South Carolina Marine Game Fish Tagging Program 1978 -2009

Robert K. Wiggers

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Robert K. Wiggers

South Carolina Department of Natural Resources
Marine Resources Division

South Carolina Saltwater Recreational Fishing License

DNR

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Marine Resources Division
South Carolina Department of Natural Resources
P.O. Box 12559
Charleston, South Carolina 29422

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Introduction

The South Carolina Marine Game Fish Tagging Program (MGFTP) began in 1974 under the direction of David Cupka. Since its inception the program has had a succession of principle administrators including Charles Moore, Donald Hammond, Kay Davy, and Robert Wiggers. Operated from the Marine Resources Division's Office of Fisheries Management, the program was initiated with a small contribution from the Charleston based South Carolina Saltwater Sportfishing Association. For a number of years the program received funding from the U.S. Fish and Wildlife Service's Sport fish Restoration Act before coming under the funding umbrella of the South Carolina Saltwater Recreational Fishing License. The tagging program has proven to be a useful tool for promoting the conservation of marine game fish and increasing public resource awareness. In addition, the program has provided biologists with valuable data on movement and migration rates between stocks, growth rates, habitat utilization, and mortality associated with both fishing and natural events.

Tagging or "marking" fish is a common tool used by researchers and fisheries managers to assess fish populations and the practice was documented as early as 1653 (Walton). Since the 1940's there have been numerous tagging operations conducted by scientists (Davy, 1994), but it wasn't until the early 1960's that the idea of having recreational anglers tag and release their fish was even attempted. For the SCDNR, partnering with the angling community has proven to be an efficient and cost effective means for researchers to collect data. Anglers are typically able to tag more fish over a larger geographic area than would an agency-based tagging effort, and the opportunity for the public to participate in a research project often creates more of a "buy in" towards fisheries management decisions.

Since the program utilizes the public as a means for deploying tags, it is technically referred to as an "angler-based" tagging project. The MGFTP was unique in that it was the first state operated public tagging program on the East Coast. The program has served as a model for other projects that encouraged public fish tagging efforts. The National Marine Fisheries Service (NMFS), American Littoral Society, and several Atlantic coast states including Rhode Island, Maryland, Virginia, North Carolina, and Florida have successfully operated cooperative tagging programs for decades. The popularity of agency operated, as well as privately operated tagging programs, throughout the United States prompted the National Oceanic and Atmospheric Administration (NOAA) in conjunction with the Atlantic States Marine Fisheries Commission (ASMFC) to develop a Cooperative Tagging Website and Registry (http://fwie.fw.vt.edu/tagging/) as a means to provide online information detailing various programs. In 1999, the ASMFC appointed an Interstate Tagging Committee to develop and promote protocols for effective tagging programs. A certification process was established which provided a baseline of specific criteria necessary for a quality program, and the registry serves as a means to identify programs that have been certified. The ultimate goal of this process is to inform anglers who want to participate on how to choose a quality tagging program that will actually have some linkage to fisheries management.

Since its inception, nearly 9,000 participants comprised of South Carolina recreational anglers, charterboat captains, headboat captains, and commercial fishermen have tagged and released over 134,000 marine finfish. Marine finfish species are identified for tag and release

based on their importance both recreationally and commercially to the State and South Atlantic region. The program has maintained a list of around 46 target species representing 20 families. The list of target species has been periodically modified throughout the life of the program in order to address data needs related to seasonal movements, habitat requirements, growth rates, and release mortality. By far, red drum has comprised the majority (about 46%) of the fish tagged in this program, with non-target species making up less than 3% of the total fish tagged and released. The popularity of red drum as a target species for tag and release often lead to the misunderstanding that the MGFTP's primary focus was on red drum, when in fact the program has always been a multi-species tagging program.

The program has experimented with eight different tag types, with cost, ease of application, and minimal injury to the fish being the major considerations when choosing the best option. Three types of tags met the criteria, all of which were developed and manufactured in Australia by Hallprint Ltd. Polyethylene (non toxic) dart and t-bar tags have proven to have good tag retention and are relatively easy to apply.

From 1986 to 2000, the program grew steadily. Between 1990 and 2000 the program was at its peak in terms of participation, primarily as a result of a more environmentally conscious public and a robust promotional effort put forth by program staff. The establishment of more restrictive size and creel limits, particularly for red drum in the early nineties, resulted in anglers having to release more fish, and thus tag and release provided a satisfying option. Also during this decade, the program was highly publicized in numerous fishing publications and other media outlets, and as a result had more exposure to recreational anglers anxious to get involved. After 2000, changes in the program's operational design, which were aimed at reducing the overall size of the program, resulted in a decline in program participation.

Methods

Prior to 2005, any fishermen requesting to participate in the MGFTP were provided with a tag kit consisting of 5 dart tags, an applicator, associated postage paid information cards for recording the initial tag event, and a brief instructional brochure. After the startup kit, anglers were re-supplied with additional tags (in packs of 10) as requested. Each angler is assigned a unique alphanumeric identifier that is used to monitor tagging activity as well as track tag issuance. This information, along with initial tag and recapture data is maintained in a relational database (MS Access).

Because of the relative ease with which dart tags can be applied, most instructions were given to participants verbally, although a brief instructional brochure was developed as a reference tool and to further promote the program. The brochure gave a brief history of the program, what steps to take if a tagged fish is caught, how to tag large and small fish, as well as the target species to tag (Davy, 1994). Pictures were provided of the target species to aid with identification.

In 2004, a new instructional publication was developed entitled "An Angler's Guide to Tag and Release" (Wiggers, 2005) and was the precursor to training workshops that occurred shortly thereafter. During 2005, the program format changed significantly with the

establishment of new guidelines that limited participation to those individuals that could attend a training workshop. Overall participation was also limited to 225 anglers that would now be considered "certified" taggers. The reasoning behind the development of these workshops was twofold. First, it would create a more manageable number of taggers, making it easier to communicate and provide feedback to program participants. Second, the actual training alleviates many problems, such as inaccurate data reporting and improper tagging technique, which are common challenges of angler based programs. The workshops are structured around teaching anglers the proper techniques used in handling, tagging, venting, and releasing marine game fish in addition to providing an overview of the programs' tag and recapture database. The two hour workshop is divided into two parts; a presentation, followed by "hands-on" tagging where participants have the opportunity to practice tagging on dead fish. The practice tagging proves invaluable in helping anglers to hone their tagging technique before placing a tag in a live fish.

Through both the instructional guides and training workshops participants are also educated on proper handling and release techniques. Emphasis is put on the healthy release of the fish as the main priority and not necessarily a release where a tag is implanted. Extremely warm water temperatures, swim bladder rupture, or a long fight can all add to a fish becoming overly stressed and in such cases tagging is not advised. When fish are removed from the water to be tagged, anglers are encouraged to place a soft wet towel over the head and eyes of the fish to help keep it calm. It is also suggested that handling be kept to a minimum to avoid removing the fishes' slime layer.

