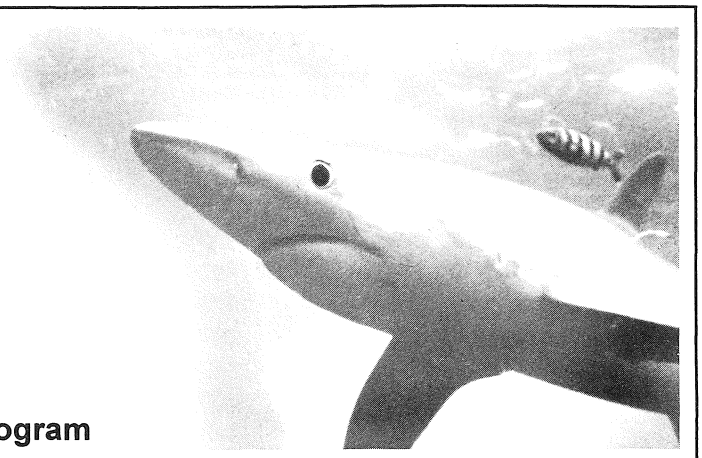
THE SHARK TAGGER 1997 SUMMARY



Newsletter of the Cooperative Shark Tagging Program

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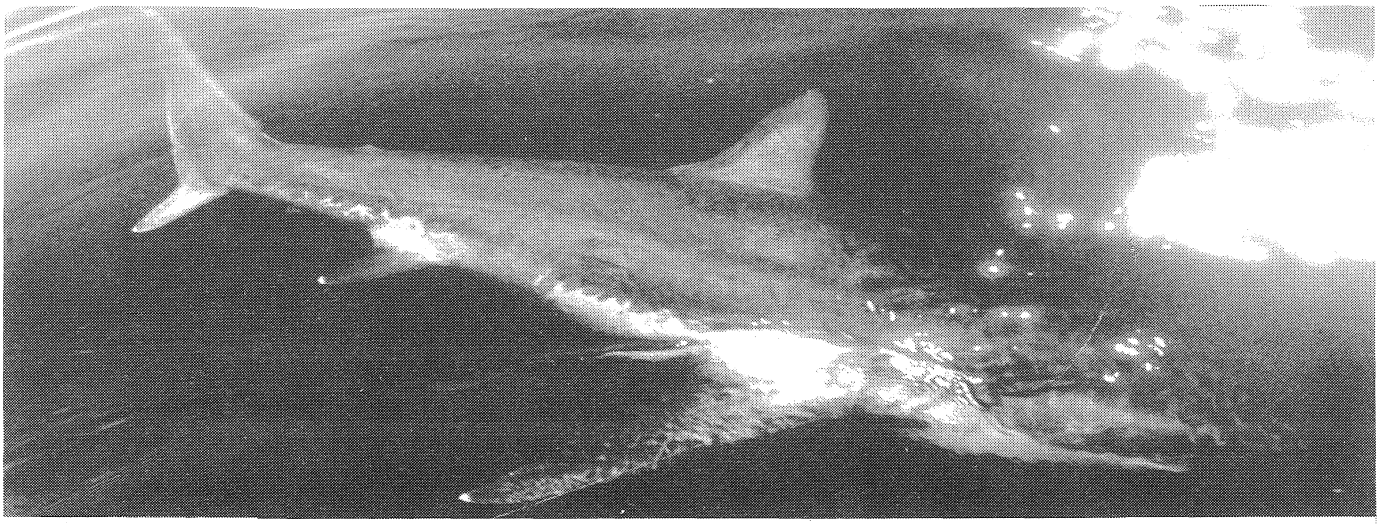
1997 Overview

In 1997, members of the Cooperative Shark Tagging Program (CSTP) tagged 8,816 fish representing 31 species of sharks and rays and 11 species of teleosts (Table 1). This is the second highest number tagged in a single year (second only to 1996) and brings the total to more than 147,000. Sharks and teleosts were tagged primarily by recreational anglers (68%) fishing with rod and reel and tagging free swimming sharks, and by NMFS and other biologists (21%) using longlines, gill nets, and handlines. An additional 1,016 fish (11%) were tagged by commercial fishermen and fisheries observers on board commercial vessels. United States fishermen, in conjunction with taggers from England, Canada, Portugal, Ireland, France, and Spain were responsible for the tagging effort.

The principal shark species tagged were blue (68%), sandbar (9%), tiger (4%), mako (3%), Atlantic sharpnose, blacktip, and porbeagle (each 2%). Sport fishermen tagged the vast majority of blue sharks, making this the second highest number of blue sharks tagged in the history of the CSTP. In addition,



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Distribution of this newsletter is limited to active participants in the NMFS Cooperative Shark Tagging Program. This information is preliminary, and subject to revision.

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Table 1. Summary of sharks and teleosts tagged, January to December, 1997

Species	Number Tagged by Cooperative Taggers
Sharks	
Blue shark	5956
Sandbar shark	792
Tiger shark	379
Shortfin mako	237
Atlantic sharpnose shark	219
Blacktip shark	200
Porbeagle	143
Dusky shark	127
Bonnethead	104
Nurse shark	64
Blacknose shark	51
Spinner shark	42
Scalloped hammerhead	35
Smooth dogfish	34
Silky shark	26
Bull shark	23
Lemon shark	22
Sand tiger shark	20
Thresher shark	19
Atlantic angel shark	11
Oceanic whitetip shark	8
Caribbean reef shark	7
Great hammerhead	6
Spiny dogfish	5
Smooth hammerhead	4
Finetooth shark	4
Longfin mako	4
Shark, unspecified	22
Hammerhead, unspecified	8
Dogfish, unspecified	8
Brown/Dusky, unspecified	1
Miscellaneous rays	15
Total sharks	8596
Teleosts	
Swordfish	89
White marlin	37
Bigeye tuna	27
Bluefin tuna	25
Blue marlin	22
Sailfish	5
Yellowfin tuna	2
Miscellaneous teleosts	13
Total teleosts	220
Grand total	**8816**

Cover photo: Thresher shark brought along side the *F/V Panther* for tagging (see story Page 15.) Photo by Lisa J. Natanson
Photo opposite: Blue shark in sling along side the *F/V Panther* for tagging and injection with OTC (see story Page 15.) Photo by Lisa J. Natanson

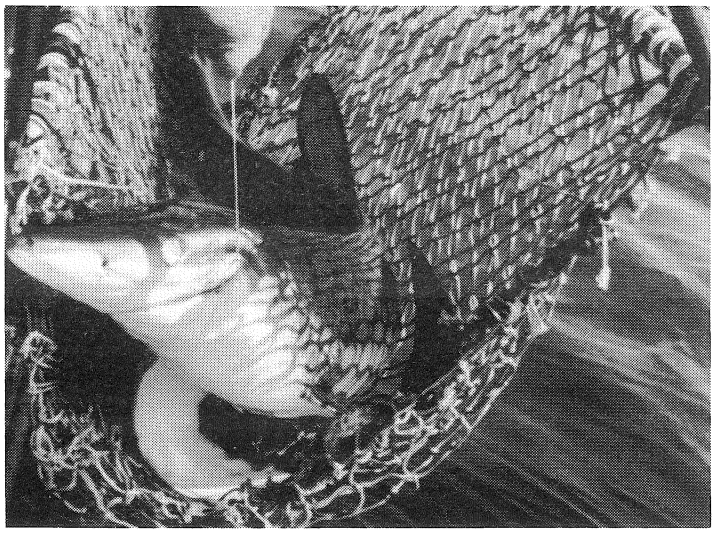
NMFS and other biologists tagged more than 400 blue sharks on research cruises in 1997. The number of sandbar sharks tagged has also been increasing in recent years, largely due to the cooperative efforts of NMFS biologists and other researchers and fisheries observers investigating inshore shark pupping areas. Nearly 50% of the sandbar sharks tagged in 1997 were neonates (newborns) in Delaware Bay (this research is described in more detail in the Field Studies section of the Newsletter).

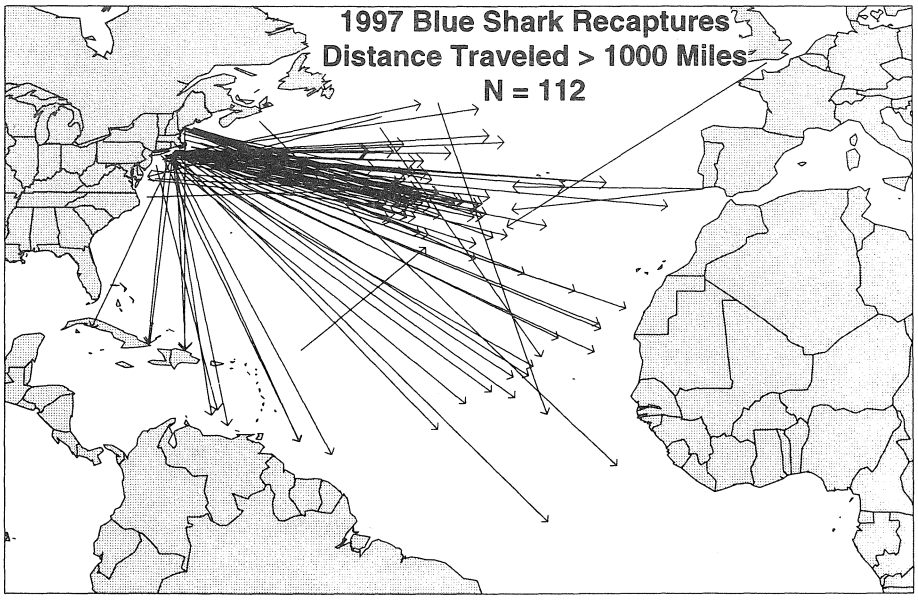
In addition to the standard "M" type dart tag that most taggers are familiar with, NMFS biologists are also using a yellow plastic-tipped dart tag and a blue plastic rototag. These latter two tags are used exclusively on small sharks. The blue rototag is a small fin tag applied through the first dorsal fin of the shark (see picture on Page 16). Please watch out for these new tags and report information on tag number, species, sex, measured fork length, location, date, and capture gear. If you are sacrificing the animal, please also take a piece of the backbone for ageing studies. These data are critical to studies of coastal shark nursery grounds.

In 1997, information was received on 685 recaptured fish representing 21 species of sharks and 4 species of teleosts. Blue (482), sandbar (61), tiger (34), porbeagle (23), and mako (22) sharks represented the predominant species recaptured (Table 2). This was another record year in terms of recaptures, and brings the total to nearly 7,500 fish. The recaptured fish were originally tagged by recreational anglers (73%), NMFS and other biologists (15%), and commercial fishermen and fisheries observers onboard commercial vessels (12%). In contrast, tagged fish were recaught primarily by anglers (52%) and commercial fishermen and fisheries observers (47%). Recapture information was obtained from fishermen representing 14 countries: U.S. (459), Spain (125), Canada (44), Japan (20), Mexico (9), Portugal (9), Venezuela (8), Cuba (3), Dominican Republic (2), France (2), Italy (10), Bermuda (10), Uruguay (1), and Ireland (1). In addition to the enthusiastic and valuable support from U.S. anglers and commercial fishermen, continued cooperation with fishermen and biologists from countries across the Atlantic has made 1997 another successful year for the CSTP and shark research.

Blue Sharks (482 Returns)

Times at liberty ranged from 1 day to 7.1 years - The majority of the blue shark recaptures (275) were at liberty for less





than 1 year; 153 at liberty from 1 to 5 years; and 5 were at liberty for greater than 5 years. Two of these recaptures were the sixth and eighth longest times at liberty to date (6.1 and 7.1 years). Overall, 173 of the blue sharks were released after initial capture, 107 with and 66 without a tag. Of these retags, eleven were caught again. Short-term multiple recaptures (6), which were tagged and recaptured in the summer off Rhode Island and New York over a 2.5 month period in 1997, demonstrated fine scale movements of the individual fish in a localized area.

A multiple blue shark return from a previous year's tagging was tagged in October of 1996 and first recaptured in July of 1997, only 55 nm away. It was recaptured again 16 days later, 3 nm away. Although this longer term multiple recapture may show little overall migration, its actual movements during the initial 9 months at liberty are unknown. In contrast, another long-term multiple recapture was tagged and recaptured after one year within 17 nm of its original tagging location off Rhode Island; then retagged and returned another year later, 2,134 nm away off the Azores. The use of archival tags on this pelagic species will help unravel the mysteries of these movements by providing a more comprehensive picture of the migration timing, routes, and cues that may trigger these migrations (see Page 13).

Distances traveled ranged from 1 to 3,374 nm - Overall, 225 blue sharks traveled distances less than 100 nm; 82 between 100-500 nm; 24 between 500-1,000 nm; and 112 greater than 1,000 nm. Of these, 23 traveled over 2,000 nm and 2 over 3,000 nm (third and tenth longest distance recorded in the CSTP). The shark that traveled 3,374 nm was tagged southeast of Montauk Pt., NY and recaptured just north of the equator (east of Brazil) after 1.8 years. One traveling 3,129 nm had been tagged off Sable Island, Canada and recaptured off Sierra Leone after 3.7 years at liberty. Other long distance recapture locations included the Flemish Cap, Azores, Portugal, Canary Islands, Cape Verde Islands, Western Sahara, Surinam, Guyana, Venezuela, Dominican Republic, and Cuba.

The number of long distance returns (> 1000 nm) in 1997 is more than double the number reported in 1996, and is a result of the extraordinary cooperation from international biologists and fishermen. Information on a total of 174 blue shark returns was received from people from Spain (113), Canada (21) Japan (16), Portugal (9), Venezuela (7), Cuba (3), Dominican Republic (2), Italy (1), Bermuda (1) and Ireland (1). These data are critical to begin to fully understand the complex migrations of this highly migratory shark species.

Interesting returns - Six blue sharks, tagged by NMFS, Narragansett Laboratory biologists east of Massachusetts in September of 1996, were returned in 1997. These sharks were all recaptured after less than one year (0.4, 0.5, 0.6, 0.7, 0.8, and 0.9 years) at liberty and from 110 to 2,041 nm away. The areas of return were spread across the Atlantic with the furthest recapture returned after the shortest amount of time. These points of recapture include the waters off the Canary Islands, Azores, Flemish Cap, Nova Scotia, southern Massachusetts, and New York. The latter two recaptures were during the summer months when blue sharks are commonly found in the New York Bight area.

Another group of 14 blue shark returns were all tagged by *R/V Geronimo* biologists within one week of each other off Martha's Vineyard, MA in late June and early July of 1996, and recaptured after approximately one year. Distances traveled ranged from 46 to 2,546 nm and points of return were scattered from the northeastern U.S. (Maryland, New York, New Jersey, and Maine) to Newfoundland, the Flemish Cap, Azores, and Cape Verde Islands.

Other interesting long distance returns included: two blue sharks tagged almost one year apart (June of 1995 and 1996) off Long Island, NY that were recaptured in the same place off Guyana; a blue shark tagged northeast of Antigua and recaptured 1,039 nm in mid-ocean after eight months at liberty; a blue shark tagged in the English Channel and recaptured southwest of the Azores (1,710 nm; 0.8 years); and a group of eight blue sharks, tagged by recreational fishermen

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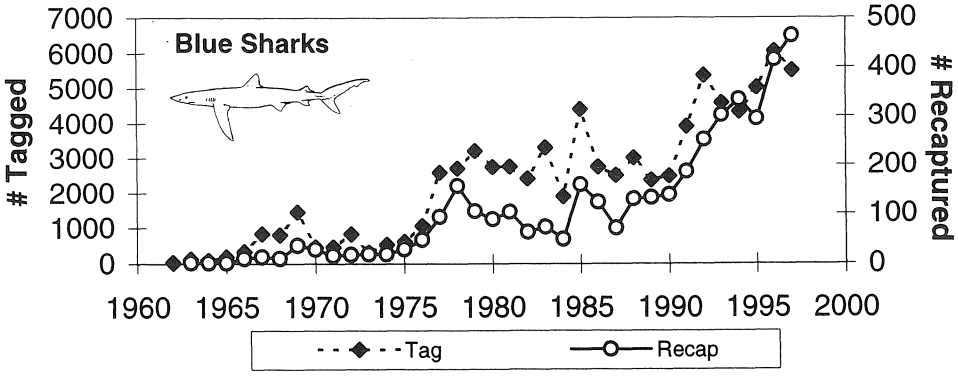
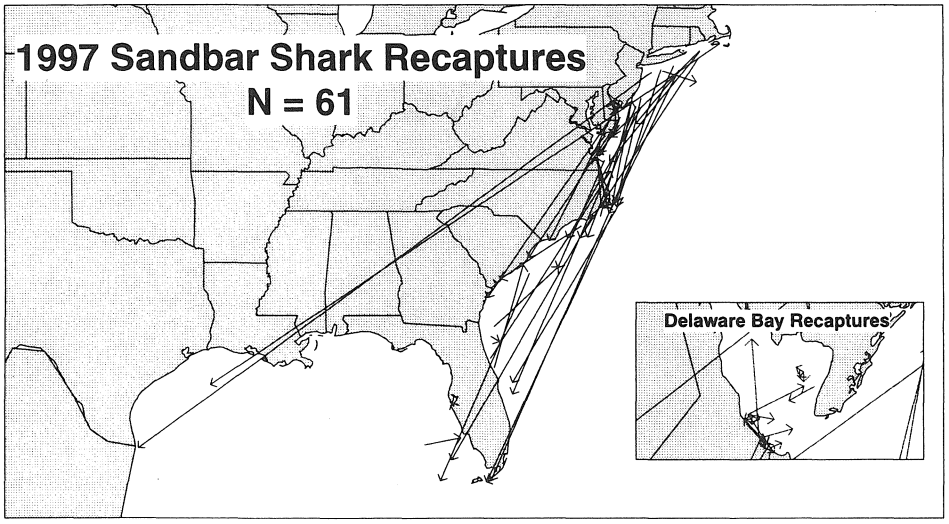




off Spain and Portugal, that were recaptured after up to 2.2 years at liberty and distances of 1,108 nm.

Sandbar Sharks (61 Returns)

Times at liberty ranged from 2 days to 13.4 years - Thirty sandbar sharks were recaptured after less than 1 year; 23 at liberty from 1-10 years, and 3 were returns from 10-15 years. The longest time at liberty for any tagged sandbar shark returned in 1997 was 13.4 years. This fish was tagged by a recreational fisherman in August of 1983, off Long Island, NY and was recovered by a fisheries observer off North Carolina. With the exception of four fish, all short-term recaptures (< 1 year) were neonates.

Distances traveled ranged from less than 1 to 1,938 nm - Most (40) of the sandbar sharks were recaptured less than 300 nm from their original tagging location, however, 3 traveled more than 1000 nm. These three fish were all recaptured in the Gulf of Mexico; one off Florida and two off Texas after traveling from the waters off New Jersey, New York and Massachusetts. Three other sandbar sharks, tagged in the Atlantic, were recovered in the Gulf of Mexico off southwest Florida. All local returns (distances traveled of < 25 nm), in 1997, were neonates with the exception of four fish; three were tagged off Florida and recaptured after one, two, and three years at liberty; and the fourth was at liberty for 6.5 years. These local returns, recaptured during the same time of year as tagging, suggest that some sandbar sharks may return to the same general location in subsequent years.

