely stemming from its rare event status, combined with its large geographic range, great mobility, tag loss, and nonreporting of fish caught with tags. Recreational rod-and-reel fishermen

accounted for most of these fish tagged and returned, although participation from various commercial longline fleets is evident (Table 1). The locations of areas mentioned throughout the text are illustrated in Figure 1.

Discussion

Blue marlin in the Caribbean area, particularly the "North Drop" off St. Thomas in the Virgin Islands, appear to

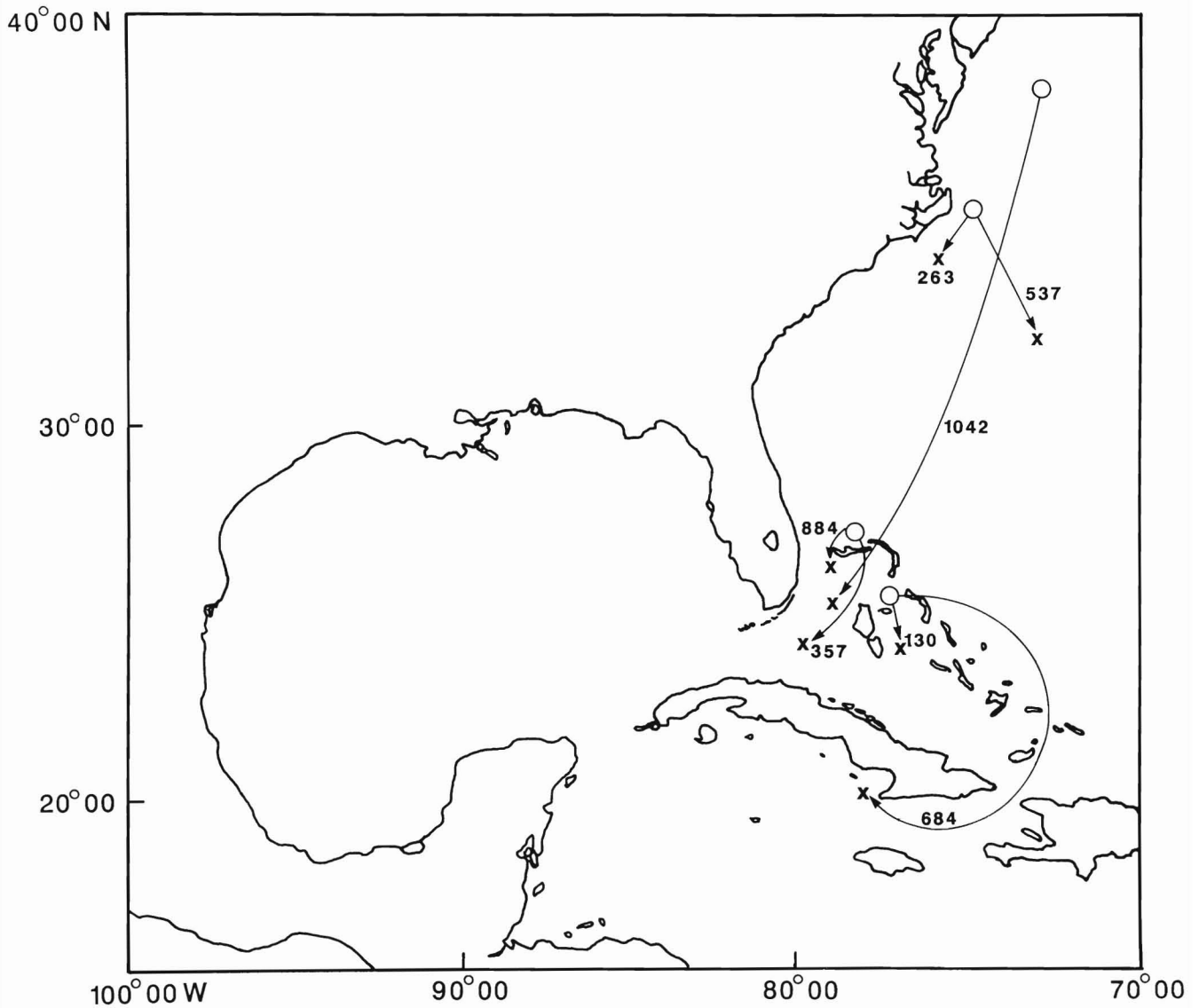


Figure 4.—Blue marlin tag/recapture in U.S. East Coast and the Bahamas are from the NMFS Cooperative Game Fish Tagging Program, 1954-88. Numbers indicate days fish were at large. Note: Arrows are not intended to indicate routes taken by tagged fish, but only as a visual aid to differentiate tagging and recapture sites. O = tagging, location; X = location.

be relatively abundant (Prince et al., 1989). This abundance is also reflected by the high numbers of fish tagged/released in this area (Table 2). Tag/recapture data (Table 3, Fig. 2) indicates that Caribbean-tagged blue marlin not only travel considerable distances, but they have remained at large for up to 8 years. Evidence indicates two-way movements between the Caribbean Islands and Venezuela and the Bahamas, and at least one-way travel from St.