As an incentive to report the recapture of tagged fish, a reward program was initiated in 1991. A white baseball cap with the program logo was the first type of reward provided to individuals who reported a recapture. A fish history report, detailing the date, location and size of the fish from both the initial tag event and recapture event, was also provided to both the angler reporting the recapture and the angler who initially tagged the fish. In many cases, anglers were more excited to learn the history of the fish than to receive the reward. Several other types of rewards were incorporated over the years to give anglers more choices. Pocket t-shirts and hand towels with the tagging logo or other relevant artwork were also offered, and typically held up better in the mail than did hats which frequently arrived out of shape. Given the amount of paperwork associated with documenting a monetary transaction in the state government system, the program has consistently opted not to give monetary rewards for reporting recaptures.

The MGFTP has consistently used the color yellow for all tags deployed by recreational participants. Tags are printed with a six digit number preceded by a specific letter (see appendix i). The letter designation serves as a means for identifying the size tag being used, which is dependent on both the species and size of fish being tagged. The alpha-numeric tag code is printed on both ends of the tag in case one end is mutilated. In addition to the tag number, the legend printed on the tag streamer reads, "REWARD-MAIL TO: SC MARINE RESOURCES BOX 12559, CHARLESTON, SC 29422, U.S.A. In 2007, the development of a toll free phone number for reporting recaptures resulted in changes to the legend.

Since 1988 the program has used nylon dart tags and in 2005 added a nylon T-bar anchor tag (W series) as a species specific option. The smallest dart tags (E series) measure 9.5 cm (3.75 in.) which anglers are instructed to use on fish between 12 and 27 inches. The next size (K series) measures 14.5 cm (5.75 in.) and is for use on fish over 27 inches. Dart tags are applied with an applicator consisting of a hollow stainless steel tube, the tip of which is cut at a sharp angle, which is then mounted inside a wooden dowel. When assembled, the applicator measures from7-8 inches, thus requiring the angler to be close to the fish when applying the tag. The tag is inserted just below the spinous first dorsal fin at a 45 degree angle to allow the barb to anchor between the pterygiophores. On larger fish, where the pterygiophores are spaced farther apart, tags are inserted just below the soft rays of the second dorsal fin. At this location, the barb is more likely to anchor between the pterygiophores which are naturally spaced closer together. After the tag is in place, anglers are advised to give the tag a firm tug to ensure the tag has locked into place.

The T-bar anchor tag is considerably smaller than the dart tag, measuring 4.5 cm (1.75 inches), and as the name suggests, is shaped like a "T" and is designed to anchor between the pterygiophores. T–bar tags typically come in strips of 50-100 tags, are numbered sequentially, and the entire strip is then loaded into a tagging gun featuring a removable stainless steel tagging needle (see appendix ii). The use of this tag type was a result of a focused tagging effort on weakfish, where studies had shown the T-bar tag as being the best option for fish with soft flesh that were susceptible to tag induced mortality (Clark, 2005). T-bar tags are inserted in the same location as the dart tags, but since they are being used on smaller fish (less than 20 inches) there is rarely the need to adjust the tag location back to the second dorsal fin.

The largest tag (A series) is a "harpoon" style tag consisting of a stainless wire streamer (covered with polyethelene) measuring 13.5 cm (5.3 inches) and attached to a stainless angled barb. Unlike dart tags, the harpoon tag is designed to embed in the musculature of the fish and is able to penetrate the thick skin of fish such as billfish and sharks. For this reason, and considering the cost of these tags, anglers are instructed to only use harpoon tags on billfish or sharks. For applying these tags, anglers are only provided with a stainless slotted applicator tip that must then be mounted onto a longer pole. There are several commercial tagging poles on the market where the tip can be inserted into one end and is then held in place with a small screw, but if cost is an issue, anglers are encouraged to construct a pole using a long metal or wood dowel. Because the fish being tagged with the harpoon tag are typically tagged in the water, while next to the boat, the tagging pole must be long enough to insert the tag while the angler is some distance away. The most effective size tagging pole is between 4 and 8 feet long. Once the tag is placed into the slotted tip it is held in place with a rubber band. To properly insert the tag, the tagger takes a position slightly behind the fish and implants the tag in the musculature below the dorsal fin.

Once a fish has been properly tagged and released, anglers are asked to record the date, location, species, length, weight, and name and address on the tag card (see appendix iii). In recording information, anglers are instructed to be as specific as possible. Lengths should be measured as total length, however if the angler is estimating size, this should be indicated as such on the card. Locations should also be specific. Furthermore, anglers are encouraged to mail in tag cards promptly or as soon as possible after tagging.

When cards are received, each data element is coded into specific alpha-numeric identifiers and entered into a database. Other information reported in the remarks section (requests for tags, recapture of tagged fish etc.) is noted and handled appropriately. Once the data has been key punched, it is edited by a third party before the card is filed.

When a recovery is reported, data elements similar to those on the initial tag card are coded and then compared to those elements on the initial tag card. Questionable data, either as reported by the initial tagger or recovery angler may require follow up in order to clarify discrepancies. Days out, direction of travel, distance traveled and growth rate (if applicable) are calculated. A fish history report summarizes this information along with the names of both the angler who reported the recovery and the angler who initially tagged the fish. Both parties receive this report and a reward is included for the angler reporting the recapture.

Results

From 1978 through 2009, cooperating anglers tagged 134,578 fish, of which 97% were designated as target species (Table 1).

Starting in 1986, the number of fish tagged and released began to increase steadily (Figure 1). The inception of more conservative size and bag limits ushered in an era of more conservation-minded anglers, and tag and release became the driving force behind the practice of catch and release fishing. The program also began to receive more publicity and with more promotional effort those previously unfamiliar with the program were anxious to become involved.

The trends in the number of fish tagged over the next 23 years would be directly related to participation levels (Figure 2). A decline in fish tagged and participation in 1994 and 1995 was the result of programmatic changes to target species. Specifically, participants were asked to discontinue tagging spotted seatrout and to only focus on tagging red drum over 18 inches. Since these species are two of the most popular marine gamefish caught by recreational anglers, and were a considerable portion of the total fish tagged, the numbers naturally declined before beginning another increase over the course of the next 6 years. From 2000 to 2009, a decrease in tagging and participation was a result of reductions in program staffing which necessitated operating a smaller more easily managed program.

Coinciding with the general coastal areas where tagging activity occurs, participation has been greatest in Charleston County at around 55% (Figure 3). Furthermore, participation and associated tagging is evenly distributed between the southern coastal counties (Beaufort and Colleton) and northern coastal counties (Georgetown and Horry) at 11% and 12% respectively.

From 1978 to 2009, the number of tagged fish recoveries (recaptures) has followed a trend similar to the number of fish tagged, and the program's overall recovery rate is around 9% (Figure 4). Tagged fish have been recovered as far north Connecticut, as far west as Texas, and as far south as Brazil (Davy, 1993).

Table 1. Number of target species tagged and recovered in the Marine Game Fish Tagging Program, 1978-2009.