Interesting returns - As part of an ongoing shark nursery grounds study (see Field Studies), 392 neonate sandbar sharks were released with tags in Delaware Bay in 1997, of which 20 were recaptured. Seventeen were recaptured inside the Bay with times at liberty ranging from 2 to 62 days and distances traveled from 1 to 13 nm. These local returns were all tagged in the months of July (nine) and August (eight) and recaptured as late as the end of September in the Bay. One neonate was recaptured with no information on location. The other two sandbar sharks, which were tagged in Delaware Bay, were recaptured as they migrated south to their over-wintering grounds. One was returned off Chincoteague Inlet, VA in October (77 days; 56 nm) and the other off Folly Inlet, NC (91 days; 333 nm).

Eight sandbar sharks tagged in previous years as neonates were recaptured in 1997. Four of these fish were tagged on their pupping grounds (two in Great Bay, NJ and two in Delaware Bay). The two New Jersey fish were tagged at the same time and place in 1996 and were recaptured together 9 months later after traveling 260 nm. Of the two Delaware Bay fish, one was tagged in 1995 and recaptured off Georgia after 1.8 years at liberty; the other was tagged in 1996 and recovered in Delaware Bay, only 21 nm from its original tagging location after 1 year at liberty.

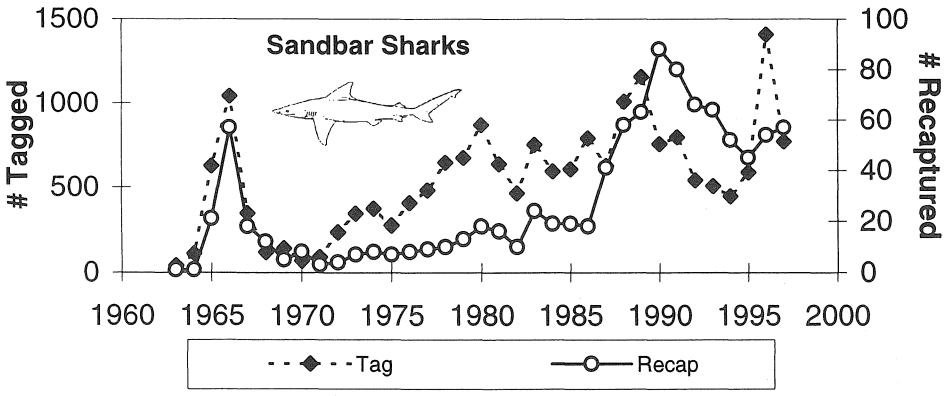
Four other neonates were recaptured. These fish were tagged by a biologist in October of 1996 off North Carolina after having presumably migrated south from their northern summer pupping grounds. After 8-9 months at liberty, three of these fish were recovered in Chesapeake Bay, VA, another primary sandbar shark nursery area. The other neonate was returned from the same area of tagging in March of 1997.

These and other neonate recaptures will help us delineate migratory patterns, and the location of primary pupping, nursery and over-wintering areas. In addition, they may answer questions on site fidelity, whether neonates return to their pupping grounds, and for how many years.

Tiger Sharks (34 Returns)

Times at liberty ranged from 1 day to 2.2 years - Fifteen tiger sharks were recaptured less than one year after tagging; eight were at liberty from 1 to 2 years; and 1 fish was at liberty for more than 2 years. Ten tags were returned with no date information, precluding the calculation of time at liberty.

Distances traveled ranged from less than 7 to 2,373 nm - The majority (31) of the tiger sharks made coastwide migrations from 100 to 300 nm, traveling farther north in the warmer months. There were two exceptions in 1997,



which have followed a pattern observed in recent years. One tiger shark was first tagged in September of 1995 and recaught and re-released with the same tag one day later and 8 nm away. The fish was recaptured again 2.2 years later after traveling 2,373 nm to an area 800 nm west of the Cape Verde Islands. The other shark was tagged off North Carolina in January of 1996 and recaptured 1.5 years later approximately 600 nm south of the Flemish Cap (a distance 1,549 nm). These are the fourth and tenth longest distance traveled to date for any tiger shark previously tagged in the CSTP. Both of these fish were tagged by biologists and positively identified as tiger sharks at tagging. These sharks are only the fourth and fifth out of 620 that have shown long-distance movements to an area south of the Flemish Cap or transatlantic migrations toward the African coast.

Interesting returns - In addition to the multiple return just discussed, another tiger shark was recaptured twice. This fish was originally tagged off Georgia in January of 1997 and first recovered off North Carolina after 6 months at liberty and traveling 266 nm to the northeast. He was re-released with the same tag, recaptured two days later (28 nm away) and released again with the tag in place. At each point of tag and recapture, the tiger shark was caught and measured by the same biologist. Repeated returns of this kind show that juvenile sharks can survive the catch and release process and provide information on growth and fine scale migration routes.

Another interesting return was a tiger shark that was tagged southwest of Puerto Rico and recaptured south of Anguilla Island in the Lesser Antilles (1 year; 284 nm). Recoveries from unusual tagging locations are critical to help elucidate the migrations of such wide ranging coastal-pelagic shark species as the tiger shark.

Porbeagles (23 Returns)

Times at liberty ranged from 6 days to 9.2 years - The 9.2 year return was the longest time at liberty for any porbeagle tagged in the CSTP (prior record was 8.6 years). This shark was tagged east of Martha's Vineyard, MA by a fisheries observer, in 1987, and was recaptured by a Canadian commercial fisherman east of Cape Sable, Nova Scotia, Canada after traveling a distance of 268 nm northeast. Overall, 5 sharks were at liberty less than 1 year, 5 from 1 to 2 years, 5 from 2 to 3 years, 7 at liberty from 4 to 5 years, and 1 at liberty greater than 5 years.

Distances traveled ranged from 20 to 426 nm - All porbeagle recaptures in 1997 were returns from sharks tagged in the western Atlantic with the exception of two fish. Both of these sharks were tagged and recaptured in the English Channel after up to 1.5 years at liberty and traveling distances up to 67 nm. There have been less than five porbeagles returned from this area in the records of the CSTP.

Interesting returns - Three porbeagles were recaptured in the Gulf of St. Lawrence. Two were originally tagged in the Gulf of Maine and one on Sable Island Bank. All were at liberty from 2.8 to 3.7 years and traveled distances from 243 to 391 nm. Up to this time, only two other porbeagles, tagged by members of the CSTP, have been recaptured from this area. Other returns this year showed similar patterns of localized movements between U.S. and Canadian waters (see 1996 Shark Tagger).

Shortfin Makos (22 Returns)

Times at liberty ranged from 13 days to 12.8 years - The 12.8 year recapture is the longest time at liberty for any mako recorded in the CSTP. The previous record was 9.5 years. This shark was originally tagged from the research vessel *R/V Geronimo* in 1984 off Oregon Inlet, NC and was recaptured off South Carolina by a fisheries observer on a commercial longline vessel. In addition, a piece of the backbone was collected to verify current age estimates. This recapture proves that shortfin mako sharks live at least 13 years; this longevity information is critical to the management of this valuable resource. Two other returns were at liberty for more than four years (4.9 and 5.2 years). These are the seventh and ninth longest times at liberty on record.

Distances traveled ranged from 19 to 1,142 nm - Five mako sharks in the 1997 data show distances traveled of less than 100 nm; 10 between 100 and 500 nm; and five traveled greater than 500 nm. Data on these long distance recaptures were supplied by foreign fishermen. Information on two sharks was returned by a Spanish biologist; both makos were recaptured southwest of the Azores and traveled over 700 nm from their original tagging location, one after three months and one after 3.8 years at liberty. Two other fish, which were originally tagged off the northeast coast of the U.S. and recaptured southwest of the Flemish Cap by Japanese longline fishermen, traveled distances greater than 1,000 nm. The fifth long distance mako shark return was a southern hemisphere tag and recapture; tagged off Argentina and returned off Brazil (853 nm; 4.9 years). This is only the second mako return that was both tagged and recaptured in the South Atlantic. Overall in 1997, information on ten shortfin makos was received from cooperating foreign biologists and fishermen from Canada, Spain, Japan and Uruguay.

Interesting returns - One fish, tagged south of Montauk Point, NY, was recaptured on Jeffrey's Ledge off Rockport, ME (149 nm) after 5.2 years. There are less than five shortfin mako shark returns that show movement into the Gulf of Maine.

Other Species (63 Returns)

Recaptures of other species included some long distance and maximum time at liberty records for the CSTP. A **great hammerhead shark** that was tagged off the west coast of Florida, was recaptured off Campeche, Mexico (637 nm; 2.8 years). This is only the fourth great hammerhead recaptured to date, the first recovered from Mexican waters, and is a record time at liberty and distance traveled for this species. A **spinner shark** traveled 148 nm from Port Everglades, FL into the Gulf of Mexico after 4.4 years at liberty. This is the longest time at liberty for this species. Other interesting recoveries include: an **Atlantic sharpnose shark** that traveled from Chincoteague Inlet, VA to Folly Inlet, NC (272 nm; 6.9 years) (second longest time at liberty and sixth longest distance); a **scalloped hammerhead** at liberty for 7.9 years (fourth longest time at liberty); a **longfin mako** at liberty for 5.5 years that traveled 1,852 nm from Tobago Island to offshore of Cape May, NJ (record time at liberty and distance traveled); and a **blacknose shark** that traveled from the Florida east coast to Georgia after 2.2 years. This is only the ninth blacknose shark recaptured to date, the third longest at liberty, and the fifth furthest distance.

Table 2. Tag recoveries: January-December 1997.

	GENERAL LOCATIONS		MONTHS AT LIBERTY	DIST. (MI.) AND DIR.		CAPTURE METHOD		TAGGED BY	
	TAGGED	RECAPTURED				TAG.	REC.	TAGGER	RESIDENCE
Blue shark	Pt. Pleasant, NJ	E Pt. Pleasant, NJ	2	47	SE	RR	RR	Joe Rubino	NY
" "	SW Valencia Isl., Ireland	NR	NR	0		RR	LL	Seanie Murphy	Ireland
" "	SE Ocean City, MD	S Fire Island Inlet, NY	<1	148	NE	RR	RR	Arthur Lohsen	MD
" "	SE Pt. Judith, RI	S Martha's Vineyard, MA	61	11	NE	RR	RR	Dan Terceiro	RI
" "	E Barnaget, NJ	S Shinnecock Inlet, NY	3	74	NE	RR	RR	David Krypel	NJ
" "	SE Pt. Judith, RI	SE Portland Headlights, ME	11	143	NE	RR	RR	James Levy	RI
" "	SSE Moriches Inlet, NY	NR	NR	0		RR	NR	Jim Matuszewski	NY
" "	NE Oregon Inlet, NC	S Flemish Cap	38	1421	E	GN	LL	B. Bernatonis, NMFS Obs.	MA
" "	SE Block Island, RI	SE Block Island, RI	<1	3	W	RR	RR	Kathleen & Stephen Cone	NY
" "	NR	SE Portland Headlights, ME	NR	0		RR	RR	Dale Hoover	PA
" "	SE Pt. Judith, RI	S Flemish Cap	20	1243	E	RR	LL	Norman Jalbert	RI
" "	S Moriches Inlet, NY	S Halifax, NS, Canada	85	470	NE	RR	LL	Richard Haug	NY
" "	S Shinnecock Inlet, NY	SE Block Island, RI	13	77	NE	RR	RR	Bill Martin	NY
" "	NR	SSE Fire Island Inlet, NY	NR	0		RR	RR	Jeff Slater	NY
" "	S Montauk Pt., NY	SE Flemish Cap	74	1317	NE	RR	LL	Bill Ricca	NY
" "	NR	S Shinnecock Inlet, NY	NR	0		RR	RR	Denny Dillon	RI
" "	NR	S Flemish Cap	NR	0		RR	LL	Steven Lovegreen	RI
" "	SE Montauk Pt., NY	S Pt. Judith, RI	45	28	N	RR	RR	Bill Brown	CT
" "	SE Montauk Pt., NY	E Portland Headlights, ME	2	183	N	FS	RR	Bud Goldfinger	NY
" "	SE Pt. Judith, RI	E Montauk Pt., NY	1	13	S	RR	RR	Ilario V. Circosta	MA
Blue shark	SE Pt. Judith, RI	S Pt. Judith, RI	<1	8	SW	RR	RR	Ilario V. Circosta	MA
" "	S Pt. Judith, RI	SW Pico Island, Azores	19	1725	E	RR	LL	Fran Ramella	RI
" "	S Portland, England	SW Faial, Azores	9	1710	SW	RR	LL	Joe Filipe	
" "	E Flemish Cap	SW Cape Verde Islands	27	2112	S	LL	LL	J. Symonds, NMFS Obs.	MA
" "	S Cape Race, NF, Canada	S Halifax, NS, Canada	48	581	NW	LL	LL	John W. Caldwell	FL
" "	E Wachapreague Inlet, VA	E Beach Haven, NJ	61	102	N	RR	RR	Billy Verbanas	DE
" "	SE Montauk Pt., NY	SW Villa Cisneros, W. Sahara	62	2829	E	RR	LL	Richard Jensen	NY
" "	Rimini, Italy	NE Crotone, Italy	NR	354	SW	RR	LL	Letizia Putrone	Italy
" "	SE Fire Island Inlet, NY	E Charleston, SC	55	488	SW	RR	LL	Nicholas Zerille	NY
" "	E Ocean City, MD	SE Montauk Pt., NY	<1	205	NE	RR	RR	Chris Jobes	NJ
" "	SE Jones Inlet, NY	S Pt. Judith, RI	2	89	NE	RR	RR	Jim Sullivan	NY
" "	SE Ocean City, MD	SE Montauk Pt., NY	14	224	NE	RR	RR	Ed Kaufman	PA
" "	SE Montauk Pt., NY	S Flemish Cap	24	1226	E	RR	LL	Durien Way	CT
" "	SSW Montauk Pt., NY	SE Fire Island Inlet, NY	13	26	SW	RR	RR	Kelly Smith	CT
" "	S Shinnecock Inlet, NY	W Cape Verde Islands	20	2603	E	RR	LL	Robert W. Timson	NY
" "	S Montauk Pt., NY	S Montauk Pt., NY	60	9	S	RR	RR	Adam Hoffenberg	MA
" "	S Pt. Judith, RI	NW Cumana, Venezuela	49	1772	S	RR	LL	Robert L. Greene	MA
" "	S Fire Island Inlet, NY	SE Jones Inlet, NY	2	20	NW	RR	RR	Alex Omundsen	NY
" "	SE Cape Elizabeth, ME	S Flemish Cap	57	1244	E	RR	LL	Richard Provencher	ME
" "	S Montauk Pt., NY	NE Paramaribo, Surinam	21	2171	SE	RR	LL	Peter Jakits	NY
Blue shark	S Nantucket Island, MA	S Flemish Cap	47	1241	E	HL	LL	Stephen Connett	RI
" "	NE Gloucester, MA	SE Gloucester, MA	<1	22	S	RR	RR	Ken Lai	NH
" "	SSE Block Island, RI	S Pt. Judith, RI	12	8	NW	RR	RR	Michael Amodeo	CT
" "	SE Pt. Judith, RI	Challenger Bank, Bermuda	31	603	SE	RR	LL	John Rainone	RI
" "	SE Pt. Judith, RI	SW Sao Miguel, Azores	40	1934	E	RR	LL	Ralph V. Carlson, Jr.	RI
" "	E Gloucester, MA	NR	NR	0		RR	LL	Paul Cronin	MA
" "	SE Portland Headlights, ME	SW Faial, Azores	43	1838	E	RR	LL	Ben Garfield	ME
" "	SE Block Island, RI	S Pt. Judith, RI	<1	8	SE	RR	RR	Alex Malgieri	MA
" "	E Cape May, NJ	SE Montauk Pt., NY	26	159	NE	RR	RR	Richard Herb	PA
" "	SE Flemish Cap	SW Faial, Azores	47	594	SE	LL	LL	Andy Kingman	PA
" "	S Cape Sable, NS, Canada	S Flemish Cap	22	1084	E	GN	LL	B. Hoffman, NMFS Obs.	MA
" "	S Portland Headlights, ME	S Flemish Cap	35	1279	E	RR	LL	Donald Harris	ME
" "	SE Pt. Judith, RI	W Villa Cisneros, W. Sahara	27	2720	E	RR	LL	Paul Bertelli	RI
" "	S Shinnecock Inlet, NY	S Cape Sable, NS, Canada	14	346	NE	RR	LL	Albert Katz	NY
" "	E Barnegat Inlet, NJ	SE Moriches Inlet, NY	<1	67	NE	RR	RR	Jeff Merrill	NJ
" "	SE Pt. Judith, RI	SE Montauk Pt., NY	2	18	SW	RR	RR	Ilario V. Circosta	MA
" "	E Manasquan Inlet, NJ	S Fire Island Inlet, NY	14	26	NE	RR	RR	Derry Bennett	NJ
" "	SE Portland Headlights, ME	NW Atlantic	NR	0		RR	LL	Ernie Johnson	ME
" "	E Montauk Pt., NY	S Moriches Inlet, NY	2	0		RR	RR	Tom Mort	RI
" "	E Portland Headlights, ME	S Flemish Cap	22	1195	E	RR	LL	Dave Sinclair	ME
Blue shark	SE Pt. Judith, RI	SW Montauk Pt., NY	40	47	W	RR	RR	Ken Benson	RI
" "	NE Gloucester, MA	S Flemish Cap	8	1333	E	RR	LL	Al Trudeau	NH
" "	S Nantucket Island, MA	W Faial, Azores	40	1556	E	LL	LL	Alex Sutton	NY
" "	S Montauk Pt., NY	W Cape Verde Islands	29	2420	SE	RR	LL	Carl Safina	NY
" "	S Pt. Judith, RI	S Flemish Cap	12	1316	E	RR	LL	John Rainone	RI
" "	SW Huelva, Spain	N La Coruna, Spain	17	533	N	RR	LL	Helder Ferreira	Portugal
" "	W Sable Island, Canada	W Freetown, Sierra Leone	45	3129	SE	LL	LL	Andy Kingman	PA
" "	E Halifax, NS, Canada	S Halifax, NS, Canada	45	83	W	LL	LL	Andy Kingman	PA
" "	E Halifax, NS, Canada	SW Flemish Cap	46	562	E	LL	LL	Andy Kingman	PA
" "	NR	W Lisboa, Portugal	NR	0		RR	LL	Graeme Pullen	England
" "	NR	SE Flemish Cap	NR	0		RR	LL	Harry J Nesbitt Jr.	PA
" "	SE Portland Headlights, ME	W Faial, Azores	21	1329	E	RR	LL	Mark Chase	ME
" "	SE Portland Headlights, ME	SW Flemish Cap	22	930	E	RR	LL	Mark Chase	ME
" "	SE Pt. Judith, RI	W Faial, Azores	NR	1452	E	RR	LL	Tom Mort	RI
" "	SE Montauk Pt., NY	SW Nantucket Island, MA	25	51	E	RR	RR	Laird Summerlin	MA
" "	S Montauk Pt., NY	W Faial, Azores	10	1493	E	RR	LL	Laird Summerlin	MA
" "	S Montauk Pt., NY	E Townsends Inlet, NJ	12	127	SW	RR	RR	Laird Summerlin	MA
" "	SSE Manasquan Inlet, NJ	NW Cumana, Venezuela	NR	1622	S	RR	LL	John Williams	NJ
" "	NR	NW Cape Verde Islands	NR	0		RR	LL	Ric Fuller	England
" "	SE Flemish Cap	W Faial, Azores	21	682	S	LL	LL	P. O'Donnell, NMFS Obs.	MA
Blue shark	SW Flemish Cap	NW Cape Verde Islands	35	1762	SE	LL	LL	J. Symonds, NMFS Obs.	MA
" "	SW Flemish Cap	SW Faial, Azores	36	802	SE	LL	LL	J. Symonds, NMFS Obs.	MA
" "	SE Fire Island Inlet, NY	S Flemish Cap	23	1273	E	RR	LL	Freddie Major	NY
" "	E Wachapreague Inlet, VA	SE Shinnecock Inlet, NY	13	220	NE	RR	RR	James D. Houser	MD
" "	SE Montauk Pt., NY	S Moriches Inlet, NY	24	69	SW	RR	FS	John Farris	NY
" "	SE Montauk Pt., NY	N Cape Verde Islands	NR	2505	E	RR	LL	Jeff Eckert	CT
" "	SE Ocean City, MD	W Faial, Azores	NR	1540	E	RR	LL	Marty Moran	MD
" "	S Shinnecock Inlet, NY	SE Montauk Pt., NY	26	44	NE	RR	RR	Kurt Hofman	NY
" "	S Flemish Cap	SE Flemish Cap	34	215	E	LL	LL	John Caldwell	FL

Table 2. Tag recoveries: January-December 1997.