Table 1.—Number of blue marlin recaptures reported to the Cooperative Game Fish Tagging Program by gear type from 1954 to 1988.

Item	Method	Number	Percent
Tagged	Rod and reel	26	86.7
	Longline	4	13.3
Total		30	100.0
Returned	Rod and reel	15	50.0
	Longline	10	33.4
	Handline	2	6.7
	Purse seine	1	3.3
	Found dead	1	3.3
	Unknown	1	3.3
Total		30	100.0

Table 2.—Number of blue marlin tagged and recaptured, reported to the Cooperative Game Fish Tagging Program, by area, from 1954-1988.

Area	Number tagged	Number returned	Percent of total returned
Caribbean	4,826	12	0.248
Gulf of Mexico	1,253	8	0.638
Bahamas	1,706	6	0.351
U.S. East Coast	662	4	0.604
Total	8,447	30	0.355

Table 3.—Summary of Atlantic blue marlin tag/recapture data by geographic location and season (calendar) from the Cooperative Game Fish Tagging Program, 1954-88.

Area and season tagged	Days free	Area returned	Season returned
Caribbean Sea			
Summer	1,453	Caribbean	Summer
Summer	1,098	Caribbean	Summer
Summer	799	Caribbean	Fall
Summer	427	Bahamas	Fall
Summer	187	W. Africa	Winter
Fall	153	W. Africa	Winter
Fall	55	Mid-Atlantic	Fall
Fall	69	Caribbean	Fall
Fall	636	Caribbean	Summer
Fall	426	Caribbean	Fall
Fall	186	Caribbean	Spring
Winter	2,906	Caribbean	Winter
Gulf of Mexico			
Summer	118	Gulf of Mexico	Fall
Summer	492	Gulf of Mexico	Fall
Summer	21	Gulf of Mexico	Summer
Summer	154	Gulf of Mexico	Fall
Summer	1,507	Gulf of Mexico	Summer
Summer	208	Bahamas	Winter
Fall	134	Bahamas	Winter
Winter	63	Gulf of Mexico	Spring
Bahamas			
Summer	315	Caribbean	Spring
Summer	684	Bahamas	Spring
Summer	130	Bahamas	Winter
Summer	357	Bahamas	Summer
Winter	884	Bahamas	Summer
Winter	911	Gulf of Mexico	Summer
U.S. East Coast			
Summer	537	U.S. East Coast	Winter
Summer	1,042	Bahamas	Summer
Summer	412	Caribbean	Fall
Fall	263	U.S. East Coast	Summer

Thomas to West Africa. It is unknown if the trans-Atlantic fish ever return to the western Atlantic, and fisheries scientists will never know without an extensive eastern Atlantic tagging project to document any west to east trans-Atlantic movements. Several animals were recaptured in the same general area as tagged, and it may be likely that these were repeat travelers that were returning to the area after multiple years of freedom. Although these data indicate considerable movements occur, they are too few to determine seasonality of movements accurately.

Blue marlin tag/recapture data from the Gulf of Mexico (Table 3, Fig. 3) indicates that seasonal movements may occur between the Gulf (summer) and the Bahamas (winter). It appears that, although some Gulf fish are undoubtedly remigrants, some may spend considerable time in the Gulf.

There have been relatively few blue marlin tagged and recaptured off the U.S. east coast and Bahamas (Fig. 3, 4; Tables 2, 3). All the marlin tagged from the U.S. east coast moved south, as far as the Bahamas and St. Thomas, while most of the fish tagged in the Bahamas were recovered in the same general area, except for one fish that moved into the Gulf

of Mexico and one that moved into the Caribbean.

These data are too few to determine accurately blue marlin migration patterns. Evidence presented here suggests that the concentrations of marlin in the Caribbean area occur year-round, particularly near St. Thomas, and may move seasonally either to West Africa, the Bahamas, or to the U.S. east coast. It is interesting to note that there are no direct movements recorded between the Caribbean and the Gulf of Mexico.

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