Species Name	Tagged	Recovered
AMBERJACK	941	74
BARRACUDA	1196	46
BASS, STRIPED	1471	218
BLUEFISH	3011	57
COBIA	1066	201
DOGFISH, SPINY	132	6
DOLPHIN	960	16
DRUM, BLACK	2282	315
DRUM, RED (SPOTTAIL BASS)	62550	8264
FLOUNDER (UNKNOWN	4462	375
FLOUNDER, SOUTHERN	751	51
FLOUNDER, SUMMER	151	7
GROUPER, GAG	1545	165
GROUPER, RED	263	39
GROUPER, WARSAW	216	159
JACK, CREVALLE	1311	11
MACKEREL, KING	3119	60
MACKEREL, SPANISH	1665	11
MARLIN, BLUE	1163	14
MARLIN, WHITE	492	6
POMPANO, FLORIDA	105	3
PORGY, RED	218	5
SAILFISH	1790	21
SCAMP	1410	76
SEA BASS, BLACK	1316	155
SEATROUT, SPOTTED	14490	348
SHARK, ATLANTIC	3826	60
SHARK, BLACKTIP	1574	33
SHARK, BONNETHEAD	1917	70
SHARK, GREAT	69	3
SHARK, HAMMERHEAD	207	2
SHARK, LEMON	208	4
SHARK, SANDBAR	233	6
SHARK, SCALLOPED	142	0
SHARK, SMOOTH DOGFISH	420	10
SHEEPSHEAD	8928	1050
SNAPPER, RED	1644	180
SNAPPER, VERMILION	128	2
SPADEFISH, ATLANTIC	1078	51
TARPON	289	5
TRIPLETAIL	122	15
WEAKFISH	1167	4
TOTAL	130028	12198

Figure 1. Number of fish tagged and released annually in the Marine Game Fish Tagging Program, 1978-2009.

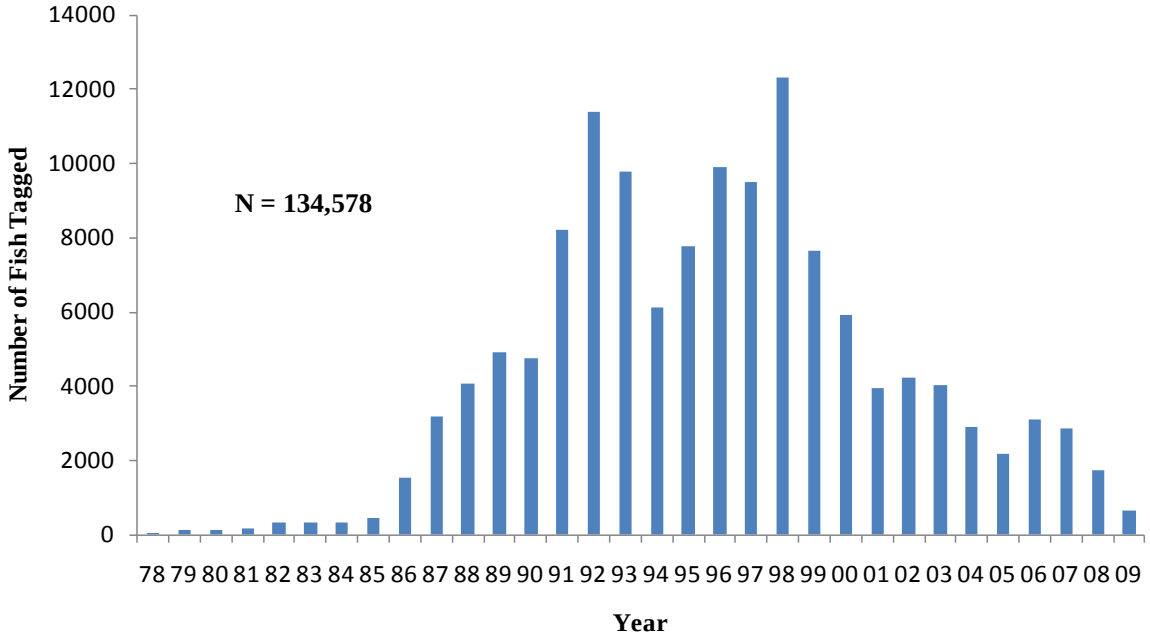


Figure 2. Number of volunteer taggers participating annually in the Marine Game Fish Tagging Program, 1978-2009.

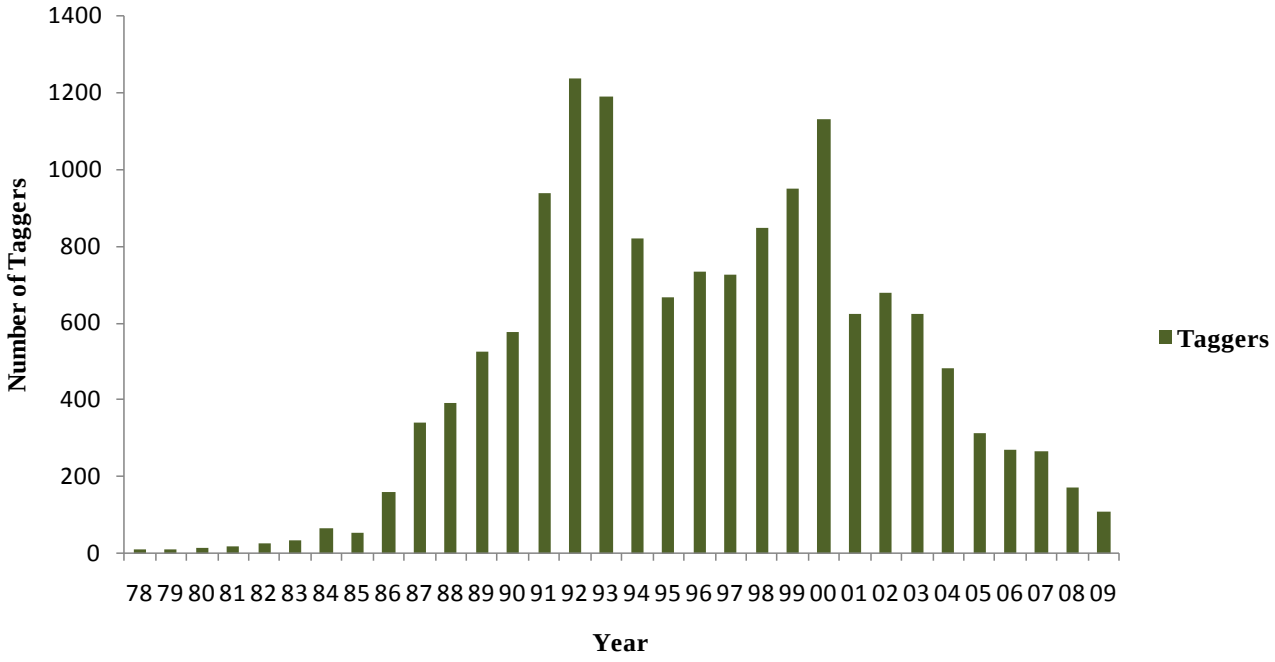


Figure 3. Participation in the top ten counties by overall number of volunteer taggers in the MGFTP, 1978 – 2009.