	GENERAL LOCATIONS		MONTHS AT LIBERTY	DIST. (MI.) AND DIR.		CAPTURE METHOD		TAGGED BY	
	TAGGED	RECAPTURED				TAG.	REC.	TAGGER	RESIDENCE
Blue shark	SE Martha's Vineyard, MA	S Flemish Cap	31	1074	E	LL	LL	John Caldwell	FL
" "	SE Martha's Vineyard, MA	S Flemish Cap	29	906	E	LL	LL	John Caldwell	FL
" "	SE Shinnecock Inlet, NY	SE Moriches Inlet, NY	<1	21	SE	RR	RR	J.N. Raguso	NY
" "	S Martha's Vineyard, MA	S Flemish Cap	10	1340	E	RR	LL	Chuck Walker	MA
" "	SE Montauk Pt., NY	W Faial, Azores	23	1418	E	RR	LL	Steve Szoke	NY
" "	SE Pt. Judith, RI	SW Flemish Cap	11	1022	E	RR	LL	Frank Maglione	RI
" "	NR	S Martha's Vineyard, MA	NR	0		RR	RR	Gary Sherer	RI
" "	SE Montauk Pt., NY	S Montauk Pt., NY	35	18	SW	RR	RR	Peter Jakits	NY
" "	E Cape May, NJ	SE Cape May, NJ	<1	14	SW	RR	RR	Paul Ginnta	NJ
" "	SE Shinnecock Inlet, NY	SE Montauk Pt., NY	27	34	E	RR	RR	Ron Scott	NY
" "	NR	S Shinnecock Inlet, NY	NR	0		RR	RR	Robert Sieber	NY
" "	SE Fire Island Inlet, NY	S Fire Island Inlet, NY	<1	9	SW	RR	RR	Robert Darmanin	NY
" "	SE Portland, ME	E Portland Headlights, ME	<1	16	SW	RR	RR	Mike Ellsmore	ME
" "	NR	NE Sao Miguel Isl, Azores	NR	0		RR	LL	Leonard Doyle	MA
" "	NE Provincetown, MA	W Faial, Azores	8	1526	E	RR	LL	Bob Veach	CT
" "	SE Moriches Inlet, NY	NR	NR	0		RR	LL	Richard Haug	NY
" "	SE Montauk Pt., NY	Bahia de Cochino, Cuba	6	1210	SW	RR	HL	Albert G. Woynar	CT
" "	SW Shinnecock Inlet, NY	SE Fire Island Inlet, NY	15	6	S	RR	RR	John Raguso	NY
" "	S Montauk Pt., NY	E Cumana, Venezuela	20	2012	SE	RR	LL	Tom Mort	RI
" "	S Montauk Pt., NY	S Montauk Pt., NY	25	8	NW	RR	RR	Mike Brumm	NY
Blue shark	SE Portland Headlights, ME	W Faial, Azores	29	1517	E	RR	LL	Albert Pillsbury	ME
" "	E Ocean City, MD	SE Montauk Pt., NY	14	216	NE	RR	RR	Gary Stamm	MD
" "	S Pt. Judith, RI	S Flemish Cap	32	1301	E	RR	LL	Ken Benson	RI
" "	NR	S Flemish Cap	NR	0		RR	LL	David Lambert	ME
" "	NR	S Martha's Vineyard, MA	NR	0		RR	HL	Barry Steinberg	NY
" "	SE Portland Headlights, ME	SW Faial, Azores	38	1729	E	RR	LL	Ian Bexon	ME
" "	SE Wood Island Light, ME	W Faial, Azores	32	1351	E	FS	LL	Dana Sevigny	ME
" "	SE Martha's Vineyard, MA	E Montauk Pt., NY	22	40	W	RR	RR	Philip Marks III	MA
" "	S Flemish Cap	N Faial, Azores	33	696	E	LL	LL	Barry Marx	FL
" "	S Flemish Cap	S Flemish Cap	37	36	N	LL	HL	Barry Marx	FL
" "	SW Flemish Cap	SE Cape May, NJ	32	1288	W	LL	RR	Barry Marx	FL
" "	SE Portland Headlights, ME	SW Faial, Azores	21	1713	E	RR	LL	Ben Garfield	ME
" "	S Martha's Vineyard, MA	W Faial, Azores	22	1433	E	RR	LL	Bill Tucker	MA
" "	NW North Truro, MA	SE Montauk Pt., NY	<1	99	SW	RR	RR	Eric Stewart	MA
" "	S Portland Headlights, ME	E York Harbor, ME	1	12	SE	RR	RR	Wayne F. Picard	ME
" "	NR	W Cape Verde Islands	NR	0		RR	LL	Seanie Murphy	Ireland
" "	SE Portland Headlights, ME	S Flemish Cap	10	1179	E	RR	LL	Joseph Tufts	ME
" "	S Martha's Vineyard, MA	SE Montauk Pt., NY	3	56	W	RR	RR	Steve James	MA
" "	SE Montauk Pt., NY	SE Montauk Pt., NY	<1	0		RR	RR	Mike Poola	CT
" "	SE Montauk Pt., NY	SE Pt. Judith, RI	<1	43	N	RR	RR	Mike Poola	CT
Blue shark	SE Shinnecock Inlet, NY	S Martha's Vineyard, MA	26	69	E	RR	RR	Bill Williams	NY
" "	SE Pt. Judith, RI	SE Pt. Judith, RI	12	1	NW	RR	RR	Ken Benson	RI
" "	SE Jones Inlet, NY	S Cape Sable, NS, Canada	3	307	E	RR	LL	Lawrence Gorman	NY
" "	S Martha's Vineyard, MA	S Flemish Cap	NR	1253	E	RR	LL	Laird Summerlin	MA
" "	SE Montauk Pt., NY	E Barnegat Inlet, NJ	NR	88	SW	RR	RR	Laird Summerlin	MA
" "	SE Flemish Cap	SE Faial, Azores	24	924	SE	LL	LL	J. Symonds, NMFS Obs.	MA
" "	E Nantucket Island, MA	SW Faial, Azores	19	1621	E	RR	LL	David St. John	MA
" "	SE Moriches Inlet, NY	SW Faial, Azores	22	1802	E	RR	LL	Fred Wedley	NY
" "	S Lagos, Portugal	E Sao Miguel Isl., Azores	19	499	W	RR	LL	George Burgum	England
" "	NR	S Montauk Pt., NY	NR	0		RR	RR	Joseph Hahn	CT
" "	SE Pt. Judith, RI	SE Montauk Pt., NY	<1	21	S	RR	RR	J.N. Raguso	NY
" "	NR	W Faial Island, Azores	NR	0		RR	LL	Terrence Stoner	NY
" "	S Montauk Pt., NY	SW Faial, Azores	25	1738	E	RR	LL	Al Phillips, Jr.	NY
" "	SSW Pt. Judith, RI	SE Cape Sable, NS, Canada	24	475	E	FS	LL	Charlie Donilon	RI
" "	SSE Pt. Judith, RI	SE Moriches Inlet, NY	25	67	W	FS	RR	Charlie Donilon	RI
" "	SW Montauk Pt., NY	SE Montauk Pt., NY	24	41	E	RR	RR	H. Jerry Woods	NY
" "	S Montauk Pt., NY	SE Montauk Pt., NY	13	21	SE	RR	RR	Steve DeMarco	CT
" "	S Montauk Pt., NY	S Jones Inlet, NY	24	86	SW	RR	RR	Nick Millilo	CT
" "	S Pt. Judith, RI	E Flemish Cap	23	1584	E	FS	LL	Andy Dangelo	RI
" "	SE Montauk Pt., NY	SW Faial, Azores	28	1532	E	RR	LL	Fritz Hubner	NY
Blue shark	SE Montauk Pt., NY	S Montauk Pt., NY	24	21	SW	RR	RR	Charles Betz	NY
" "	SE Montauk Pt., NY	E Fortaleza, Brazil	22	3374	SE	RR	LL	Bill Ricca	NY
" "	SE Shinnecock Inlet, NY	S Nantucket Island, MA	12	92	NE	RR	HL	Laird Summerlin	MA
" "	S Martha's Vineyard, MA	SE Jones Inlet, NY	23	112	SW	FS	RR	Chuck Walker	MA
" "	SE Pt. Judith, RI	S Faial, Azores	12	2134	E	RR	LL	Al Anderson	RI
" "	SE Pt. Judith, RI	S Faial, Azores	12	2134	E	RR	LL	Al Anderson	RI
" "	S Pt. Judith, RI	N Rio San Juan, Dom. Rep.	11	1264	S	RR	LL	Chuck Walker	MA
" "	S Jones Inlet, NY	SSE Nantucket Island, MA	2	214	E	RR	LL	Peter J. Geiselman	NY
" "	S Shinnecock Inlet, NY	SW Sao Vincente, Portugal	15	2779	E	RR	LL	Anthony Innamorato	NY
" "	E Ocean City, MD	SW Martha's Vineyard, MA	<1	216	NE	RR	RR	Matt Muzslay	NJ
" "	SE Shark River Inlet, NJ	S Montauk Pt., NY	10	91	NE	RR	RR	Chris DeFoe	NJ
" "	Fire Island Inlet, NY	SE Pt. Judith, RI	2	105	NE	RR	RR	Lewis Leibetroth	NY
" "	SE Pt. Judith, RI	SW Flemish Cap	23	1003	E	RR	LL	Al Anderson	RI
" "	SE Pt. Judith, RI	SE Moriches Inlet, NY	28	55	SW	RR	RR	Al Anderson	RI
" "	S Pt. Judith, RI	W Cape Verde Islands	14	2520	SE	RR	LL	John Rainone	RI
" "	S Shinnecock Inlet, NY	SE Montauk Pt., NY	12	40	E	RR	RR	Michael Sullivan	NY
" "	S Pt. Judith, RI	SE Portland Headlights, ME	14	160	NE	FS	RR	Charlie Donilon	RI
" "	SW Shinnecock Inlet, NY	E Montauk Pt., NY	12	70	NE	RR	RR	James Becker	NY
" "	E Manasquan Inlet, NJ	S Montauk Pt., NY	<1	91	E	RR	RR	Brian Stromko	NJ
" "	S Montauk Pt., NY	S Flemish Cap	16	1279	E	RR	LL	Peter Jakits	NY
Blue shark	S Montauk Pt., NY	SE Cape May, NJ	16	155	S	RR	LL	Peter Jakits	NY
" "	S Pt. Judith, RI	SE Pt. Judith, RI	<1	12	N	RR	RR	John Rainone	RI
" "	SE Block Island, RI	W Faial, Azores	10	1568	E	RR	LL	Denny Dillon	RI
" "	S Fire Island Inlet, NY	S Cape Sable, NS, Canada	14	375	E	RR	LL	John Young	NY
" "	SE Fire Island Inlet, NY	S Shinnecock Inlet, NY	2	27	NE	RR	RR	John Young	NY
" "	S Pt. Judith, RI	SE Nantucket Island, MA	15	118	SE	RR	LL	David Blackburn	RI
" "	SE Moriches Inlet, NY	S Montauk Pt., NY	17	96	SE	RR	LL	Wain Carlough	NY
" "	SE Montauk Pt., NY	W Villa Cisneros, W. Sahara	15	2834	E	RR	LL	David Cochrane	FL
" "	SW Martha's Vineyard, MA	S Flemish Cap	23	1222	E	RR	LL	Ernest Dunphy, Jr.	RI

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	TAGGED	RECAPTURED				TAG.	REC.	TAGGER	RESIDENCE
Blue shark	SE Montauk Pt., NY	SE Montauk Pt., NY	<1	12	S	RR	RR	Jim Bohara	CT
" "	E Nantucket Island, MA	S Flemish Cap	22	1089	E	FS	LL	Rodman Sykes	RI
" "	SE Pt. Judith, RI	S Martha's Vineyard, MA	24	11	NE	FS	RR	Rodman Sykes	RI
" "	S Pt. Judith, RI	E Sao Miguel Isl., Azores	16	2324	E	RR	LL	Sandy Ballou	RI
" "	SE Montauk Pt., NY	SW Montauk Pt., NY	12	38	W	RR	RR	Alfred Ingulli	CT
" "	SE Fire Island Inlet, NY	S Block Island, RI	<1	77	NE	RR	RR	Vincent Cottone	NY
" "	S Fire Island Inlet, NY	SE Shinnecock Inlet, NY	12	47	NE	RR	RR	Frank D'Amaro	NY
" "	SE Shinnecock Inlet, NY	S Pt. Judith, RI	2	37	NE	RR	RR	Peter Rao	NY
" "	SE Montauk Pt., NY	S Flemish Cap	19	1061	E	RR	LL	Mike Sforza	NY
" "	S Montauk Pt., NY	SW Montauk Pt., NY	<1	20	W	RR	RR	Carl Safina	NY
" "	S Montauk Pt., NY	SE Montauk Pt., NY	<1	26	E	RR	RR	Carl Safina	NY
" "	S Montauk Pt., NY	S Montauk Pt., NY	<1	10	SW	FS	RR	Carl Safina	NY
" "	S Montauk Pt., NY	SE Ocean City, MD	23	206	SW	RR	RR	Steve Roland	NY
" "	S Montauk Pt., NY	SW Flemish Cap	20	1051	E	RR	LL	Mike Brumm	NY
" "	NR	S Montauk Pt., NY	NR	0		RR	RR	David King	NY
" "	S Nantucket Island, MA	NR	NR	0		RR	LL	Michael Plaia	CT
" "	SE Pt. Judith, RI	S Pt. Judith, RI	2	17	SW	RR	RR	Robert Moseley	RI
" "	SE Pt. Judith, RI	Azore Islands	11	0		RR	LL	Ray Chappuis	CT
" "	SE Fire Island Inlet, NY	SE Fire Island Inlet, NY	12	18	SW	RR	RR	Andy Becker	NY
" "	SE Pt. Judith, RI	W Faial, Azores	9	1387	E	RR	LL	Robert Messinger	RI
Blue shark	SE Pt. Judith, RI	SE Montauk Pt., NY	14	31	W	RR	RR	Robert Messinger	RI
" "	S Shinnecock Inlet, NY	SE Pt. Judith, RI	10	66	NE	RR	RR	Kurt Hofman	NY
" "	SE Montauk Pt., NY	SE Nantucket Island, MA	15	174	E	RR	LL	Bob Weaver	NY
" "	SE Cape Elizabeth, ME	S Flemish Cap	21	1260	E	RR	LL	Arnold Beleckis	ME
" "	S Lagos, Portugal	SW Faial, Azores	12	1076	W	RR	LL	George Burgum	England
" "	S Lagos, Portugal	S Cape Clear, Ireland	15	605	N	RR	LL	George Burgum	England
" "	S Martha's Vineyard, MA	S Montauk Pt., NY	11	62	SW	RR	RR	Bill Tucker	MA
" "	S Martha's Vineyard, MA	S Cape Sable, NS, Canada	5	367	E	RR	LL	Bill Tucker	MA
" "	S Martha's Vineyard, MA	S Martha's Vineyard, MA	11	4	NW	RR	RR	Bill Tucker	MA
" "	S Martha's Vineyard, MA	SE Martha's Vineyard, MA	13	12	N	RR	RR	Bill Tucker	MA
" "	E Ocean City, MD	SE Moriches Inlet, NY	9	164	NE	RR	RR	Mark Sampson	MD
" "	SE Tavira, Portugal	E Sao Miguel Isl., Azores	18	615	W	RR	LL	Helder Ferreira	MA
" "	SE Pt. Judith, RI	W Faial, Azores	10	1323	E	RR	LL	Chuck Walker	MA
" "	SE Shinnecock Inlet, NY	SE Cape May, NJ	12	174	SW	RR	RR	Bill Williams	NY
" "	SE Pt. Judith, RI	S Montauk Pt., NY	15	34	W	RR	RR	Al Anderson	RI
" "	S Block Island, RI	SE Block Island, RI	14	13	N	RR	RR	Mitch Chagnon	RI
" "	SE Montauk Pt., NY	S Shinnecock Inlet, NY	1	69	SW	RR	RR	Dana Bartley	CT
" "	SE Moriches Inlet, NY	W Cape Verde Islands	16	2518	SE	RR	LL	Peter Macaluso	NY
" "	NR	W Cape Verde Islands	NR	0		RR	LL	John T. Pirie	MA
" "	S Moriches Inlet, NY	E Cumana, Venezuela	8	2012	SE	RR	LL	Wain Carlough	NY
Blue shark	Monhegan Island, ME	S Montauk Pt., NY	10	220	SW	RR	RR	Dave Sinclair	ME
" "	SE Shinnecock Inlet, NY	Baracoa, Cuba	12	1222	S	RR	LL	Robert Crawford	NY
" "	SW Moriches Inlet, NY	W Cape Verde Islands	17	2462	SE	RR	LL	Matthew Richardson	NY
" "	S Pt. Judith, RI	E Montauk Pt., NY	22	14	N	FS	RR	Charlie Donilon	RI
" "	SE Portland Headlights, ME	SW Faial, Azores	27	1455	E	RR	LL	Al Pillsbury	ME
" "	S Lagos, Portugal	SW Faial, Azores	14	1108	W	RR	LL	George Burgum	England
" "	S Lagos, Portugal	S Cabo Ortegal, Spain	13	517	N	RR	LL	George Burgum	England
" "	NR	SW Shinnecock Inlet, NY	NR	0		RR	RR	Ray Nettune	NY
" "	SE Cape Elizabeth, ME	SW Faial Isl., Azores	17	1713	E	RR	LL	Arnold Beleckis	ME
" "	NE Barbuda Isl., Antigua	E Georgetown, Guyana	13	711	S	LL	LL	John Caldwell	FL
" "	S Montauk Pt., NY	S Montauk Pt., NY	12	15	SE	RR	RR	Stephen Roland	NY
" "	S Lagos, Portugal	SW Canary Islands	27	891	SW	RR	LL	George Burgum	England
" "	SE Pt. Judith, RI	SE Atlantic City, NJ	10	180	SW	RR	RR	Jim Quinn	RI
" "	S Montauk Pt., NY	S Montauk Pt., NY	<1	6	W	RR	RR	Al Phillips, Jr.	NY
" "	SE Fire Island Inlet, NY	SW Shinnecock Inlet, NY	<1	7	N	RR	RR	Mike Zullo	NY
" "	S Fire Island Inlet, NY	S Shinnecock Inlet, NY	1	46	NE	RR	RR	Jim Glasser	NY
" "	E Portsmouth, NH	S Flemish Cap	8	1272	E	RR	LL	Joshua T. Sheehy	NH
" "	S Montauk Pt., NY	SW Montauk Pt., NY	<1	25	W	RR	RR	Burton Prince	NY
" "	SE Atlantic City, NJ	S Flemish Cap	11	1504	E	RR	LL	Ray Bergman	NJ
" "	S Cape Elizabeth, ME	S Cape Race, NF, Canada	5	696	E	RR	LL	Richard Provencher	ME
Blue shark	S Montauk Pt., NY	SE Absecon Inlet, NJ	12	119	SW	RR	RR	Fred Wedley	NY
" "	SE Martha's Vineyard, MA	SE Moriches Inlet, NY	11	92	SW	RR	RR	Bill Tucker	MA
" "	SE Montauk Pt., NY	SE Townsends Inlet, NJ	12	160	SW	RR	RR	Barry Bordner	MA
" "	E Beach Haven, NJ	SE Jones Inlet, NY	<1	55	N	RR	RR	Dave Garzillo	NJ
" "	E Beach Haven, NJ	E Ocean City, MD	<1	88	S	RR	RR	Keith Burnet	NJ
" "	E Wachapreague Inlet, VA	SE Shinnecock Inlet, NY	15	220	NE	RR	RR	James Houser	MD
" "	SW Flemish Cap	S Flemish Cap	1	332	E	LL	LL	P. O'Donnell, NMFS Obs.	MA
" "	SE Montauk Pt., NY	S Cape Sable, NS, Canada	15	248	E	RR	LL	Mike Langieri	MA
" "	S Fire Island Inlet, NY	E Barnegat Light, NJ	<1	0		RR	LL	Robert Ehrlich	NY
" "	SE Fire Island Inlet, NY	S Shinnecock Inlet, NY	<1	37	NE	RR	RR	Paul Tooker	NY
" "	S Jones Inlet, NY	S Montauk Pt., NY	12	85	NE	RR	RR	Mark Errett	CT
" "	NR	S Moriches Inlet, NY	NR	0		RR	RR	Erik Hasenstab	NY
" "	SE Shinnecock Inlet, NY	S Pt. Judith, RI	12	42	NE	RR	RR	Kenneth Schmieder	NY
" "	SE Moriches, NY	SE Pt. Judith, RI	9	55	NE	RR	RR	Michael Flynn	NY
" "	E Cape May, NJ	SE Cape May, NJ	<1	18	SW	RR	RR	Ed Pickul	PA
" "	SE Montauk Pt., NY	S Flemish Cap	10	1233	E	RR	LL	Bill Ricca	NY
" "	S Pt. Judith, RI	SE Pt. Judith, RI	13	12	N	RR	RR	Andy Dangelo	RI
" "	SE Ocean City, MD	S Cape Sable, NS, Canada	3	453	NE	RR	LL	Marty Moran	MD
" "	E Wachapreague Inlet, VA	S Montauk Pt., NY	<1	220	NE	RR	RR	James D. Houser	MD
" "	SE Shinnecock Inlet, NY	S Montauk Pt., NY	<1	26	E	RR	RR	John Kowalski	NY
Blue shark	S Shinnecock Inlet, NY	S Montauk Pt., NY	2	46	NE	RR	RR	Charles Witek	NY
" "	S Pt. Judith, RI	S Flemish Cap	11	1162	E	FS	LL	Charlie Donilon	RI
" "	SE Montauk Pt., NY	SE Portland Headlights, ME	12	151	E	RR	LL	Charles Boyar	NY
" "	SW Cape May, NJ	SE Fire Island Inlet, NY	<1	179	NE	RR	RR	Bob Vichko	NJ
" "	SE Pt. Judith, RI	S Shinnecock Inlet, NY	11	73	SW	RR	RR	Don Mattera	RI
" "	S Montauk Pt., NY	SE Ocean City, MD	12	204	SW	FS	RR	Mike S. Forza	NY
" "	SE Moriches Inlet, NY	SW Pt. Judith, RI	14	35	NE	RR	RR	Bill Tweed	CT
" "	S Martha's Vineyard, MA	S Montauk Pt., NY	11	67	W	RR	RR	Chuck Walker	MA
" "	S Pt. Judith, RI	SW Flemish Cap	11	982	E	RR	LL	Tom Birch	MA