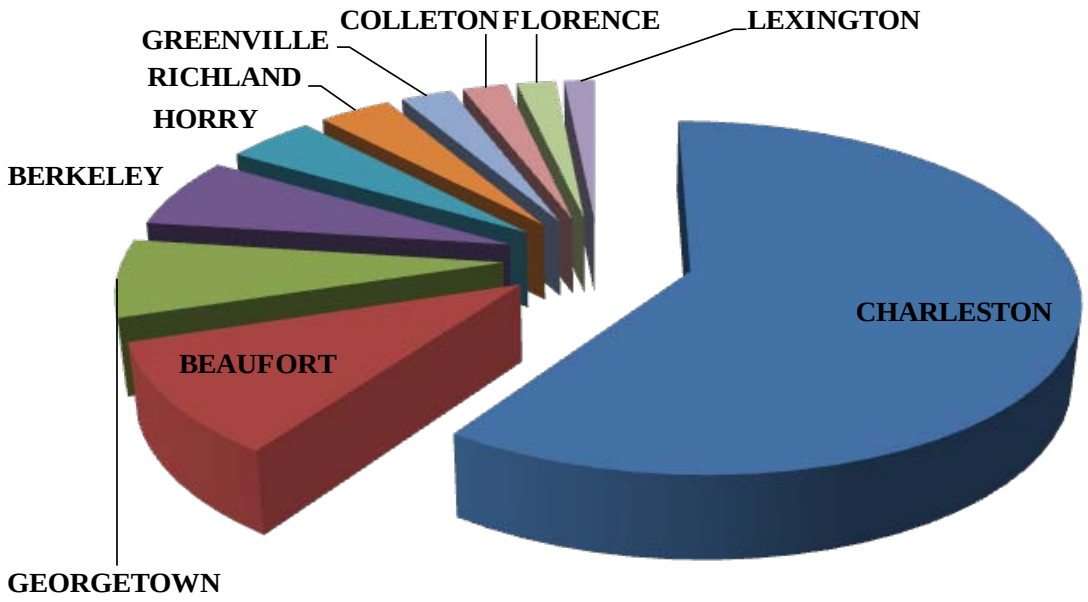
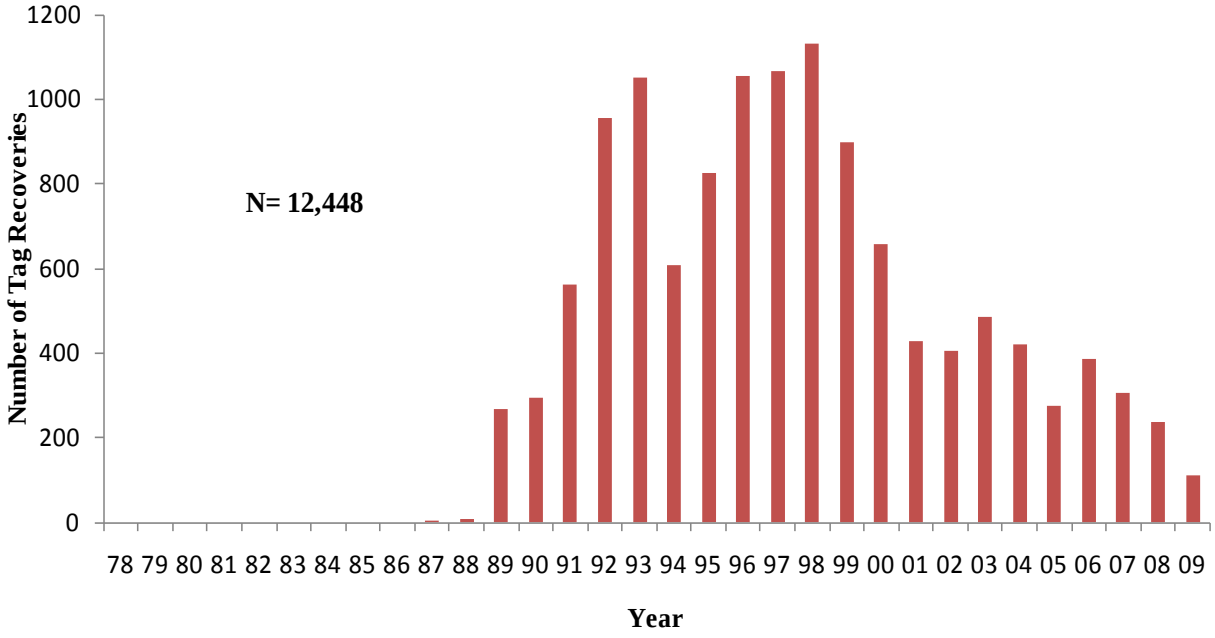


Figure 4. Number of tagged fish recovered annually in the Marine Game Fish Tagging Program, 1978-2009.



Results by Species

The following results are from target species for which there were recaptures.

Greater Amberjack
Seriola dumerili

From 1981 to 2009, 941 greater amberjack were tagged, and 74 were reported recaptured (Figure 5). The average time at liberty (days out) was 480 days and ranged from 1 to 2,703 days. Seventy-five percent (75%) of greater amberjack were tagged off South Carolina, while the remaining fish were tagged off Florida (16%), Georgia (8%) and North Carolina (1%). Over half (63%) of the recaptures occurred off Florida. Only three (3) of the amberjack recaptured were released with the tag still intact and as a result no multiple recaptures were documented. There were five (5) documented cases where greater amberjack had been initially tagged in the South Atlantic and were recaptured in the Gulf of Mexico however one of these had limited initial tag information (Table 2).

Recaptures of tagged amberjack off Florida occurred mostly during the months between January and May, which would support the idea that amberjack spawn off Southeast Florida during April and May.

A greater amberjack tagged in June, 1993 on the Hector Wreck off South Carolina, was recaptured in August, 1995 (800 days out) off Cuba; a distance traveled of approximately 787 miles. The longest time at liberty for a tagged greater amberjack was a fish tagged in April 1994 off Charleston, SC and recaptured in September 2001 off North Carolina (2,703 days out).

Table 2. Tagged greater amberjack recovered in the Gulf of Mexico.

Tagging Date	Location	Recapture Date	Location	Days Out
5/10/1987	Offshore Murrells Inlet, SC	3/15/1991	Off Key West, Gulf of Mexico	1405
6/15/1988	Off Charleston, SC	10/31/1992	Apalachicola, FL	1599
Missing Initial Tag Card		4/30/1997	Ft. Myers, FL	N/A
8/6/1998	Anchor Wreck, SC	12/10/1998	Destin, FL	126
8/10/1998	Off Georgia	11/15/2002	Largo, FL	1558

Barracuda
Sphyraena barracuda

Anglers tagged and released 1,196 barracuda between 1983 and 2009, of which 46 were recaptured (Figure 6). The average time at liberty was 417 days and ranged from 4 to 2,191 days.

Two barracuda tagged at the General Sherman Wreck off South Carolina (8/14/1993) and off Charleston, SC (8/20/1989) were recaptured in the Bahamas on 8/14/1994 (366 days out) and 5/25/1992 (1009 days out) respectively; a distance traveled of approximately 554 miles. Another fish tagged on 5/24/1996 on the Edisto Banks was recaptured off Cuba 113 days later (9/14/1996).

One of the most remarkable recoveries of a tagged barracuda, and one that supports strong site fidelity was a fish (36 inches TL) tagged on 7/14/1993 at the General Sherman Wreck and recaptured 6 years later to the day (7/14/1999) on the same wreck. At the time of recovery, the fish measured 49 inches total length.

Figure 5. Number of greater amberjack tagged and recaptured annually.

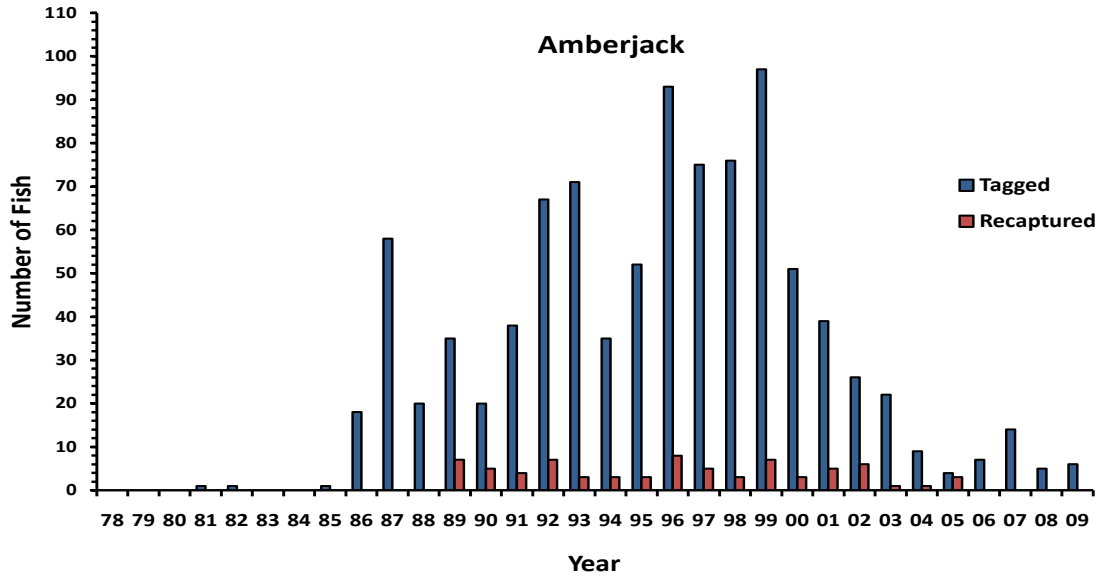
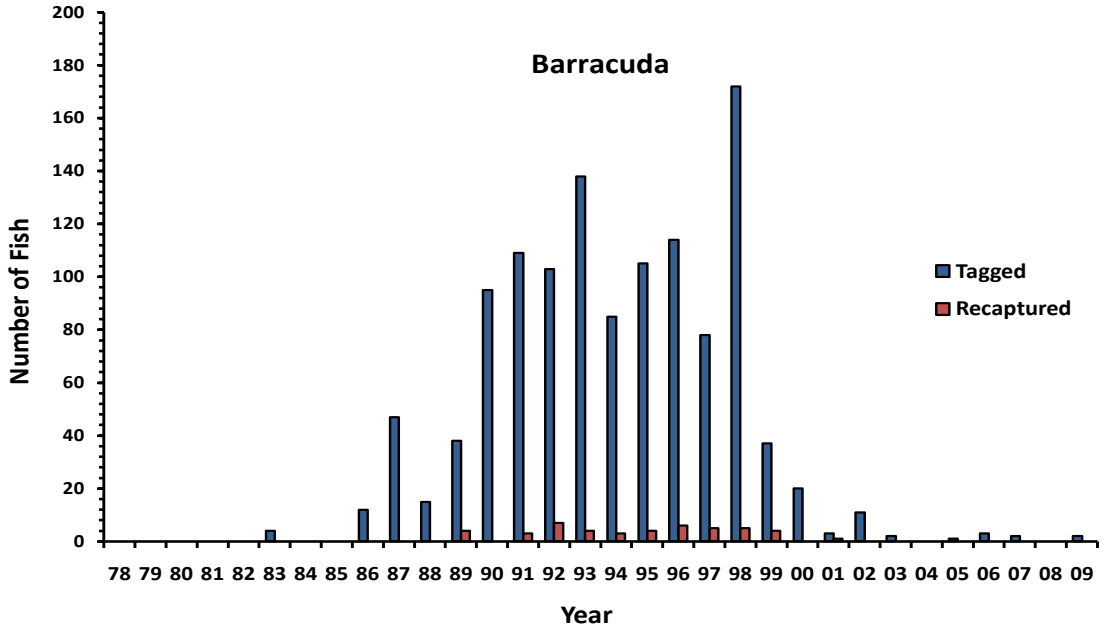


Figure 6. Number of barracuda tagged and recaptured annually.



Striped Bass

Morone saxatilis

Anglers tagged and released 1,471 striped bass between 1984 and 2009. Of these, 218 were recaptured (Figure 7). Thirty three percent (33%) of fish were tagged in the Combahee River with an average size of approximately 16 inches. The Sampit River (Georgetown County) accounted for the next most frequent initial tag location (22%) where average size tagged was approximately 14 inches.

Average time at liberty was 329 days and ranged from 1 to 1,747 days. Almost half (47%) of striper recaptures occurred in the Combahee River, and all of those had initially been tagged in the Combahee. There was some movement of stripers to adjacent river systems particularly with fish tagged in the Sampit River. Of the 41 recoveries of striped bass where the initial tagging occurred in the Sampit River, 8 of those fish were recovered in the Pee Dee River and 4 were recovered in the Black River.

Bluefish

Pomatomus saltatrix

Participating anglers tagged 3,011 bluefish between 1978 and 2009 and reported the recapture of 57 of those fish (Figure 8). Average time at large was 167 days and ranged from 1 to 547 days. One possible explanation for the low recovery rate for bluefish is their aggressive nature in which tagged fish may be a target for other bluefish in the school that see the yellow streamer tag as potential prey.

Bluefish follow typical South Atlantic migration patterns seen in many coastal species where winter months are spent in southern waters (primarily Florida) and as the season progresses from spring to summer they migrate northward. Recaptures of bluefish in the MGFTP support this movement. Fifty one percent (51%) of bluefish recaptures occurred outside of South Carolina (Table 3).

Table 3. Tagged bluefish recovered outside South Carolina.