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	TAGGED	RECAPTURED				TAG.	REC.	TAGGER	RESIDENCE
Blue shark	S Montauk Pt., NY	S Martha's Vineyard, MA	2	59	E	RR	RR	Bob Weaver	NY
" "	S Shinnecock Inlet, NY	SW Fire Island Inlet, NY	2	63	W	RR	RR	Charlie Johnson	NY
" "	S Pt. Judith, RI	NR	11	0		RR	RR	Philip Randolph	RI
" "	S Pt. Judith, RI	SE Ocean City, MD	11	233	SW	RR	RR	Dave Blackburn	RI
" "	S Pt. Judith, RI	E Manasquan Inlet, NJ	2	114	SW	RR	RR	David Blackburn	RI
" "	SE Pt. Judith, RI	E Gloucester, MA	13	106	N	RR	RR	Ernest Dunphy, Jr.	RI
" "	SE Montauk Pt., NY	E Newport News, VA	12	279	SE	RR	LL	Mike Brumm	NY
" "	S Shinnecock Inlet, NY	S Pt. Judith, RI	1	41	NE	RR	RR	Michael Sullivan	NY
" "	SE Portland Headlights, ME	W Faial, Azores	NR	1318	E	RR	LL	Ben Garfield	ME
" "	SE Pt. Judith, RI	SE Flemish Cap	12	1465	E	RR	LL	Al Anderson	RI
" "	S Pt. Judith, RI	SE Pt. Judith, RI	10	31	E	RR	RR	John Rainone	RI
" "	E Ocean City, MD	S Montauk Pt., NY	<1	185	NE	RR	RR	Matt Muzslay	NJ
" "	NR	SE Pt. Judith, RI	NR	0		RR	RR	Robert Timsen	NY
" "	S Shinnecock Inlet, NY	SE Moriches Inlet, NY	<1	6	NW	RR	RR	Tom Cashman	NY
" "	S Moriches Inlet, NY	S Cape Sable, NS, Canada	2	344	E	RR	LL	Tom Cashman	NY
" "	SW Shinnecock Inlet, NY	E Manasquan Inlet, NJ	<1	41	SW	RR	RR	Tom Cashman	NY
" "	SE Fire Island Inlet, NY	SE Montauk Pt., NY	10	87	E	RR	RR	Barry Mack	NY
" "	SE Montauk Pt., NY	SE Pt. Judith, RI	12	25	NE	RR	RR	Steve Szoke	NY
" "	S Montauk Pt., NY	SW Montauk Pt., NY	1	21	SW	RR	RR	Robert Nowakowski	CT
" "	SE Montauk Pt., NY	S Montauk Pt., NY	<1	14	S	RR	RR	Robert Nowakowski	CT
Blue shark	SE Montauk Pt., NY	SE Pt. Judith, RI	<1	24	NE	RR	RR	Robert Nowakowski	CT
" "	S Moriches Inlet, NY	SE Moriches Inlet, NY	1	30	N	FS	RR	Bill Martin	NY
" "	S Montauk Pt., NY	SE Moriches Inlet, NY	<1	31	W	RR	RR	Scott Bayne	CT
" "	SE Montauk Pt., NY	SE Montauk Pt., NY	1	6	SW	RR	RR	Frank Braddick	NY
" "	S Pt. Judith, RI	SE Moriches Inlet, NY	<1	38	SW	RR	RR	Mike Langieri	MA
" "	SE Shinnecock Inlet, NY	SE Pt. Judith, RI	2	51	NE	RR	RR	Mike Langieri	MA
" "	SE Shinnecock Inlet, NY	SE E. Rockaway Inlet, NY	3	65	SW	RR	RR	Mike Langieri	MA
" "	S Montauk Pt., NY	N Caracas, Venezuela	7	1690	S	RR	LL	John Gavencak	NY
" "	S Portland Headlights, ME	NW Rio San Juan, Dom. Rep	7	1425	S	RR	LL	Ian Bexon	ME
" "	S Cape Elizabeth, ME	S Cape Race, NF, Canada	14	764	E	RR	LL	Richard Provencher	ME
" "	S Portland Headlights, ME	W Faial, Azores	10	1495	E	RR	LL	Richard Provencher	ME
" "	NE Race Pt., MA	SSW Sable Island, Canada	12	427	E	RR	LL	Eric A. Stewart	MA
" "	SE Pt. Judith, RI	S Shinnecock Inlet, NY	5	97	S	RR	LL	Frank Maglione	RI
" "	SE Moriches Inlet, NY	S Moriches Inlet, NY	<1	10	SW	RR	RR	Wain Carlough	NY
" "	SSW Pt. Judith, RI	S Moriches Inlet, NY	9	79	SW	FS	RR	Charlie Donilon	RI
" "	S Pt. Judith, RI	SW Montauk Pt., NY	10	27	W	FS	RR	Charlie Donilon	RI
" "	SSW Pt. Judith, RI	ENE Baracoa, Cuba	16	1235	S	RR	LL	Charlie Donilon	RI
" "	SSW Pt. Judith, RI	SW Montauk Pt., NY	9	11	SW	RR	RR	Charlie Donilon	RI
" "	SSW Pt. Judith, RI	W Faial, Azores	8	1337	E	RR	LL	Charlie Donilon	RI
" "	SE Pt. Judith, RI	S Montauk Pt., NY	14	50	SW	RR	RR	James Walsh	CT
Blue shark	SE Pt. Judith, RI	S Flemish Cap	NR	1272	E	FS	LL	Jim Walsh	CT
" "	S Montauk Pt., NY	SW Shinnecock Inlet, NY	1	32	W	RR	RR	Dan Fitzmaurice	NY
" "	E Barnegat Inlet, NJ	SSE Montauk Pt., NY	<1	97	NE	RR	RR	Mike Szegeski	NJ
" "	E Barnegat Inlet, NJ	S Martha's Vineyard, MA	3	142	NE	RR	RR	Mike Szegeski	NJ
" "	S Martha's Vineyard, MA	SW Montauk Pt., NY	10	58	W	RR	RR	Robert Rowan	RI
" "	S Pt. Judith, RI	SE Shinnecock Inlet, NY	1	37	W	RR	RR	Al Anderson	RI
" "	SSE Pt. Judith, RI	W Cape Verde Islands	6	2600	SE	RR	LL	Charlie Donilon	RI
" "	SSE Pt. Judith, RI	W Faial, Azores	NR	1367	E	RR	LL	Charlie Donilon	RI
" "	SSW Pt. Judith, RI	S Jones Inlet, NY	10	99	SW	FS	RR	Charlie Donilon	RI
" "	SE Portland Headlights, ME	S Cape Race, NF, Canada	8	906	E	RR	LL	Arnold Beleckis	ME
" "	SE Portland Headlights, ME	SE Portland Headlights, ME	<1	0		FS	RR	Al Pillsbury	ME
" "	SE Pt. Judith, RI	SE Montauk Pt., NY	<1	22	S	RR	RR	Robert Hogan	RI
" "	E Portland Headlights, ME	W Faial, Azores	NR	1349	E	RR	LL	Thomas S. McNeil	ME
" "	SW Pt. Judith, RI	S Martha's Vineyard, MA	12	29	NE	RR	RR	James Walsh	CT
" "	S Montauk Pt., NY	S Montauk Pt., NY	<1	12	N	RR	RR	Joe Mistina	NY
" "	SE Fire Island Inlet, NY	S Pt. Judith, RI	11	80	NE	RR	RR	Bill Mercado	NY
" "	S Martha's Vineyard, MA	SW Flemish Cap	9	982	E	RR	LL	Bill Tucker	MA
" "	S Pt. Judith, RI	S Fire Island Inlet, NY	1	93	SW	RR	RR	Philip Randolph	RI
" "	S Montauk Pt., NY	E Ocean City, MD	8	178	SW	RR	RR	Gary Savard	MA
" "	S Montauk Pt., NY	E Absecon Inlet, NJ	12	88	S	RR	RR	Gary Savard	MA
Blue shark	S Martha's Vineyard, MA	SE Martha's Vineyard, MA	11	19	E	FS	RR	Chuck Walker	MA
" "	S Montauk Pt., NY	SE Fire Island Inlet, NY	4	58	W	RR	RR	Laird Summerlin	MA
" "	S Pt. Judith, RI	SE Montauk Pt., NY	12	8	NE	RR	RR	Ken Benson	RI
" "	S Portland Headlights, ME	S Portland Headlights, ME	11	17	NE	RR	RR	Richard Provencher	ME
" "	S Pt. Judith, RI	W Faial, Azores	NR	1357	E	RR	LL	Jim Bohara	CT
" "	SSW Pt. Judith, RI	SE Montauk Pt., NY	4	103	SE	FS	LL	Charlie Donilon	RI
" "	SE Fire Island Inlet, NY	SE Pt. Judith, RI	<1	110	NE	RR	FS	Peter Scelfo	NY
" "	E Portland Headlights, ME	E Portland Headlights, ME	<1	13	E	RR	LL	Chuck Baker	ME
" "	SE Portland Headlights, ME	S Nantucket Island, MA	3	210	S	RR	LL	Richard Provencher	ME
" "	S Pt. Judith, RI	E Barnegat Inlet, NJ	4	95	S	RR	LL	John Rainone	RI
" "	S Nantucket Island, MA	E Halifax, NS, Canada	2	390	NE	HL	LL	Stephen Connett	RI
" "	SW Nantucket Island, MA	S Block Island, RI	3	5	N	HL	RR	Stephen Connett	RI
" "	S Martha's Vineyard, MA	S Montauk Pt., NY	12	46	SW	HL	RR	Stephen Connett	RI
" "	S Martha's Vineyard, MA	SE Moriches Inlet, NY	12	73	W	HL	RR	Stephen Connett	RI
" "	SW Martha's Vineyard, MA	SE Ocean City, MD	12	231	SW	HL	RR	Stephen Connett	RI
" "	SW Martha's Vineyard, MA	S Flemish Cap	11	1317	E	HL	LL	Stephen Connett	RI
" "	SW Martha's Vineyard, MA	SE Atlantic City, NJ	12	183	SW	HL	RR	Stephen Connett	RI
" "	SW Martha's Vineyard, MA	SW Sao Miguel Isl., Azores	17	1791	E	HL	LL	Stephen Connett	RI
" "	S Martha's Vineyard, MA	NR	2	0		HL	LL	Stephen Connett	RI
" "	S Martha's Vineyard, MA	SE St.Lawrence, NF,Canada	12	946	E	HL	LL	Stephen Connett	RI
Blue shark	S Martha's Vineyard, MA	S Cape Race, NF, Canada	10	936	E	HL	LL	Stephen Connett	RI
" "	S Martha's Vineyard, MA	NR	NR	0		HL	RR	Stephen Connett	RI
" "	S Martha's Vineyard, MA	SE Portland Headlights, ME	14	163	N	HL	RR	Stephen Connett	RI
" "	S Martha's Vineyard, MA	SE Faial, Azores	9	2097	E	HL	LL	Stephen Connett	RI
" "	S Martha's Vineyard, MA	W Cape Verde Islands	16	2546	E	FS	LL	Stephen Connett	RI
" "	S Martha's Vineyard, MA	E Cape May, NJ	11	209	SW	HL	RR	Stephen Connett	RI
" "	SE Vineyard Haven, MA	S Flemish Cap	11	1118	E	HL	LL	Stephen Connett	RI
" "	S Nantucket Island, MA	SE Montauk Pt., NY	12	61	W	HL	RR	Stephen Connett	RI
" "	S Martha's Vineyard, MA	S Fire Island Inlet, NY	2	129	W	HL	RR	Stephen Connett	RI

Table 2. Tag recoveries: January-December 1997.