Tagging Date	Location (South Carolina)	Recapture Date	Location	Days Out	Approx. Distance (miles)
8/12/1989	Lower Wando River	11/11/1989	St. Augustine, FL	91.0	225
5/12/1990	Capers Reef	6/22/1990	Kure Beach Pier, NC	41.0	128
8/17/1991	Charleston Harbor	2/7/1992	Jupiter Inlet, FL	174.0	428
6/6/1992	Hector Wreck	6/22/1992	Atlantic Beach, NC	16.0	178
6/6/1992	Hector Wreck	6/19/1992	Ocracoke, NC	13.0	233
6/6/1992	Hector Wreck	10/9/1992	Ft. Fisher, NC	125.0	101
9/7/1992	Dynamite Hole, Charleston Jetties	1/29/1993	Jupiter Inlet, FL	144.0	428
8/21/1993	Charleston Harbor	10/5/1993	Tybee Island, GA	45.0	77
10/2/1993	Dynamite Hole, Charleston Jetties	12/20/1993	Ft. Pierce, FL	79.0	390
10/25/1993	Dynamite Hole, Charleston Jetties	11/30/1993	Daytona Beach, FL	36.0	261
7/4/1995	Foster Creek, Wando River	12/31/1995	Daytona Beach, FL	180.0	275
10/24/1996	Charleston Harbor	3/29/1997	St. Augustine, FL	156.0	211
5/15/1997	Braddock Point, South Beach, Hilton Head	7/6/1997	Shallotte, NC	52.0	188
5/19/1997	Braddock Point, South Beach, Hilton Head	6/12/1997	Bogue Inlet Pier, NC	24.0	279
5/20/1997	Braddock Point, South Beach, Hilton Head	8/18/1997	Indian River Inlet, DE	90.0	587
8/1/1997	Braddock Point, South Beach, Hilton Head	11/30/1997	Mayport, FL	121.0	122
9/19/1997	Lawrence Wreck, Fripp Island	11/17/1997	Vero Beach, FL	59.0	326
10/3/1997	Little River	10/6/1997	Sunset Beach, NC	3.0	6
4/3/1998	Jack Creek, Bull Island	5/13/1998	Oak Island Pier, NC	40.0	110
4/21/1998	Charleston Harbor	5/17/1998	Harker's Island, NC	26.0	232
5/1/1998	Comanche Reef	5/23/1998	Ocean City, MD	22.0	550
8/4/1998	Braddock Point, South Beach, Hilton Head	11/2/1998	Ormond Beach, FL	90.0	195
9/4/1998	Bay Point	12/23/1998	Cape Canaveral, FL	110.0	269
9/9/1999	Port Royal Sound	12/29/1999	Jupiter Inlet, FL	111.0	378
12/14/1999	Murrells Inlet	6/13/2001	Jones Inlet, Long Island, NY	547.0	626
6/7/2000	Surfside Beach	6/16/2000	Sunset Beach, NC	9.0	40
9/30/2001	Charleston Harbor	2/8/2002	Cape Canaveral, FL	131.0	319
10/21/2003	Charleston Harbor	1/22/2004	Cape Canaveral, FL	93.0	319

Figure 7. Number of striped bass tagged and recaptured annually.

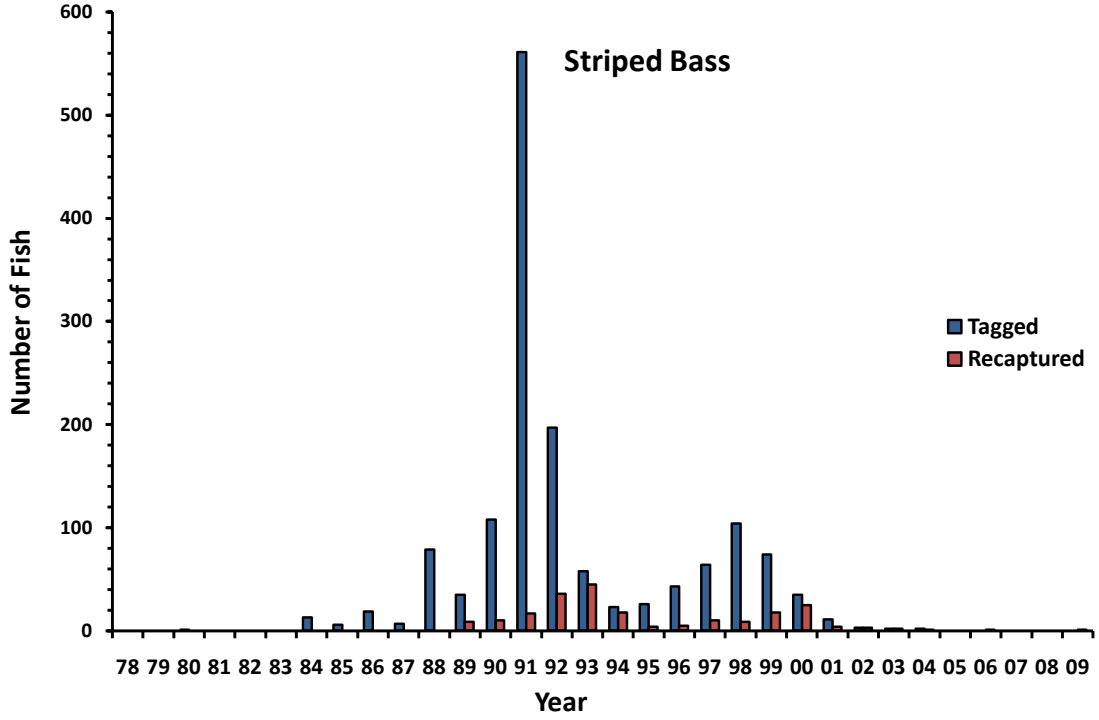
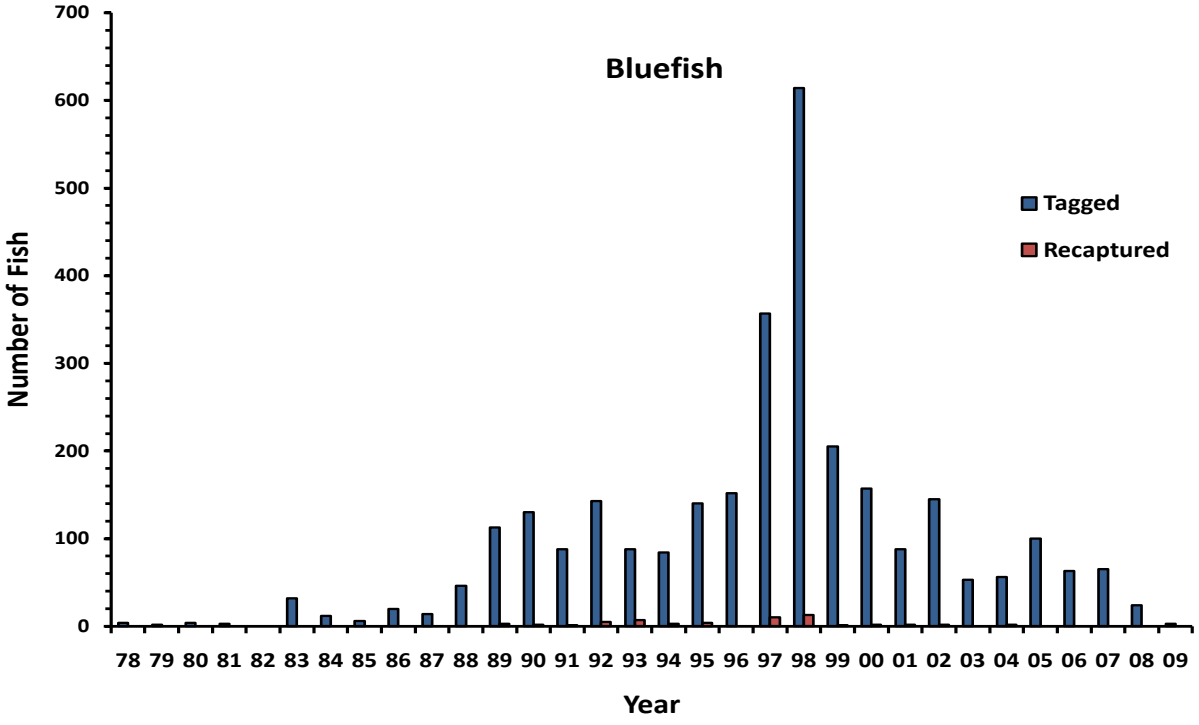


Figure 8. Number of bluefish tagged and recaptured annually.



Cobia

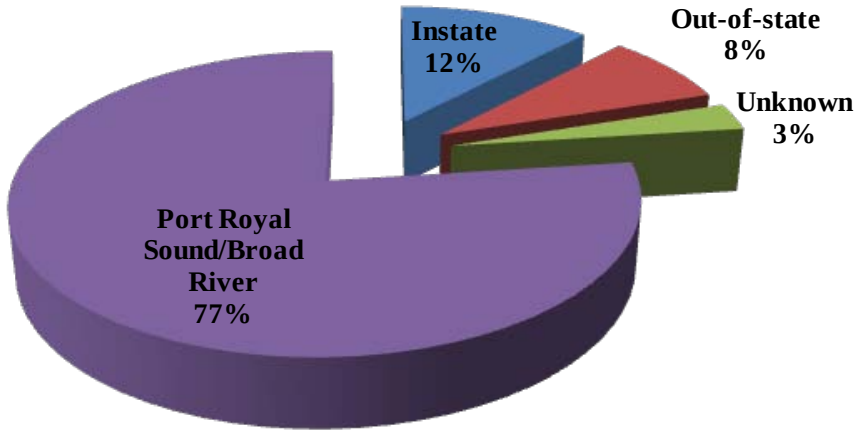
Rachycentron canadum

Between 1986 and 2009, anglers tagged and released 1,066 cobia and of those, 201 were recaptured (Figure 9). Average time at liberty was 365 days and ranged from 1 to 2,371 days. Recaptures of cobia initially tagged in South Carolina support a spring to summer, northern migration and a fall to winter southern migration. This pattern is typical for coastal migratory species.

About 18% of cobia tagging occurred in states other than South Carolina, including Florida, Georgia, and North Carolina. In South Carolina, the majority of cobia tagging (80%) occurred in Beaufort County primarily during the months of May and June, which coincides with the peak of the recreational cobia season.

South Carolina was the initial tagging location for 93% of the recaptures where initial tag information was provided (23 recaptures had no associated initial tag information). More specifically, 142 recovered cobia were fish initially tagged in the Broad River and Port Royal Sound (BR/PRS). Seventy-seven percent (77%) of those exhibited site fidelity and were at liberty for an average of 301 days.

Figure 10. Distribution of recapture sites for cobia tagged in the Broad River and Port Royal Sound areas (n=142).

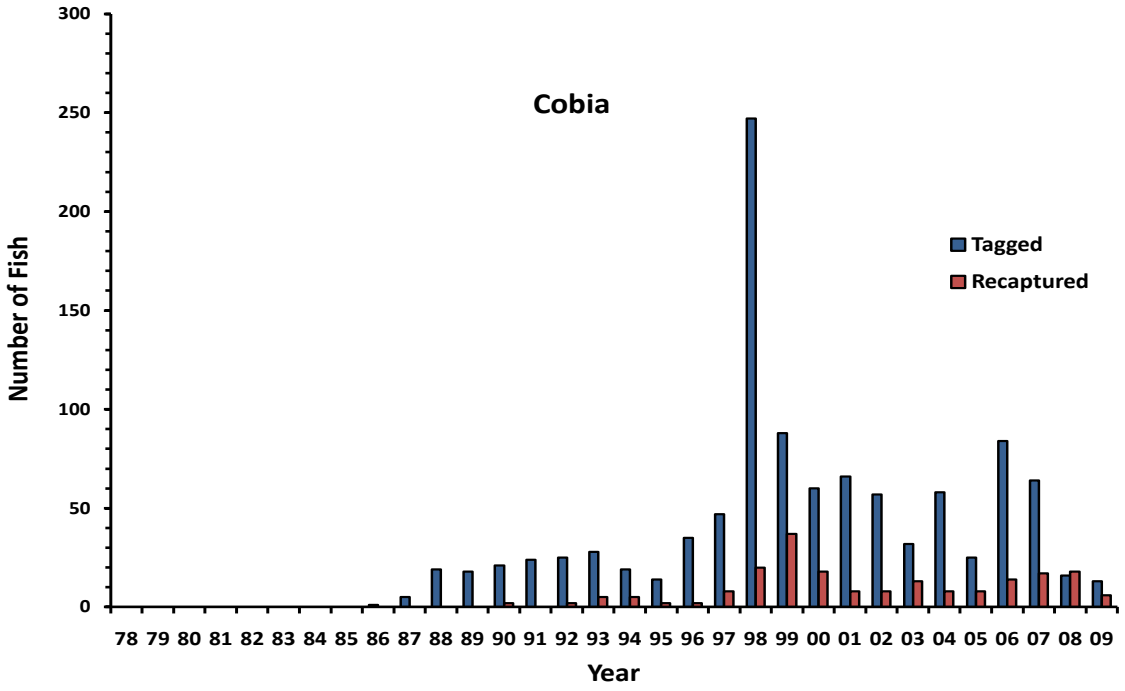


There appears to be some mixing of cobia stocks between the South Atlantic and Gulf of Mexico and several cobia tagged in the South Atlantic were recaptured in the Gulf (Table 4). In addition, there have been other notable recoveries of cobia including a fish tagged off Sebastian Inlet, Florida that was recovered 456 days later off Manasquan, New Jersey; a distance traveled of approximately 931 miles. Another cobia tagged in 1994 near Fort Pulaski, Savannah River, Georgia was recovered off Frying Pan Shoals, North Carolina in 2001 (2,371 days out; approx. 224 miles).

Table 4. Tagged cobia from the MGFTP recovered in the Gulf of Mexico.

Tagging Date	Location	Recapture Date	Location	Days Out
6/27/1990	Off Charleston, SC	4/21/1992	Horn Island, LA	664
6/1/1991	Broad River Bridge, SC	6/10/1993	Off Florida Gulf Coast	740
2/19/1996	Offshore Sebastian Inlet, FL	4/21/1998	Off Florida Gulf Coast	792
12/12/2000	Offshore Sebastian Inlet, FL	6/22/2003	Offshore Alabama	922
3/21/2004	Offshore Stuart, FL	5/27/2005	Offshore Mississippi	432
Missing Initial Tag Card		4/21/2001	Offshore Destin, FL	N/A

Figure 9. Number of cobia tagged and recaptured annually.



Spiny Dogfish
Squalus acanthias

Participating anglers tagged 132 spiny dogfish between 1982 and 2009, of which 6 have been recaptured (Figure 11). The average time at liberty was 186 days and ranged from 35 to 488 days. One spiny dogfish initially tagged on 3/14/2008 at the Edisto Inshore Reef was recaptured 488 days later off Massachusetts (approx. 946 miles).

Dolphin
Coryphaena hippurus

Anglers tagged 960 dolphin between 1986 and 2009. There were 17 reported recaptures (Figure 12). Average time at liberty was 48 days and ranged from 8 to 197 days (Table 5).

Recaptures represent mostly small fish (> 36 inches). Because dolphin are a short lived species (maximum age less than 5 years), it would be unlikely to have any long term recoveries.