	GENERAL LOCATIONS		MONTHS AT LIBERTY	DIST. (MI.) AND DIR.		CAPTURE METHOD		TAGGED BY	
	TAGGED	RECAPTURED				TAG.	REC.	TAGGER	RESIDENCE
Blue shark	S Martha's Vineyard, MA	SE Shinnecock Inlet, NY	3	58	W	HL	RR	Stephen Connett	RI
" "	S Martha's Vineyard, MA	SE Montauk Pt., NY	3	37	W	HL	RR	Stephen Connett	RI
" "	E Rockport, MA	SE Moriches Inlet, NY	10	200	SW	LL	RR	Biologist (NMFS)	RI
" "	E Provincetown, MA	S Flemish Cap	8	1208	E	LL	LL	Biologist (NMFS)	RI
" "	E Provincetown, MA	SW Nantucket Island, MA	10	110	SW	LL	RR	Biologist (NMFS)	RI
" "	E Provincetown, MA	W Canary Islands	5	2041	E	LL	LL	Biologist (NMFS)	RI
" "	SE Provincetown, MA	S Cape Sable, NS, Canada	9	204	E	LL	LL	Biologist (NMFS)	RI
" "	NE Nantucket Island, MA	W Faial, Azores	6	1531	E	LL	LL	Biologist (NMFS)	RI
" "	SW Montauk Pt., NY	S Nantucket Island, MA	1	101	E	RR	RR	Joe Mistina	NY
" "	SE Block Island, RI	SE Moriches Inlet, NY	<1	58	SW	RR	RR	Gary Eaton	RI
" "	NE Barbuda Isl., Antigua	SW Faial, Azores	9	1039	NE	LL	LL	Barry Marx	FL
" "	SE Pt. Judith, RI	SW Montauk Pt., NY	1	45	W	RR	RR	Tony Visentin	NY
" "	SE Montauk Pt., NY	S Fire Island Inlet, NY	<1	98	SW	RR	RR	Bill Ricca	NY
" "	SE Ocean City, MD	S Montauk Pt., NY	5	138	NE	RR	LL	Mark Sampson	MD
" "	S Pt. Judith, RI	SE Moriches Inlet, NY	<1	51	SW	RR	RR	Robert Reichenberger	NY
" "	SE Barnegat Inlet, NJ	SE Pt. Judith, RI	<1	146	NE	RR	RR	Anthony Okupski	NJ
" "	E Barnegat Inlet, NJ	S Fire Island Inlet, NY	<1	60	NW	RR	RR	Anthony Okupski	NJ
" "	SE Shinnecock Inlet, NY	S Montauk Pt., NY	<1	23	NE	FS	RR	Bill Williams	NY
" "	SE Shinnecock Inlet, NY	S Moriches Inlet, NY	8	30	SW	RR	RR	Bill Williams	NY
" "	S Shinnecock Inlet, NY	E Point Pleasant, NJ	<1	32	SW	RR	RR	Ben Brown	NY
Blue shark	E Portland Headlights, ME	SE Montauk Pt., NY	3	251	S	RR	LL	Dominic Carter	ME
" "	SE Ocean City, MD	SE Barnegat Inlet, NJ	<1	98	NE	RR	RR	Ed Richardson	MD
" "	S Moriches Inlet, NY	E Moriches Inlet, NY	<1	13	NE	RR	RR	Mike Flynn	NY
" "	SE Jones Inlet, NY	S Moriches Inlet, NY	2	52	N	RR	RR	Howard Berman	NY
" "	S Shinnecock Inlet, NY	SE Pt. Judith, RI	1	97	E	RR	FS	Kenneth Schmieder	NY
" "	SE Montauk Pt., NY	S Montauk Pt., NY	<1	12	SW	RR	RR	Joe McBride	NY
" "	E Montauk Pt., NY	S Moriches Inlet, NY	3	68	SW	RR	RR	Joe McBride	NY
" "	SE Montauk Pt., NY	SE Pt. Judith, RI	<1	7	E	RR	RR	Joe McBride	NY
" "	S Montauk Pt., NY	S Montauk Pt., NY	<1	6	SE	RR	RR	Jim Bohara	CT
" "	SE Fire Island Inlet, NY	E Manasquan Inlet, NJ	1	40	SW	RR	RR	Tom Cashman	NY
" "	E Gloucester, MA	SE Gloucester, MA	<1	10	S	FS	RR	Bernie Beauchemin	MA
" "	SE Montauk Pt., NY	S Moriches Inlet, NY	<1	54	SW	RR	RR	Fred Miller	RI
" "	E Barnegat Inlet, NJ	NE Barnegat Inlet, NJ	3	43	NW	RR	RR	Roy Voss	NJ
" "	SE Atlantic City, NJ	S Pt. Judith, RI	<1	159	NE	RR	RR	Ray Bergman	NJ
" "	SE Moriches Inlet, NY	SW Martha's Vineyard, MA	3	61	E	RR	RR	Richard Haug	NY
" "	S Montauk Pt., NY	E Montauk Pt., NY	<1	22	NE	RR	TN	Jim Walsh	CT
" "	SE Shinnecock Inlet, NY	SE Pt. Judith, RI	2	56	NE	RR	RR	Fred Wedley	NY
" "	SE Absecon Inlet, NJ	S Moriches Inlet, NY	<1	107	NE	RR	RR	Herb Pizagno	NJ
" "	SW Montauk Pt., NY	SE Moriches Inlet, NY	1	25	SW	RR	RR	Joe Mistina	NY
" "	S Shinnecock Inlet, NY	S Montauk Pt., NY	1	33	NE	RR	RR	Ron Bertasi	CT
Blue shark	S Montauk Pt., NY	S Pt. Judith, RI	2	34	NE	RR	RR	Gene Scheuring	NY
" "	SE Pt. Judith, RI	SE Pt. Judith, RI	<1	0		RR	RR	Richard Scolavino	RI
" "	E Manasquan Inlet, NJ	SE Pt. Judith, RI	3	106	NE	RR	RR	Ray Nettune	NY
" "	S Moriches Inlet, NY	E Cape Elizabeth, ME	3	282	NE	RR	RR	Frank Digregorio	NY
" "	SE Fire Island Inlet, NY	SE Montauk Pt., NY	1	73	NE	RR	RR	Anthony Innamorato	NY
" "	SE Fire Island Inlet, NY	S Cape Sable, NS, Canada	3	328	E	FS	LL	Anthony Innamorato	NY
" "	SE Jones Inlet, NY	S Montauk Pt., NY	3	61	NE	RR	RR	Harry L. Schroeder	NY
" "	SE Jones Inlet, NY	SE Jones Inlet, NY	<1	5	NE	RR	RR	Tim Sullivan	NY
" "	SE Fire Island Inlet, NY	S Montauk Pt., NY	<1	66	NE	RR	RR	George Lindeman	NY
" "	SE Fire Island Inlet, NY	S Cape Sable, NS, Canada	3	317	E	RR	LL	Jim Gennosa	NY
" "	SE Pt. Judith, RI	SE Pt. Judith, RI	<1	2	NW	RR	RR	Frank Toti	RI
" "	SE Pt. Judith, RI	SE Moriches Inlet, NY	2	77	W	RR	RR	Jim Walsh	CT
" "	SE Pt. Judith, RI	E Block Island, RI	<1	3	NE	RR	RR	Jim Walsh	CT
" "	SE Shinnecock Inlet, NY	S Shinnecock Inlet, NY	<1	8	NW	RR	RR	Bill Williams	NY
" "	SE Pt. Pleasant, NJ	S Shinnecock Inlet, NY	<1	62	NE	RR	RR	Jeff Jacobson	NJ
" "	SE Pt. Judith, RI	NR	NR	0		RR	NR	Al Anderson	RI
" "	S Pt. Judith, RI	SE Martha's Vineyard, MA	2	127	SE	RR	LL	Al Anderson	RI
" "	E Moriches Inlet, NY	S Montauk Pt., NY	<1	35	E	RR	RR	Mike Flynn	NY
" "	S Shinnecock Inlet, NY	S Shinnecock Inlet, NY	2	4	NW	RR	RR	Daniel Dantuono	NY
" "	S Montauk Pt., NY	S Martha's Vineyard, MA	<1	43	NE	RR	RR	Mike Brumm	NY
Blue shark	S Montauk Pt., NY	SW Cape Sable, NS, Canada	3	228	E	RR	LL	Mike Brumm	NY
" "	S Pt. Judith, RI	SE Montauk Pt., NY	<1	9	S	RR	RR	Charlie Donilon	RI
" "	SSE Pt. Judith, RI	S Moriches Inlet, NY	<1	74	W	RR	RR	Charlie Donilon	RI
" "	SSE Pt. Judith, RI	S Moriches Inlet, NY	<1	82	SW	RR	RR	Charlie Donilon	RI
" "	S Pt. Judith, RI	SE Pt. Judith, RI	<1	8	NE	FS	RR	Charlie Donilon	RI
" "	SE Moriches Inlet, NY	SW Montauk Pt., NY	<1	24	NE	RR	RR	Richard Haug	NY
" "	S Montauk Pt., NY	SE Fire Island Inlet, NY	2	63	W	RR	RR	Gene Scheuring	NY
" "	S Montauk Pt., NY	S Pt. Judith, RI	<1	25	NE	RR	RR	Gene Scheuring	NY
" "	S Pt. Judith, RI	S Block Island, RI	<1	12	NW	RR	RR	Andy Dangelo	RI
" "	S Pt. Judith, RI	? Shinnecock Inlet, NY	1	28	W	RR	RR	Andy Dangelo	RI
" "	SE Montauk Pt., NY	SE Montauk Pt., NY	<1	0		RR	RR	Tom Federico	NY
" "	S Fire Island Inlet, NY	S Shinnecock Inlet, NY	<1	43	NE	RR	RR	Paul Sichler	NY
" "	SW Jones Inlet, NY	E Manasquan Inlet, NJ	<1	23	S	RR	RR	Gary Blacker	NY
" "	SE Moriches Inlet, NY	S Fire Island Inlet, NY	2	38	SW	RR	RR	Wain Carlough	NY
" "	SW Montauk Pt., NY	E Manasquan Inlet, NJ	2	74	SW	FS	RR	Stephen Murphy	NY
" "	S Martha's Vineyard, MA	SE Pt. Judith, RI	13	30	W	RR	RR	Chuck Walker	MA
" "	S Montauk Pt., NY	S Montauk Pt., NY	<1	3	S	RR	RR	Tom Birch	MA
" "	S Montauk Pt., NY	S Fire Island Inlet, NY	1	82	SW	RR	RR	Jim Kuczinski	CT
" "	S Montauk Pt., NY	SE Pt. Judith, RI	2	42	E	RR	RR	Laird Summerlin	MA
" "	SW Montauk Pt., NY	S Pt. Judith, RI	1	42	NE	RR	RR	Bud Brandt	NY
Blue shark	SE Shinnecock Inlet, NY	S Shinnecock Inlet, NY	<1	9	NW	RR	RR	Bud Brandt	NY
" "	S Fire Island Inlet, NY	E Cape May, NJ	1	101	SW	RR	RR	Larry Festa	NY
" "	S Montauk Pt., NY	E Manasquan Inlet, NJ	2	86	SW	RR	RR	Dan Dantuono	NY
" "	SE Pt. Judith, RI	S Pt. Judith, RI	<1	12	SW	RR	RR	Ed Abbenante	RI
" "	SW Pt. Judith, RI	SE Montauk Pt., NY	2	25	SE	RR	RR	Dave Witham	RI
" "	S Pt. Judith, RI	SE Pt. Judith, RI	<1	5	E	RR	RR	Frank Toti	RI
" "	SE Pt. Judith, RI	SE Pt. Judith, RI	<1	1	E	RR	RR	Frank Toti	RI
" "	SE Pt. Judith, RI	S Shinnecock Inlet, NY	2	54	W	RR	RR	Nick Mastroianni	RI
" "	SE Pt. Judith, RI	E Beach Haven, NJ	2	94	SW	RR	RR	Nick Mastroianni	RI

Table 2. Tag recoveries: January-December 1997.

	GENERAL LOCATIONS		MONTHS AT LIBERTY	DIST. (MI.) AND DIR.		CAPTURE METHOD		TAGGED BY	
	TAGGED	RECAPTURED				TAG.	REC.	TAGGER	RESIDENCE
Blue shark	SE Montauk Pt., NY	SE Montauk Pt., NY	2	13	W	RR	RR	Jim Bohara	CT
" "	NR	S Pt. Judith, RI	NR	0		RR	RR	Otto Haselman	NY
" "	NR	S Moriches Inlet, NY	NR	0		RR	RR	Fritz Hubner	NY
" "	S Montauk Pt., NY	SE Pt. Judith, RI	1	38	NE	RR	RR	Wayne King	NY
" "	S Montauk Pt., NY	SE Shinnecock Inlet, NY	<1	14	W	RR	RR	Dana Bartley	CT
" "	SE Montauk Pt., NY	S Pt. Judith, RI	1	20	N	RR	RR	Bill Ricca	NY
" "	S Pt. Judith, RI	S Martha's Vineyard, MA	<1	36	SE	RR	RR	Charlie Donilon	RI
" "	SE Pt. Judith, RI	S Montauk Pt., NY	<1	31	SW	RR	RR	Tom Mort	RI
" "	NE Nantucket Island, MA	NE Gloucester, MA	2	73	NW	RR	RR	Eric Stewart	MA
" "	S Shinnecock Inlet, NY	SE Pt. Judith, RI	<1	65	E	RR	RR	Benjamin Brown	NY
" "	SE Fire Island Inlet, NY	S Shinnecock Inlet, NY	<1	24	NE	RR	RR	Benjamin Brown	NY
" "	S Martha's Vineyard, MA	S Martha's Vineyard, MA	<1	5	N	RR	RR	Bill Tucker	MA
" "	E Marblehead, MA	S Cape Sable, NS, Canada	1	211	E	RR	LL	Mike McGourthy	MA
" "	E Provincetown, MA	SW Sao Miguel Isl., Azores	2	1699	E	LL	LL	Biologist (NMFS)	RI
" "	E Portland Headlights, ME	NE Gloucester, MA	<1	72	SW	LL	RR	Biologist (NMFS)	RI
" "	S Nantucket Island, MA	SE Montauk Pt., NY	4	87	S	HL	LL	Stephen Connett	RI
" "	S Montauk Pt., NY	S Montauk Pt., NY	<1	20	NE	RR	RR	Alfred Dobras	CT
" "	E Ocean City, MD	S Flemish Cap	26	1449	E	RR	LL	Alex Craig	PA
" "	SE Moriches Inlet, NY	NW Faial, Azores	24	1789	E	RR	LL	Rick Kelling	NY
" "	S Martha's Vineyard, MA	S Montauk Pt., NY	47	56	W	RR	RR	Ralph V. Carlson, Jr.	RI
Blue shark	SE Montauk Pt., NY	NW Faial, Azores	21	1660	E	RR	LL	Stret Whitting	NY
" "	S Montauk Pt., NY	S Halifax, NS, Canada	45	427	NE	RR	LL	Mike Brumm	NY
" "	SW Nantucket Island, MA	S Flemish Cap	11	1230	E	RR	LL	Robert Butler	MA
" "	SE Montauk Pt., NY	S Martha's Vineyard, MA	36	36	E	RR	RR	Hal Weissman	NY
" "	S Pt. Judith, RI	SW Shinnecock Inlet, NY	<1	76	SW	RR	RR	Fred Gallagher	RI
" "	S Pt. Judith, RI	E Cape Henlopen, DE	2	169	SE	RR	LL	Fred Gallagher	RI
" "	SE Pt. Judith, RI	N Cape Verde Islands	31	2575	E	RR	LL	Bill Della Valle	RI
" "	S Shinnecock Inlet, NY	E Charleston, SC	8	535	SW	RR	LL	Bill Martin	NY
" "	SE Montauk Pt., NY	SE Shinnecock Inlet, NY	33	41	W	RR	RR	Jim Bohara	CT
" "	S Montauk Pt., NY	E Sao Miguel Isl., Azores	15	2371	E	RR	LL	Jim Bohara	CT
" "	SE Portland Headlights, ME	SE Moriches Inlet, NY	48	203	SW	RR	RR	Ian Bexon	ME
" "	SE Portland Headlights, ME	S Halifax, NS, Canada	23	284	E	RR	LL	Wilbur Bell	ME
" "	SE Pt. Judith, RI	SE Pico Island, Azores	33	1714	E	RR	LL	Lee Pepin	CT
" "	SE Scituate, MA	SE Rye, NH	24	44	N	RR	RR	Bill Voloshen	MA
" "	S Martha's Vineyard, MA	SE Jones Inlet, NY	12	99	SW	HL	RR	Stephen Connett	RI
" "	S Martha's Vineyard, MA	W Villa Cisneros, W. Sahara	17	2746	E	HL	LL	Stephen Connett	RI
" "	SE Montauk Pt., NY	NR	NR	NR		RR	NR	NR	NR
Sandbar shark	Delaware Bay, DE	N Lewes, DE	<1	1	SE	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	Delaware Bay, DE	2	1	NW	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	E Chincoteague Inlet, VA	3	56	S	GN	GN	Biologist (NMFS)	RI
" "	E Broadkill Beach, DE	NE Roosevelt Inlet, DE	<1	3	NE	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	Delaware Bay, DE	<1	8	NW	LL	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	NW Villas, NJ	<1	2	NW	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	Delaware Bay, DE	<1	2	S	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	W Villas, NJ	<1	1	SW	LL	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	Delaware Bay, DE	<1	6	SW	LL	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	Delaware Bay, DE	<1	2	S	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	Delaware Bay, DE	<1	2	SW	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	S Folley Inlet, NC	3	333	SW	GN	GN	Biologist (NMFS)	RI
" "	Delaware Bay, DE	NR	NR	0		GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	NE Roosevelt Inlet, DE	<1	7	E	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	St. Catherine's Sound, GA	22	515	SW	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	SW Fortescue, NJ	13	21	N	GN	RR	Biologist (NMFS)	RI
" "	Great Bay, NJ	E Hatteras, NC	9	260	S	GN	GN	Biologist (NMFS)	RI
" "	Delaware Bay, DE	Delaware Bay, DE	<1	2	S	GN	RR	Biologist (NMFS)	RI
" "	E Hatteras Inlet, NC	N Chesapeake Bay Bridge, VA	9	126	N	GN	RR	Chris Jensen	NC
" "	E Hatteras Inlet, NC	Hatteras Inlet, NC	5	9	SW	GN	GN	Chris Jensen	NC
Sandbar shark	Delaware Bay, DE	W Villas, NJ	1	13	NE	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	E Slaughter Beach, DE	2	6	E	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	Delaware Bay, DE	<1	2	SE	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	Delaware Bay, DE	<1	7	SE	GN	RR	Biologist (NMFS)	RI
" "	Delaware Bay, DE	Delaware Bay, DE	<1	5	NW	LL	RR	Biologist (NMFS)	RI
" "	SE Montauk Pt., NY	E Southport, NC	161	486	SW	RR	LL	Harry McAllister	NY
" "	E Folley Beach, SC	W Dry Tortugas	39	663	SW	LL	LL	Glenn Ulrich	SC
" "	E Hatteras Inlet, NC	NW Cape Henry, VA	8	111	N	GN	RR	Chris Jensen	NC
" "	SE Shinnecock Inlet, NY	E Ocean City, MD	<1	161	SW	RR	RR	Tony Visentin	NY
" "	SE Jones Beach, NY	S Montauk Pt., NY	131	74	E	RR	LL	Roy T. Allen, Jr.	FL
" "	NR	Coney Island Flats, NY	NR	0		RR	RR	Carmine Vastola	CH
" "	E Avon, NC	E Cape Canaveral, FL	146	497	SW	LL	LL	Biologist (NMFS)	RI
" "	E Cape May, NJ	E Sebastian Inlet, FL	92	719	SW	RR	LL	Ron Slominski	NJ
" "	S Cape Hatteras, NC	SW Marathon, FL	118	638	SW	LL	LL	Stephen Connett	RI
" "	E Ponce Inlet, FL	S McClellanville, SC	26	245	N	LL	GN	Tris Colket	FL
" "	S Fire Island Inlet, NY	E Beaufort Inlet, NC	44	360	SW	RR	LL	Bill Martin	NY
" "	S Pt. Judith, RI	E Chesapeake, VA	108	315	SW	RR	LL	Fred Gallagher	RI
" "	E Cape Hatteras, NC	Cape Hatteras, NC	79	11	W	LL	RR	Biologist (NMFS)	RI
" "	Great Bay, NJ	E Hatteras, NC	9	260	S	GN	GN	Biologist (NMFS)	RI
" "	SE Moriches Inlet, NY	S Duck Key, FL	90	1039	SW	RR	LL	Wain Carlough	NY
Sandbar shark	Martha's Vineyard, MA	SE Galveston, TX	72	1920	SW	RR	LL	Gregg Skomal	MA
" "	S Pt. Judith, RI	S Chincoteague Inlet, VA	94	271	SW	RR	GN	Fred Gallagher	RI
" "	S Barnegat Inlet, NJ	SE Oregon Inlet, NC	NR	242	S	RR	LL	David A Newman	NJ
" "	NE Ponce Inlet, FL	SE Cape Henry, VA	78	510	NE	LL	LL	Tris Colket	FL
" "	E Shark River Inlet, NJ	E Matamoros, Mexico	86	1938	SW	RR	LL	Bernie Kulkaski	NJ
" "	E Cape May, NJ	SW Morehead City, NC	66	336	SW	RR	LL	Brian McGahhey	NJ
" "	E Beaufort Inlet, NC	SW Naples, FL	74	742	SW	LL	LL	Biologist (NFMS)	RI
" "	S Avalon, NJ	S Cape Lookout, NC	6	305	S	RR	LL	Michael Fritz	NJ
" "	SE Rehoboth Beach, DE	Georgetown, SC	60	379	SW	RR	RR	Terry Bosserman	PA
" "	W Naples, FL	W Naples, FL	38	88	E	LL	LL	Steve Thorsteinsson	FL
" "	SE Jones Inlet, NY	SE Oregon Inlet, NC	NR	327	S	RR	LL	Matt Lawston	NY
" "	Bradenton, FL	St. Petersburg, FL	35	7	NW	RR	RR	Randy Lamb	FL

Table 2. Tag recoveries: January-December 1997.

	GENERAL LOCATIONS		MONTHS AT LIBERTY	DIST. (MI.) AND DIR.		CAPTURE METHOD		TAGGED BY	
	TAGGED	RECAPTURED				TAG.	REC.	TAGGER	RESIDENCE
Sandbar shark	E Sombrero Key Light, FL	SW Marathon, FL	11	16	W	LL	LL	Biologist (NMFS)	RI
" "	SW Beaufort, NC	Harborlsland, SC	17	219	SW	LL	RR	Biologist (NMFS)	RI
" "	SW Hatteras Inlet, NC	Chesapeake Bay, VA	9	137	N	GN	RR	Chris Jensen	NC
" "	SE Ocean City, MD	N Rudee Inlet, VA	10	76	SW	RR	RR	Mark Sampson	MD
" "	E Beaufort Inlet, NC	E Townsends Inlet, NJ	7	271	N	LL	RR	Chris Jensen	FL
" "	N Cape Pt. Buxton, NC	Avon, NC	<1	0		RR	FD	Paul Clark	NC
" "	E Jacksonville, FL	E Charleston, SC	42	201	NE	LL	LL	Biologist (NMFS)	RI
" "	ESE Jacksonville, FL	E St. Augustine, FL	24	22	SE	LL	LL	Biologist (NMFS)	RI
" "	Chesapeake Light Tower, VA	E Charleston, SC	18	266	SW	LL	LL	Jack Musick	VA
Tiger shark	S Cape Lookout, NC	SE Morehead City, NC	<1	35	NE	LL	LL	Chris Jensen	FL
" "	E Southport, NC	E Morehead City, NC	16	81	NE	LL	LL	Chris Jensen	FL
" "	SE Southport, NC	SE Morehead City, NC	<1	74	NE	LL	LL	Chris Jensen	FL
" "	E Savannah, GA	E Cape Lookout, NC	6	266	NE	LL	LL	Chris Jensen	FL
" "	E Cape Lookout, NC	E Cape Lookout, NC	6	266	NE	LL	LL	Chris Jensen	FL
" "	E Charleston, SC	E Southport, NC	11	155	NE	LL	LL	Glenn Ulrich	SC
" "	SE Folley Beach, SC	E St. Augustine, FL	7	139	S	LL	LL	Glenn Ulrich	SC
" "	E Cape May, NJ	NR	NR	0		RR	TO	Roy A. Rapp	NJ
" "	SW Hatteras Inlet, NC	S Hatteras Inlet, NC	<1	12	SE	LL	LL	Chris Jensen	FL
" "	E Jacksonville, FL	NE Daytona Beach, FL	14	63	S	LL	LL	Tris Colket	FL
" "	E Cape Fear, NC	SE Morehead City, NC	<1	43	NE	LL	LL	Chris Jensen	FL
" "	E Southport, NC	SE Morehead City, NC	<1	42	NE	LL	LL	Chris Jensen	FL
" "	E St. Augustine, FL	E Ponce Inlet, FL	13	61	S	LL	LL	Biologist (NMFS)	RI
" "	SE Cape Fear, NC	SE Morehead City, NC	<1	88	NE	LL	LL	Chris Jensen	FL
" "	E Southport, NC	SE Morehead City, NC	<1	50	NE	LL	LL	Chris Jensen	FL
" "	E Southport, NC	W Cape Verde Islands	26	2373	E	LL	LL	Chris Jensen	FL
" "	E Goulds Inlet, GA	Avon, NC	15	319	NE	LL	RR	Biologist (NMFS)	RI
" "	E Cape Fear, NC	Avon, NC	15	130	NE	LL	RR	Biologist (NMFS)	RI
" "	E Southport, NC	S Flemish Cap	NR	1549	E	LL	LL	Chris Jensen	FL
" "	E Morehead City, NC	Avon Fishing Pier, NC	11	39	NE	LL	RR	Chris Jensen	FL
Tiger shark	S Beaufort Inlet, NC	SE Morehead City, NC	NR	28	NE	LL	LL	Chris Jensen	FL
" "	S Beaufort Inlet, NC	SE Morehead City, NC	NR	22	NE	LL	LL	Chris Jensen	FL
" "	E Southport, NC	Avon Fishing Pier, NC	8	110	NE	LL	RR	Chris Jensen	FL
" "	E Georgetown, SC	E Charleston, SC	9	60	SE	LL	LL	Biologist (NMFS)	RI
" "	SE Georgetown, SC	E Georgetown, SC	12	27	E	LL	LL	Chris Jensen	FL
" "	SE North Inlet, SC	SE Bogue Inlet, SC	2	123	NE	LL	RR	Chris Jensen	FL
" "	SW Ponce, Puerto Rico	S Anguilla Island	13	284	E	LL	LL	John Fabryka	DE
" "	S Hatteras Inlet, NC	SE Cape Lookout, NC	<1	48	S	LL	LL	Chris Jensen	FL
" "	E Carolina Beach Inlet, NC	SE Cape Lookout, NC	<1	44	E	LL	LL	Chris Jensen	FL
" "	S Cape Fear, NC	SE Carolina Bch Inlet, NC	9	30	NE	LL	LL	Chris Jensen	FL
" "	SE Southport, NC	E Southport, NC	3	45	NE	LL	LL	Chris Jensen	FL
" "	NE Cape Lookout, NC	E Cape Lookout, NC	<1	7	SE	LL	LL	Chris Jensen	FL
" "	E Jacksonville Beach, FL	E Southport, NC	12	277	NE	LL	LL	Tris Colket	FL
" "	E Cape Fear, NC	SE Swansboro, NC	17	28	NW	LL	RR	Chris Jensen	FL
Porbeagle shark	E Martha's Vineyard, MA	E Cape Sable, NS, Canada	111	268	NE	LL	LL	G. Hinteregger, NMFS Obs.	RI
" "	Isle of Wight, England	NE Start Point, France	18	67	W	RR	TN	Danny Vokins	England
" "	S Portsmouth, NH	NE Tignish, PEI, Canada	34	391	NE	RR	TN	Joseph Marquette	NH
" "	S Grand Bank, NF, Canada	S Sable Island, NS, Canada	26	240	SW	LL	LL	Kevin Antle	Canada
" "	E Provincetown, MA	ENE Tignish, PEI, Canada	45	389	NE	LL	GN	Steve Athanosios	ME
" "	E Cape Breton, Canada	S Cape Sable, NS, Canada	42	426	SW	LL	LL	Andy Kingman	PA
" "	E Cape Sable, NS, Canada	S Cape Sable, NS, Canada	40	181	SW	LL	LL	Andy Kingman	PA
" "	S Cape Race, NF, Canada	SW Cape Race, NF, Canada	46	165	W	LL	LL	Albert Lawrence	Canada
" "	SE Cape Race, NF, Canada	E Cape Race, NF, Canada	45	145	N	LL	LL	Albert Lawrence	Canada
" "	E Halifax, NS, Canada	S Sable Island, Canada	30	116	SE	LL	LL	Albert Lawrence	Canada
Porbeagle shark	Sable Isl. Bank, NS, Canada	N Cap-Aux-Meules, Canada	34	243	N	LL	LL	Albert Lawrence	Canada
" "	Sable Isl. Bank, NS, Canada	E Cape Sable, NS, Canada	28	75	SW	LL	LL	Albert Lawrence	Canada
" "	SE Cape Sable, NS, Canada	SE Sable Island, Canada	37	229	E	LL	LL	Andy Kingman	PA
" "	SE Cape Sable, NS, Canada	SE Cape Breton, Canada	37	181	E	LL	LL	Andy Kingman	PA
" "	SE Cape Breton, Canada	E Cape Sable, NS, Canada	16	270	SW	LL	LL	Kevin Antle	Canada
" "	E Cape Sable, NS, Canada	SE Sable Island, Canada	14	167	E	LL	LL	Kevin Antle	Canada
" "	S Cape Sable, NS, Canada	S Cape Sable, NS, Canada	12	20	NE	LL	LL	Kevin Antle	Canada
" "	SE Cape Breton, Canada	S Cape Canso, NS, Canada	18	128	SW	LL	LL	Kevin Antle	Canada
" "	E Cape Sable, NS, Canada	SE Cape Sable, NS, Canada	16	116	SW	LL	LL	Kevin Antle	Canada
" "	E Portland Headlights, ME	S Cape Sable, NS, Canada	8	180	SE	RR	LL	Chuck Baker	ME
" "	S Isle of Wight, England	NE Pt. de Barfleur, France	2	46	S	RR	LL	Danny Vokins	England
" "	E Portland Headlights, ME	SE Portland Headlights, ME	<1	45	W	LL	RR	Biologist (NMFS)	RI
" "	E Portland Headlights, ME	S Cape Elizabeth, ME	1	48	SW	LL	LL	Biologist (NMFS)	RI
Shortfin mako	E Oregon Inlet, NC	E Beaufort, SC	153	247	SW	LL	LL	Stephen Connett	RI
" "	E Mar De Plata, Argentina	SE Santos, Brazil	58	853	NE	LL	LL	Butch Winter	NJ
" "	E Wachapreague Inlet, VA	S Fire Island Inlet, NY	26	149	NE	RR	RR	Chuck Cogswell	NY
" "	S Montauk Pt., NY	NE Rockport, MA	62	149	NE	RR	RR	Jeff Stonehill	CT
" "	S Fire Island Inlet, NY	SE Nantucket Island, MA	<1	187	E	RR	LL	Ian Kyranakis	NY
" "	S Cape Sable, NS, Canada	NR	NR	0		LL	LL	Paul Puskas	NJ
" "	E Flemish Cap	S Flemish Cap	45	481	SW	LL	LL	J. Harrington, NMFS Obs.	MA
" "	SE Cape Race, NF, Canada	SW Faial, Azores	46	767	SE	LL	LL	Alex Sutton	NY
" "	E Wildwood, NJ	Ocean City, MD	24	0		RR	LL	Joseph Lucas	PA
" "	SW Fire Island Inlet, NY	S Shinnecock Inlet, NY	1	50	E	RR	RR	Bob Winter	NY
Shortfin mako	SE Shinnecock Inlet, NY	S Shinnecock Inlet, NY	12	52	S	RR	RR	Mike Fomin	NY
" "	SE Cape May, NJ	SW Flemish Cap	23	1142	E	RR	LL	Ed Pickul	PA
" "	ESE Moriches Inlet, NY	SW Flemish Cap	10	1067	E	RR	LL	Jim Becker	NY
" "	S Flemish Cap	SE Flemish Cap	12	350	SE	LL	LL	Barry Marx	FL
" "	SE Cape May, NJ	S Cape Sable, NS, Canada	14	441	NE	RR	LL	Joe McHugh	PA
" "	SE Wassaw Sound, GA	SE Charleston, SC	3	74	NE	LL	RR	Biologist (NMFS)	RI
" "	SE Flemish Cap	W Faial, Azores	4	294	SE	LL	LL	Barry Marx	FL
" "	SE Cape Race, NF, Canada	SW Faial, Azores	3	727	SE	LL	LL	Barry Marx	FL
" "	S Montauk Pt., NY	E Ocean City, MD	2	200	SW	RR	RR	Carl Safina	NY
" "	SSE Montauk Pt., NY	SE Block Island, RI	<1	19	NE	RR	RR	Bruce Scotti	NY
" "	SE Rudee Inlet, VA	SE Ocean City, MD	12	97	NE	RR	RR	George Dulka	VA
" "	E Cape Hatteras, NC	E Montauk Pt., NY	16	377	NE	HL	RR	Stephen Connett	RI
Nurse shark	Big Pine Key, FL	Big Pine Key, FL	27	0		RR	RR	Jeff Carrier	MI

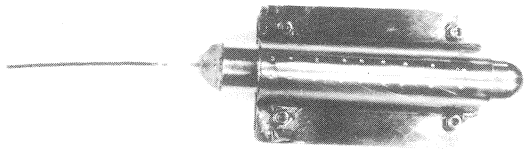
Table 2. Tag recoveries: January-December 1997.

	GENERAL LOCATIONS		MONTHS AT LIBERTY	DIST. (MI.) AND DIR.		CAPTURE METHOD		TAGGED BY	
	TAGGED	RECAPTURED				TAG.	REC.	TAGGER	RESIDENCE
Nurse shark	W Tavernier, FL	Islmorada, FL	<1	3	SW	RR	RR	George Scott	FL
" "	Vaca Key, FL	S Marathon, FL	23	0		RR	RR	Gary Stamm	MD
" "	W Tarpon Springs, FL	Hernando Beach, FL	32	40	NE	RR	RR	Ed Thompson	FL
" "	NE Ponce Inlet, FL	E Hallandale Beach, FL	11	198	S	LL	LL	Eric Sander	FL
" "	Indian Shores, FL	Indian Shores, FL	<1	0		RR	RR	Steven Grzesik	FL
" "	Indian Shores, FL	Indian Shores, FL	<1	0		RR	RR	Steven Grzesik	FL
" "	Islamorada, FL	Islmorada, FL	2	1	W	RR	RR	Graeme Pullen	England
" "	Naples, FL	Ft. Myers Beach, FL	<1	59	SW	RR	RR	John Brossard	FL
Dusky shark	SE Ocracoke Inlet, NC	S Hatteras Beach, NC	17	30	NE	LL	RR	Chris Jensen	FL
" "	SE Charleston, SC	Mahalual, Quintana Roo, Mexic	44	1068	SW	LL	GN	Glenn Ulrich	SC
" "	E Beach Haven, NJ	Tabasco, Mexico	72	1811	SW	RR	LL	Joe Scerbo	NJ
" "	SE Jones Inlet, NY	E Barra De Cazones, Mexico	85	1696	SW	RR	LL	Edward Perry	NY
" "	NR	SE Barnegat Inlet, NJ	NR	0		TN	LL	Biologist (NMFS)	MA
" "	SE Fire Island Inlet, NY	S Cape Lookout, NC	29	405	SW	RR	LL	Louis Delli-Pizzi	NY
" "	S Hatteras Inlet, NC	Cape Point, NC	3	32	NE	LL	RR	Chris Jensen	FL
" "	E Wildwood, NJ	E Cape Lookout, NC	32	263	S	RR	LL	Donald Bates	NJ
Atl. sharpnose	SE Savannah, GA	SE Charleston, SC	10	67	N	LL	RR	Biologist (NMFS)	MS
" "	SE Chincoteague Inlet, VA	SE Folly Inlet, NC	83	272	SW	RR	GN	George Garner	VA
" "	SE Charleston, SC	N Daytona Beach, FL	57	218	S	RR	LL	Ivan Schultz	SC
" "	SE Charleston, SC	S Folly Inlet, NC	69	107	NE	RR	GN	Ivan Schultz	SC
" "	E Mayport Basin, FL	Port Canaveral, FL	7	98	S	LL	GN	Biologist (NMFS)	RI
Blacktip shark	Turtle Cay, FL	Ten Thousand Island, FL	1	2	NW	GN	RR	Erich Ritter	FL
" "	Pine Island Sound, FL	Pine Island Sound, FL	10	0		RR	RR	James Keith	FL
" "	Padre Island, TX	Veracruz, Mexico	7	492	S	RR	HL	John R Mawk II	TX
" "	Padre Island, TX	E Tamiahua, Mexico	8	324	S	RR	LL	Doug Ferguson	TX
Scal. hammerhead	NE Oregon Inlet, NC	E Hatteras, NC	94	42	S	LL	GN	Biologist (NMFS)	RI
" "	N Pt. Mansfield, TX	Altamira, Tamaulipas, Mexico	NR	244	S	RR	LL	Steve Honc	TX
Bonnethead	Goodland Bay, FL	Goodland, FL	3	1	NW	GN	RR	Todd Hopkins	FL
" "	NE Key West, FL	N Key West, FL	1	19	NW	RR	RR	Bob Waterhouse	FL
Lemon shark	Palm Beach, FL	Palm Beach, FL	12	0		RR	RR	Donald Ewer	FL
" "	Long Key, FL	Long Key, FL	29	5	W	RR	RR	Ned Stearns	FL
Bull shark	E Galveston, TX	SE Galveston, TX	11	54	W	GN	LL	Biologist (NMFS)	MS
Blacknose shark	S Jacksonville Beach, FL	E Brunswick, GA	27	58	N	RR	GN	John Henry David	FL
Carribean Reef shark	Bimini, Bahamas	Gulf of Mexico	11	0		RR	RR	Larry Laffler	FL
Great hammerhead	W Keewaydin Island, FL	WNW Campeche, Mexico	34	637	SW	RR	GN	Chris Costa	FL
Longfin mako	E Tobago	SE Cape May, NJ	66	1852	NW	LL	LL	Alex Sutton	NY
Night shark	NE Oregon Inlet, NC	SE Charleston, SC	37	316	SW	LL	LL	J. Harrington, NMFS Obs.	MA
Sand tiger	Little Egg Inlet, NJ	SE Atlantic City, NJ	36	11	SW	RR	PS	Bruce Hrobak	NJ
Silky shark	E Ft. Pierce Inlet, FL	E Satellite Beach, FL	5	54	N	RR	LL	Robert Pelosi	FL
Spinner shark	Port Everglades, FL	Straits of Florida	53	148	SW	RR	RR	Matt O'Bryen	FL
Brown/Dusky shark	SE Fire Island Inlet, NY	S Murrells Inlet, NC	94	529	SW	RR	RR	Peter Rao	NY
" "	E Barnegat Inlet, NJ	E Charleston, SC	67	500	SW	RR	LL	Jim Lynch	NJ
" "	SW Wachapreague Inlet, NC	E Cape Hatteras, NC	NR	134	S	RR	LL	Elden N Lorish	MA
Carcharhinidae	SE Fire Island Inlet, NY	E Oregon Inlet, NC	116	278	S	RR	GN	Robert Baltrunas	NY
" "	NR	NW Dzilam de Bravo, Mex.	NR	0		RR	LL	Dave Shelley	NJ
Shark	E Halifax, NS, Canada	E Halifax, NS, Canada	43	56	NW	LL	LL	Andy Kingman	PA
" "	NR	S Cape Sable, NS, Canada	NR	0		RR	LL	Joseph Castellano	NY
" "	SW Jones Inlet, NY	SE Cape Sable, NS, Canada	24	231	E	RR	LL	Fred Deutcsh	NY
" "	S Flemish Cap	NW Cape Verde Islands	6	1620	SE	LL	LL	Barry Marx	FL
" "	E Savannah, GA	W Sao Vicente, Portugal	22	3166	NE	LL	LL	B. Bernatonis, NMFS Obs.	MA
Unknown	S Pt. Judith, RI	SE Sao Miguel, Azores	20	2363	E	RR	LL	Charlie Donilon	RI
" "	S Fire Island Inlet, NY	SE Montauk Pt., NY	<1	140	E	RR	LL	Eric Morrow	NY
" "	SE Portland Headlights, ME	S Flemish Cap	6	1075	E	RR	HL	Gary Nadeau	ME
" "	SE Fire Island Inlet, NY	N Cumana, Venezuela	9	1626	S	RR	LL	Kenneth Schmieder	NY
Swordfish	E Rocha, Uruguay	E Rio de Janeiro, Brazil	28	1935	E	LL	LL	Butch Winter	NJ
" "	SE Flemish Cap	W Noudhibou, Mauritania	31	1701	SE	LL	LL	Barry Marx	FL
" "	S Flemish Cap	SE Charleston, SC	NR	1808	W	LL	LL	Barry Marx	FL
" "	NW Dry Tortugas, FL	SE Charleston, SC	11	734	NE	LL	LL	Barry Marx	FL
Bluefin tuna	S Martha's Vineyard, MA	S Portland Headlights, ME	60	132	N	RR	RR	Vincent Kersey	MA
" "	NE Barnegat Inlet, NJ	E Wachapreague, VA	22	162	SW	RR	RR	Russ Smith	NJ
White marlin	E Beach Haven, NJ	SE Cape May, NJ	61	100	SW	RR	RR	Bruce Weisinger	NY
Yellowfin tuna	SE Argos Bank, Bermuda	Challenger Bank, Bermuda	<1	59	E	RR	RR	K. Winter	Bermuda

NOTE: FS=Free Swimming; GN=Gillnet; HL=Handline; LL=Longline; RR=Rod&Reel; TN=Trawl Net; FD=Found Dead; TO=Tag Only Found; PS=Purse seine; Obs=Foreign Fisheries Observer; NR=Not Reported

Archival Tag Experiment

During the coming year, we will be placing archival tags on several sharks. These tags (see photograph) continuously record environmental parameters and locations for several years. Unlike satellite tags (1994 Shark Tagger) which transmit information periodically, archival tags must be returned in order for us to retrieve the data. If you recapture a shark with one of these tags, please bring the shark in and contact us immediately.



FIELD STUDIES

The 1997 field season greatly enhanced our continuing work on survey cruise design, porbeagle shark ageing, and sandbar and nurse shark reproduction. The field season started early, with a gear comparison cruise in January and continued into the spring with shark reproductive studies in Delaware Bay and the Florida Keys, a full tournament schedule in the summer, and two fall cruises to study porbeagle shark biology.

Research Cruises

Apex Predators Gear Comparison Cruise NOAA Ship *R/V Delaware II*

In the springs of 1989 and 1991, members of the Apex Predators Program (APP) onboard the NOAA Ship *R/V Delaware II* conducted two longline surveys of sharks along the Atlantic coast using Yankee Style longline gear. The 1989 survey was conducted between Tampa Bay, FL and southern New England (DE II 89-03). The 1991 survey was conducted between Miami, FL and southern New England during the same season and used the same fishing methods (DE II 91-06).

A third survey, conducted in 1996, attempted to repeat stations from the first two surveys in the region from Key West, FL to Delaware Bay, DE during the same time season (Pelican 96-01). Gear and soak times were altered in 1996 to more accurately represent those of the commercial large coastal shark fishery; biological studies of sharks were essentially the same. Florida Style Monofilament gear (Mono) was used, replacing the Yankee gear, spiny dogfish replaced mackerel as bait, and soak times were increased from one to three hours. In addition, the survey was conducted from the beach to 40 fathoms (fm), eliminating all previously fished stations outside this depth range. To enable a comparison of the results of the 1989 and 1991 surveys with the results of the 1996 and future surveys, a gear comparison cruise was conducted during Jan-Feb 1997.

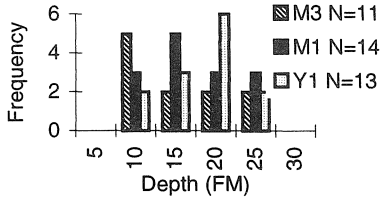
The objective of the 1997 cruise was to evaluate possible conversion factors for transforming the data from the 1989 and 1991 surveys to allow direct comparison to the 1996 data. Data were also collected to compare the difference in catch between SEFSC Shark Surveys (100 hooks/one-hour soak) and those of the NEFSC (300 hooks/three-hour soak).

Three types of stations were alternately fished: 100 hooks of Mono gear fished for 1 hour using spiny dogfish as bait (M1); 100 hooks of Yankee gear fished for 1 hour using mackerel as bait (Y1); and 300 hooks of Mono gear fished for 3 hours using spiny dogfish (M3). Randomly chosen stations were located between Cape Fear, NC and Ponce Inlet, FL between 5 and 30 fm. A random gear order (M1, Y1, M3) was chosen prior to departure and fished alternately, one type at each station.

Results

Ninety-nine fish (93 sharks) were caught on 42 longline sets, including 8 species of sharks and 3 species of teleosts or rays. Seventy-three fish (74%) were tagged and released, 10 (10%) were brought aboard, 15 (15%) were released untagged, and one was lost. Shark catch per unit effort (CPUE) was 52 per 10,000 hook hours (1.4/100 hooks). Sharks represented 94% of the catch, of which Atlantic sharpnose sharks were the most common, followed by tiger sharks. Eighteen sets were conducted during the day (start set before sunset) and 20 at night (start set before sunrise). Set depth ranged from 6.0 to

Fig. 1.



24.4 fm, with the majority of sets in 15 to 20 fm range **(Figure 1).**

Although an insufficient number of sharks were caught to allow statistical comparison of the data, interesting trends can be observed **(Figure 2).** Overall, it appears that the Y1 gear was more efficient at catching sharks than the M1 or M3 gear. However several factors, including temperature and time of day, need to be addressed.

Fig. 2.

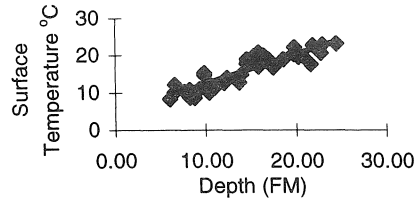
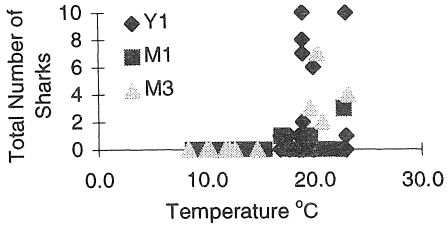


Fig. 3.



It is apparent that the number of sharks caught per set increased with temperature for all gear types with the most dramatic increase occurring at approximately 18.5 °C **(Figure 3)**. Since temperature increased linearly with depth **(Figure 2)**, the catch/depth relationship mimicked that of the catch/temperature relationship. On average, the Y1 gear was fished at a greater temperature than the M3 and M1 gears. In particular, there is a 2 °C difference in mean temperature between Y1 and M3 stations; this discrepancy could have contributed to the catch differences.

It is also interesting to note that while the Y1 gear caught more sharks, the majority were small coastals. When the catch is split by species groups comprising the shark management units, the difference in catch of large coastals by gear types becomes less dramatic, with the only sandbars being caught on the M3 gear.

Another factor to consider in relating catch to gear is day versus night sets. On this cruise, the catches were greater during the day than at night. Only 4 of 14 M1 sets were conducted during the day, whereas, the Y1 sets were more equally divided (7 day/6 night) and the M3 gear had more day (7) than night (4) sets.

Though the cruise was set up to be random in terms of all possible influences, it is apparent that some bias might have occurred which could have influenced the results. In the future, as this type of comparison is continued and refined, the stations will be closely monitored to equalize all these factors includ-

ing locations, times, and temperature. Additionally, we may change the time of year for the survey in order to increase the possibility of obtaining sharks.

Porbeagle Shark Tagging Cruises

In 1997, APP personnel were fortunate to have four opportunities to go into the field to tag and inject porbeagle sharks for our ongoing age and growth study (see 1996 Shark Tagger Summary). Two of these trips were in the spring onboard the F/V Panther *in the Gulf of Maine during regular commercial porbeagle fishing operations; tagging was done opportunistically. The other two were research cruises conducted in the fall specifically targeting porbeagle sharks. The results of these cruises are combined and summarized here.*

The objectives of the porbeagle tagging cruises were to: 1) tag and inject porbeagle sharks with oxytetracycline (OTC) for migration and age and growth studies; 2) collect morphometric data; and 3) collect biological samples for age and growth, food habits, and reproductive studies.

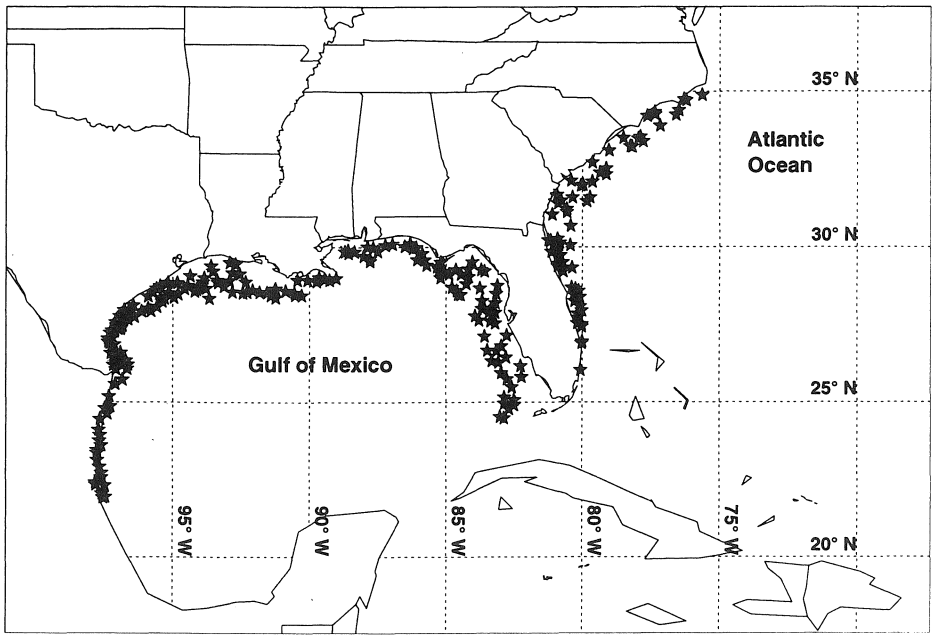
Operations for all four porbeagle cruises were conducted between Mt. Desert Rock, ME and Cape Cod, MA, out to approximately 60 nm offshore. Surface temperatures in the spring varied, between 44° to 46° F, and depth ranged from 39 to 100 fm. In the fall, the surface temperatures ranged from 49° F to 66° F and depth ranged from 48 to 124 fm.

Pelagic longline sampling gear was set at each station. The gear configuration varied depending on time of day and area. The basic gear consisted of 900 lb monofilament mainline with 24 ft (7.3 m) gangions, although gangion type varied. Some were composed of monofilament line while others were composed of rope with wire leaders. The number of sets per day depended on the catch from previous sets and weather conditions.

In the spring, 32 sets of longline gear were completed. The majority of porbeagles caught on these trips were taken commercially, allowing us to sample the catch for biological studies. We measured fork lengths (FL) and took vertebrae for age and growth studies from 15 porbeagles. Reproductive dissections were performed on two porbeagles, and food habits dissections were completed on 12 sharks. Additionally, samples of spiral valves were taken from five porbeagles of varying sizes for parasite research, and samples of liver and muscle were taken for DNA studies. Sixteen porbeagles were tagged and injected with OTC for age validation studies during these cruises.

In the fall, 35 longline sets produced 583 sharks, representing 5 species. The majority of the sharks caught were blue sharks (420), followed by porbeagle (99), spiny dogfish (47), thresher (12) and mako sharks (5). Of these, 388 were tagged (384 blues, 93 porbeagles), four (porbeagles) were dissected, and 91 sharks were lost or released at the rail (this included 50 spiny dogfish released without tags). In all, 85 porbeagle, 53 blue, and two thresher sharks were injected with OTC.

These four cruises were invaluable to our current porbeagle shark research. Sharks have already been returned and in one case, the whole vertebral column of an injected porbeagle was removed and sent to us (see related article on Page 16).



Coastal Shark Assessment - Bottom Longlining

Contributed by: Mark Grace
NMFS, Pascagoula, MS

The 1997 Gulf and Atlantic Coastal Shark Assessment survey was conducted in the Gulf of Mexico and western North Atlantic coastal waters from Cabo Rojo, Mexico to Cape Hatteras, NC **(see Map)** onboard the NOAA Ship *R/V OREGON II*. Commercial style bottom longline gear was fished in depths of 5 to 30 fathoms (see 1995 Shark Tagger Summary). A portion of the survey, conducted within territorial waters of Mexico (Leg II, U.S.–Mexico international boundary, southern limit of Texas to Cabo Rojo, Mexico), operated under auspices of the MEXUS-GULF Program and was coordinated with Instituto Nacional de la Pesca headquarters in Mexico City, Mexico.

Objectives of the survey were to: 1) assess the distribution and abundance of coastal sharks along the U.S. and Mexico coasts of the Gulf of Mexico; 2) collect biological and environmental data; and 3) tag and release sharks. Biological data for each capture included species identification, fork length (mm), total length (mm), fish condition (alive or dead), sex, whole weight (kg) and tag number if applicable. For some specimens, biological sampling included tissue samples for DNA studies, external parasites, collection of vertebrae for age and growth studies, and dissections to examine reproductive status and/or collection of internal parasites.

During the survey, 259 longline sets were completed (approximately 25,900 hook hours). Survey operations for Legs I, II, and III were in the Gulf of Mexico; Leg IV was along the southeast U.S. Atlantic coast **(Figure 1)**. Leg I was conducted from south of Mississippi to offshore of Brownsville, TX. Leg II was conducted from offshore of Brownsville, TX

Continued

to Cabo Rojo, Mexico (25 longline sets in Mexican waters). Leg III was conducted from south of Mississippi to the Florida Keys, FL, and Leg IV was conducted from offshore of Miami, FL to Cape Hatteras, NC. The survey along the Mexican coast from Cabo Rojo to the eastern Yucatan Peninsula was not completed due to circumstances requiring changes in the project objectives.

Shark captures composed 90% (926) of the total catch (1,030), with the remaining 10% classified as incidental catch (104). Of the 15 shark species captured, 4 species were small coastal sharks (74% of shark captures), 10 were large coastal species (26% of shark captures), and 1 was a pelagic species (shortfin mako, *Isurus oxyrinchus*, 0.11% of shark captures). The Atlantic sharpnose shark (*Rhizoprionodon terraenovae,* 88% of 681 small coastal shark captures) was the dominant small coastal shark, and the most dominant shark caught overall (65% of all shark captures). The dominant large coastal shark species caught was the sandbar shark (*Carcharhinus plumbeus*, 24.6% of 244 large coastal shark captures), followed by blacktip (*C. limbatus*, 23.8%) and tiger sharks (*Galeocerdo cuvier*, 22.1%).

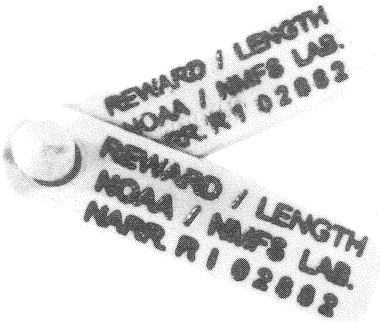
The ratio of small coastal sharks to large coastal sharks and the dominant shark species often varied by area. The highest percentage of small coastal shark captures occurred between Florida and Cape Hatteras (during Leg IV) with small coastals composing 81% of shark captures. The highest percentage of large coastal shark captures occurred in the eastern Gulf of Mexico (during Leg III) with large coastals composing 53% of all shark captures. During the survey, 560 sharks were tagged and released (60% of shark captures).

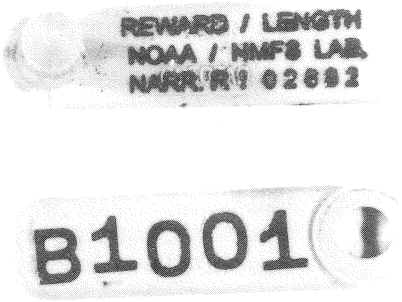
Shark catches per unit effort (CPUE, expressed as sharks per 100 hook hours) were: 4.32 during Leg I (406 shark captures, 94 longline sets), 0.41 during Leg II (14 shark captures, 34 longline sets), 2.18 during Leg III (144 shark captures, 66 longline sets) and 5.57 during Leg IV (362 shark captures, 65 longline sets).

Sandbar Shark Nursery Study

During May, July, and August, APP biologists continued to study the sandbar shark nursery grounds of Delaware Bay. There were no sandbar sharks caught during our May trip, supporting our hypothesis that the pupping season does not start prior to June. In July, longline gear was added to our sampling methods (gill net and hook/line) to increase coverage of the bay and to facilitate comparison with other nursery ground studies. During the sampling trip, 312 sandbar sharks were captured between July 26 and August 6, and 118 sandbar sharks were caught in late August. Age 0 (young of the year) sharks composed 84% of the total sandbar shark catch. Other shark species captured this year were smooth dogfish, *Mustelus canis*, and sandtiger, *Odontaspis taurus*.

This year, we tagged young sandbar sharks with small, blue fin-tags (Rototags) or yellow dart-tags (Hallprint). Please watch for these tags on the dorsal fin of young sandbar sharks.





BLUE ROTOTAGS FOR DORSAL FINS

ONGOING RESEARCH

These articles are updates of studies we have reported on in previous Shark Tagger *newsletters and highlight cooperative research projects.*

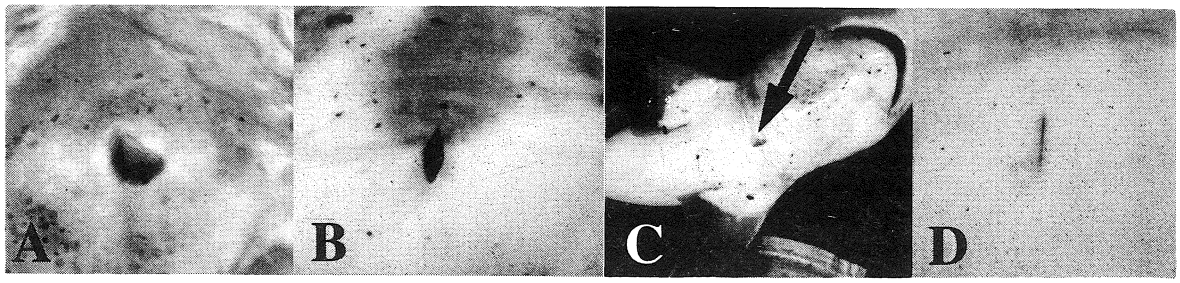
Porbeagle Shark Age and Growth

Contributed by:
Joesph Mello
University of Rhode Island

In the past year, preliminary growth curves were developed for the porbeagle shark, *Lamna nasus*, from vertebral band counts. Vertebral sections from 119 sharks, ranging in size from 76.5 to 240 cm (~2.5 to 8 ft), were prepared. The bands were counted and analyzed using standard methods. Because studies on other lamnid sharks (mako, sand tiger, and basking sharks) have suggested that two band-pairs per year are deposited, and since the frequency of band deposition has not been established for this species, the data were analyzed under two assumptions: 1) that one band-pair per year was deposited, and 2) that two band-pairs were deposited each year.

The growth curve based on two band-pairs per year resulted in an exceedingly fast growth rate and a low age at maturity when compared to size and age at maturity estimates from Aasen (1961). More biologically consistent growth and maturity estimates were produced when assuming formation of just one band per year. At this rate of band deposition, male porbeagle sharks would mature at approximately 3 years of age, based on Aasen's (1961) size at maturity estimate of ~5.2 ft (160 cm) fork length (FL). Conversely, female porbeagle sharks would not mature until approximately 8 years of age, based on a size at maturity estimate of slightly more than 6.6 ft (200 cm) FL (Aasen 1961).

In 1998, bands on each vertebral sample will be recounted by two biologists to ensure the precision of the age estimates. In addition, growth curve parameters will be calculated based on length frequency and tag-recapture data to independently verify the vertebral band data. To date, project personnel have injected 116 porbeagles with oxytetracycline (OTC, a biomarker that permanently attaches to the calcium in the vertebral column of the shark), enabling validation of the number of bands deposited per year (See *Field Studies*).



A) Umbilical *cord-remains*, B) *Open-fresh* scar, C) *Partly healed* umbilical scar, and D) *Mostly healed* scar condition. Arrow indicates position of the umbilical scar on the shark. (Not shown: *Well healed* and *None*)

One porbeagle injected in the fall was recaptured six days after tagging. Fortunately, the fisherman who recaptured the shark was aware of our research, measured the shark, removed the entire vertebral column, and sent it to us. A distinct mark was visible on the vertebral edge, along the entire column. Though only at liberty for a short time, this sample proved to be invaluable in establishing that OTC is incorporated quickly in this species. In the near future, we hope to obtain more vertebral samples, particularly from those porbeagles we have injected. If you recapture a tagged porbeagle or other shark species, please contact Lisa Natanson at (401) 782-3320.

Length at Birth of the Sandbar Shark in Delaware Bay

Contributed by:
Rebecca R. Merson
University of Rhode Island

Distribution of length at birth of sandbar sharks pupped in Delaware Bay was investigated as part of ongoing research on the ecology of shark nursery grounds. A neonate (newborn) sandbar shark can be distinguished from a juvenile shark by the presence of an unhealed umbilical scar on the belly between the pectoral fins **(see Figure)**. We examined 798 sandbar sharks captured by gill net or longline in Delaware Bay between 1995 and 1997.

Six distinct umbilical scar healing stages were observed. The scars were classified as either umbilical *cord-remains*, *open-fresh*, *partly healed*, *mostly healed, well healed* or *none*. The umbilical *cord-remains* condition is assigned when a piece of umbilical cord is attached to an open umbilical scar **(Figure A)**. The *open-fresh* scar condition has no pieces of umbilical cord attached, but there is no indication of external healing in the musculature or dermis **(Figure B)**. The *partly healed* umbilical scar condition is observed when the skin around the scar is still open approximately 1 to 2 mm (1/16 in.) wide and 6 to 8 mm (1/4-in.) long, but there appears to be tissue healing internally to the scar **(Figure C)**. The scar was classified as *mostly healed* when it was closed, but the skin has not completely healed and a thin opaque or black line could be observed **(Figure D)**. A *well healed* umbilical scar is completely closed, but a line of white scar tissue is obvious. Umbilical condition was designated as *none* when there was no visible umbilical scar tissue in the vicinity of the umbilical scar.

Of the sandbar sharks examined, 107 had no discernible scar, therefore were considered juveniles. Four sandbar sharks examined in early June had visible *well healed* umbilical scars, but were captured before the pupping season began so were at least one year old. The lengths of sharks with *cord-remains, open-fresh*, and *partly healed* umbilical scar healing stages were not statistically different; thus we considered sandbar sharks with these umbilical scar conditions to be the youngest sharks. Growth during the nursery season was evident when the lengths of sharks with *mostly healed* and *well healed* stages were compared to sharks with earlier healing stages.

Using 249 length measurements from the youngest sandbar sharks (*cord-remains*, *open-fresh* and *partly healed* umbilical scars), the mean (95% confidence interval) length at birth is 49.3 cm (19.4 in.) FL, with a range of 40 to 55 cm (16 to 22 in.) FL. This length at birth is comparable to results from other studies.

Springer (1960) stated the range in length at birth of sandbar sharks was 37 to 53 cm (15 to 21 in.) FL, and the length at birth in Florida (his reported southern limit of pupping grounds) was 52 cm (20 in.) FL. From our data and reported lengths of near-term embryos (Castro 1993), there is a considerable range in the length at birth of the sandbar (up to 15 cm [6 in.]) and other shark species. Castro (1993) published sandbar shark term-embryo lengths of 37 to 53 cm FL from a South Carolina nursery ground and reported, in 1983, that length at birth was "about" 50 cm (20 in.) FL. A study of sandbar shark reproduction reported a mean embryo length of 49 cm (19 in.) FL (range 37 to 56 cm [15 to 22 in.] FL) in females during late May and early June, the pupping season in the Chesapeake Bight region (Colvocoresses and Musick 1989).

High abundances of neonates observed in late June and July indicate that these months are the peak pupping season of the sandbar shark in Delaware Bay. Low frequencies of sharks with the two earliest stages of umbilical scar condition caught in August (1%) and September (2%) suggest that, although the peak pupping season is over, some births occur later in the season. The sandbar shark pupping season in Delaware Bay occurs one to four weeks later than pupping along the southeastern U.S.

First Documented Study of Gestation and Birth of Sharks Mating in the Wild

Contributed by:
Jeffrey C. Carrier
Albion College

Since the summer of 1991, a field project has been conducted by biologists from Albion College and the Apex Predators Program to investigate the reproductive biology of nurse sharks

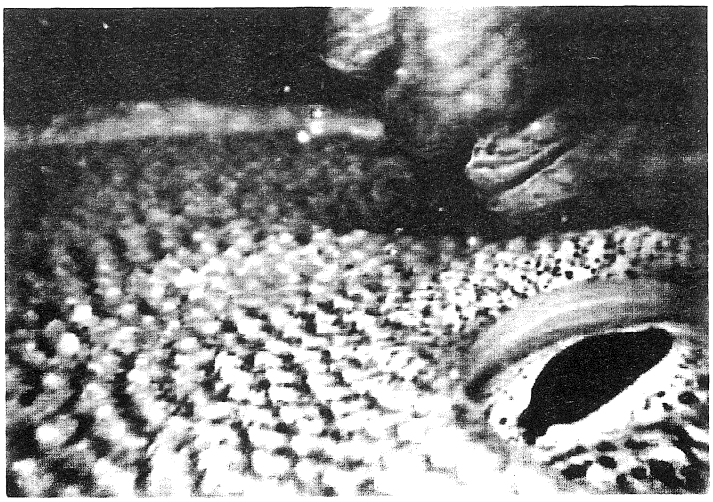
Continued

(*Ginglymostoma cirratum*) in the southwestern Florida Keys. This project differs from many other studies of shark reproduction by using direct underwater observation of mating activities. The clear waters of the Keys and the apparent preference of ovulating females for shallow water permit detailed observation and videography of sharks by diving biologists.

In addition to disclosing these largely undescribed activities, the study promises to provide information on population genetics through the use of DNA comparisons, to more completely reveal details of social organization in sharks, and also to provide access to an ongoing wild population of nurse sharks for studies of reproductive physiology. The study has demonstrated the importance of habitat to actively reproducing sharks, and measures have been taken to close the mating grounds for this population during the mating season.

The most recent aspect of the long-term study has taken parts of the investigation's field component to the captive laboratory (Sea World of Florida) for research on gestation. For the last several summers, shark mating activities were observed and recorded in the wild, and two females that were noted as participants in mating events were subsequently captured. Each year, selected females were examined in the field using ultrasonography to determine the extent of the presence of eggs and transferred to holding facilities at Sea World. In collaboration with veterinarians and laboratory staff, serial blood samples were taken from both animals during the one year captive period, and one animal was examined monthly using ultrasound and intrauterine endoscopy to assess the progress of the presumed pregnancy.

While in captivity, the female's blood was sampled periodically and changes in steroid hormones were monitored. Endoscopic procedures verified the presence of numerous eggs and revealed the appearance of young that had emerged from egg cases. Ultrasonic imagery was used to further confirm the presence of uterine hatchlings. One of the animals eventually carried young to term. The first births occurred after five months. These earliest births occurred with large yolk sac remnants in place and most of the animals did not survive. A total of 15 offspring were born, 5 from one female and 10 from the second. One pup has survived, and both of the females and the surviving offspring were tagged and returned to the site of capture. Though unique, this study can serve as a valuable "template" with which to understand mating, pupping and reproduction in other species of large sharks.



Right--Inside view of a nurse shark embryo during gestation. The endoscope reveals the right eye surrounded by denticles in contact with the maternal uterine wall.
(Photo courtesy of Sea World of Florida)

Massachusetts Sportfishing Tournament Monitoring Program

Contributed by:
Gregory Skomal
Mass. Division of Marine Fisheries

The close proximity of Massachusetts to the cooler boreal waters of the Gulf of Maine and the warmer temperate waters south of Cape Cod attract the seasonal feeding aggregations of a variety of big-game fish species. Extensive offshore fisheries for tunas, sharks, and marlin occur annually off Massachusetts' coast from June through October. Recreational anglers in private and chartered vessels travel miles offshore to catch bluefin, yellowfin, albacore, and bigeye tunas; blue, mako, and thresher sharks; and blue and white marlin. The highly migratory nature, large size, and long life span of these species render data acquisition and biological studies expensive and difficult to execute.

Since 1987, Massachusetts Division of Marine Fisheries (DMF) biologists have utilized the efforts of tournament fishermen to learn about the species and size composition, basic biology, and relative abundance of big game species off of our coast. Offshore fishing tournaments not only provide catch data and biological samples, but also estimates of effort which are often lacking for offshore recreational fisheries.

The number of tournaments held in Massachusetts fluctuates from year to year, depending on the economic climate and nature of the fisheries. There are generally about five to nine offshore tournaments held annually, with most located on Cape Cod and the Islands. Some target strictly sharks, while the majority offer prizes for a variety of species. All of the events self-impose minimum sizes and bag limits while promoting tag and release. Points can be garnered in most cases by not only weighing fish, but also by releasing them. Traditional tournaments like the Nantucket Billfish Tournament (29 years), the Green Harbor Tuna Tournament (25 years), the Oak Bluffs Monster Shark Tournament (11 years), and the Falmouth Grand Prix (8 years) have evolved over the years to changing economies and shifting fisheries but still provide valuable time series data for the DMF Tournament Program.

Although tournament data have been traditionally used by several states and the federal government to monitor landings in offshore recreational fisheries, the Massachusetts Tournament Program is unique. While most of these entities collect data on fish that are landed, the DMF program attempts to collect total catch data including fish that are boated, tagged, released, or lost. By working closely with tournament sponsors and tournament participants, DMF biologists not only assist in the development of the event but also facilitate complete data collection. When developing an index of abundance like catch per unit effort (CPUE), estimates of total catch allow the calculation of a more accurate index. This is particularly important when indices of abundance are used to monitor annual changes in fishing success.

From 1987 through 1997, DMF personnel have collected data at 73 big-

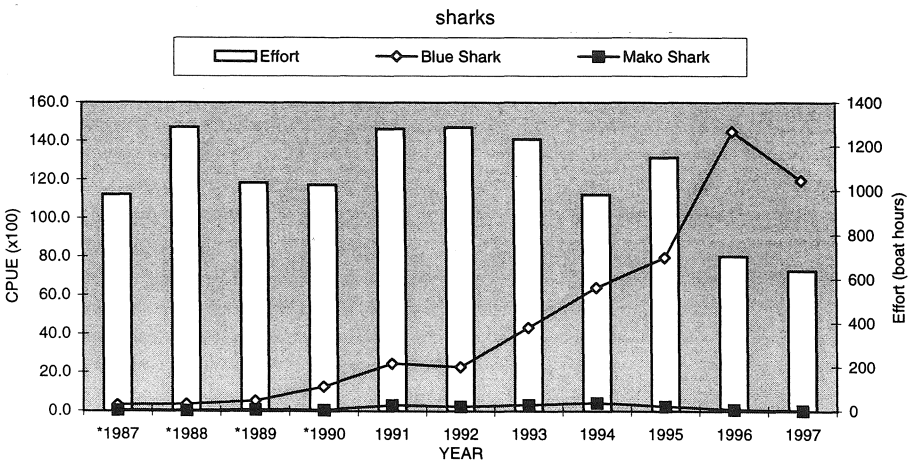


Figure 1: Annual CPUE estimates for sharks taken during Massachusetts tournaments;
* = years with incomplete release data.

game tournaments representing 34,736 boat hours of fishing effort. Over this period, 8,935 fish comprising 18 species have been tallied by the program. The dominant offshore species in the database is the blue shark, representing 68% of the tournament catch. Other species in the catch include, but are not limited to: yellowfin tuna (11%), white marlin (7%), bluefin tuna (4%), albacore tuna (3%), and mako shark (3%).

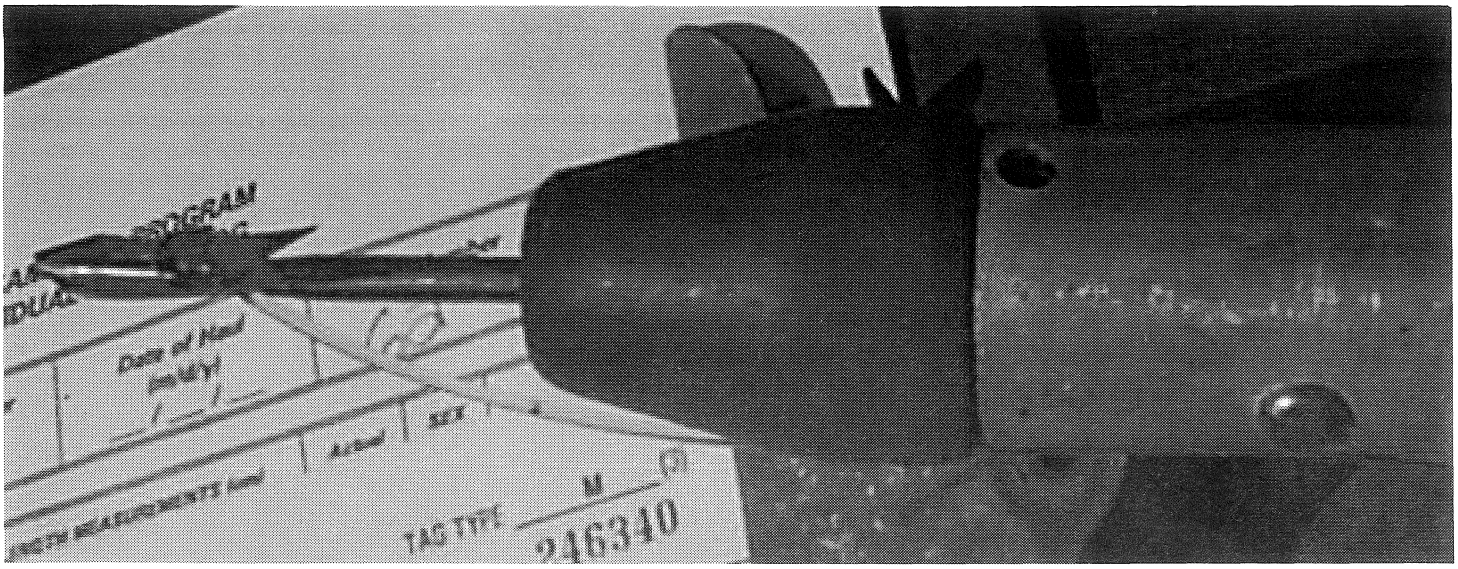
As expected, the percentage of fish released by tournament anglers during this period differed greatly by species, ranging from 0% (dolphin) to 97% (white marlin). Overall, only 18% of the total tournament catch was boated, while 63% was released and 19% was tagged when released.

Annual estimates of CPUE can be calculated to show trends in fishing success. Drastic fluctuations in CPUE may be indicative of changes in regional fish abundance caused by corresponding changes in prey availability, fish population size, and/or environmental factors. For example, the CPUE time series for yellowfin tuna shows that fishing success for this species was strong in 1993 and 1994, peaked in 1995, dropped out in 1996, and bounced back slightly in 1997. While mako shark CPUE has remained low, yet relatively stable over the eleven-year period, blue shark fishing success has steadily increased. This increase may reflect an actual change in blue shark abundance, but better reporting attributable to tournament release categories has also affected this index.

The comprehensive catch and effort data collected by the Tournament Program are forwarded annually to the National Marine Fisheries Service for inclusion in their national statistics. Well-founded fisheries management decisions must be based on a thorough understanding of the fisheries themselves. The Massachusetts Sportfishing Tournament Monitoring Program provides valuable information about our fisheries that contributes to this understanding.

Tournament organizers and those interested in additional information about the program should contact Gregory Skomal, Massachusetts Division of Marine Fisheries, Martha's Vineyard Research Station, P.O. Box 68, Vineyard Haven, MA 02568, 508-693-4372, Or email to:

gskomal@whsun1.wh.whoi.edu



http://www.nefscsharks.nmfs.gov

CHECK IT OUT--OUR WEB PAGE!

We are very pleased to finally announce our new web page. We first told you about our web page in last year's Shark Tagger, but things took longer than planned. Thanks to all who patiently waited. We would appreciate your comments and suggestions. Please email the webmaster.

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THE SHARK TAGGER NEWSLETTER

Published annually by The Apex Predators Cooperative Shark Tagging Program

Nancy E. Kohler, Lisa J. Natanson, Harold Wes Pratt, Jr., Ruth Briggs, Patricia A. Turner

MANAGEMENT UPDATE

The Highly Migratory Species Management Division of NMFS is responsible for management of Atlantic tunas, swordfish, billfish, and sharks. Thirty-nine species of Atlantic sharks are grouped into four management units - large coastal sharks, pelagic sharks, small coastal sharks, and prohibited species. In the "Report to Congress: Status of the Fisheries of the United States" (September 1997), NMFS identified all large coastal sharks and prohibited species as overfished, and pelagic and small coastal sharks as fully fished.

The Magnuson-Stevens Fishery Conservation and Management Act, as amended in 1996, required that all overfished species have fishery management plans (FMPs) or FMP amendments that include rebuilding plans. These plans must be submitted for secretarial review within one year of the overfishing designation. The act's amendments also required NMFS to establish an advisory panel for each FMP or amendment. The advisory panel that considers sharks also covers Atlantic tunas and swordfish.

The current, basic rules of the shark managment plan are as follows:

1. Annual commercial quota for large coastal sharks: 1,285 metric tons dressed weight (mt dw)
2. Annual commercial quota for small coastal sharks: 1,760 mt dw
3. Annual commercial quota for pelagic sharks: 580 mt dw
4. Recreational bag limit for all Atlantic sharks: two sharks per vessel per trip, with an additional allowance of two Atlantic sharpnose sharks per person per trip
5. ALL directed fishing (commercial or recreational) is prohibited for: whale, basking, white, sand tiger, and bigeye sand tiger
6. Catch and release only recreational fishery: white sharks
7. Filleting of sharks at sea is prohibited

Written comments are encouraged and should be addressed to Rebecca Lent, Chief, HMS Division - F/SF1, 1315 East-West Highway, Silver Spring, MD 20910. The Report on the Status of Fisheries of the United States and an issues/options paper for HMS management can be found online at: **http://kingfish.ssp.nmfs.gov/sfa** or requested from Margo Schulze by fax (301) 713-1917 or by phone (301) 713-2347.