Figure 11. Number of spiny dogfish tagged and recaptured annually.

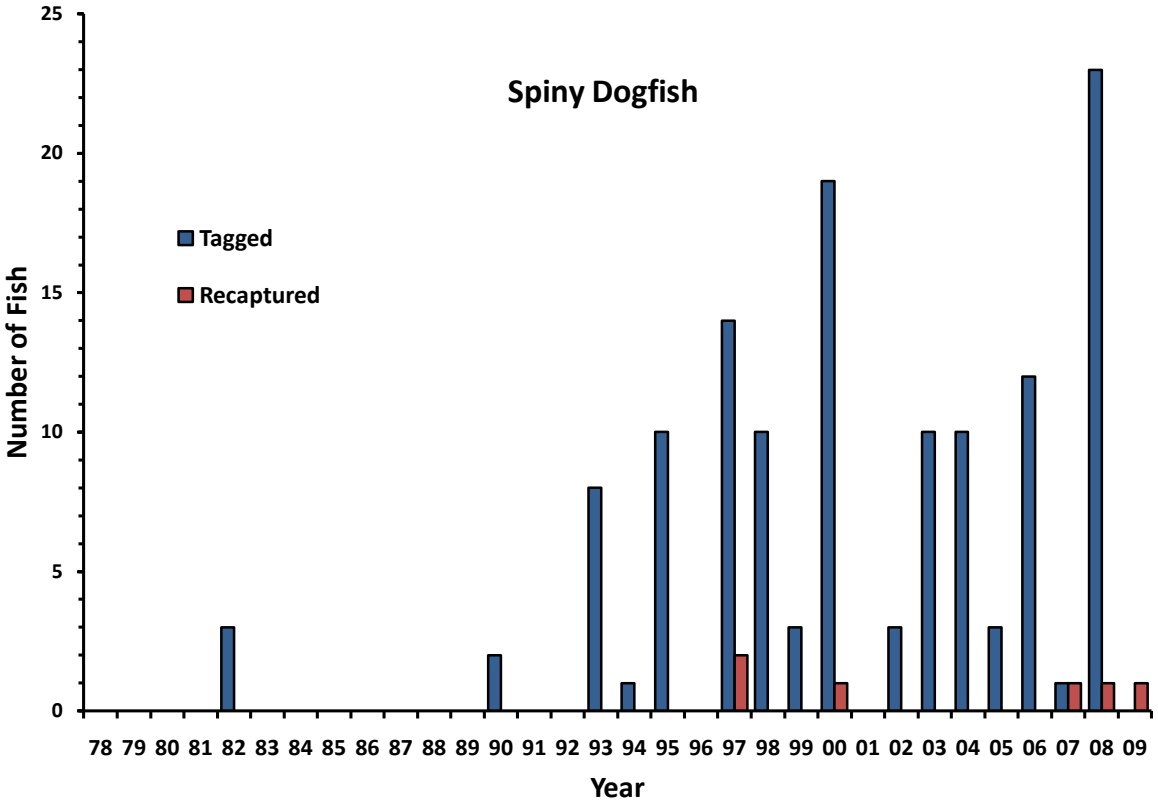
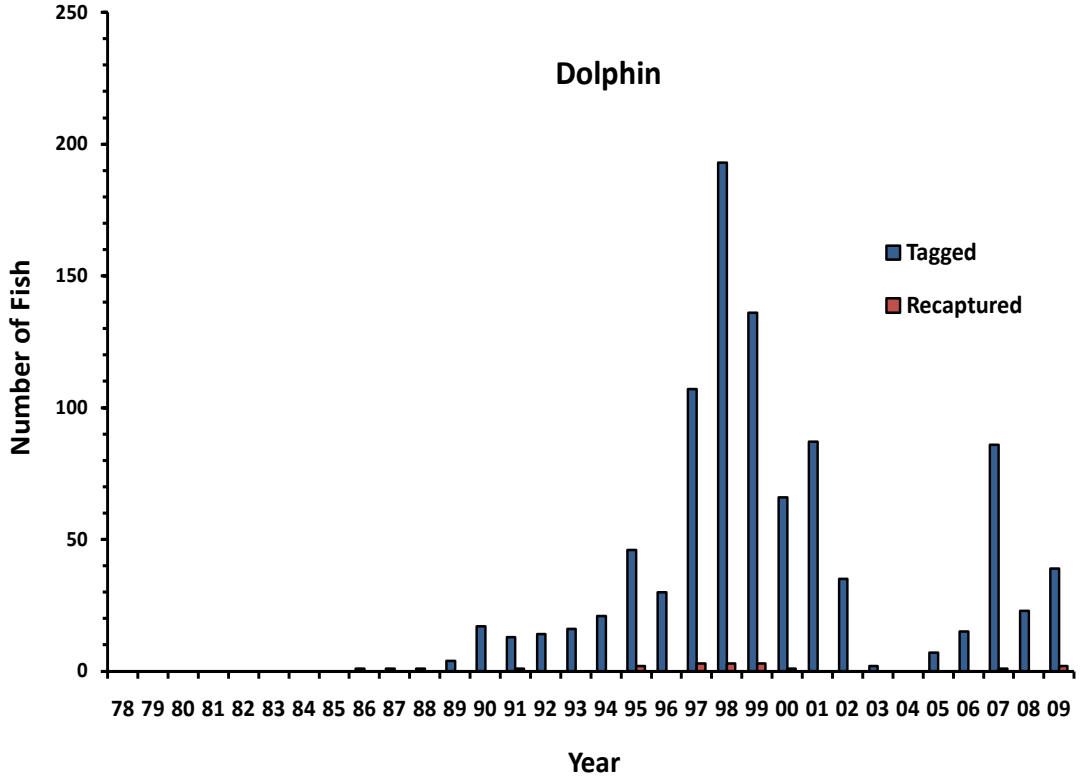


Table 5. Tagged dolphin recoveries from the MGFTP.

Tagging Date	Location (Offshore)	Recapture Date	Location (Offshore)	Days Out
12/14/1990	Stuart, FL	2/19/1991	Jupiter, FL	67
8/27/1994	Charleston, SC	3/12/1995	New Smyrna, FL	197
7/1/1995	226 Hole, SC	7/25/1995	Cape Hatteras, NC	24
5/17/1997	Capers Reef, SC	6/21/1997	Cape Lookout, NC	35
5/30/1997	Charleston, SC	7/7/1997	Morehead City, NC	38
5/30/1997	Charleston, SC	7/14/1997	Oregon Inlet, NC	45
5/1/1998	Georgetown, SC	7/27/1998	Cape Hatteras, NC	87
5/22/1998	Georgetown Hole, SC	6/20/1998	Morehead City, NC	29
6/12/1998	Georgetown, SC	7/1/1998	Diamond Shoals Light, NC	19
5/8/1999	Georgetown Hole, SC	8/15/1999	Long Island, NY	99
5/21/1999	Georgetown Hole, SC	5/29/1999	Georgetown Hole, SC	8
7/10/1999	Charleston, SC	7/24/1999	Cape Hatteras, NC	14
7/27/1999	Charleston, SC	8/8/1999	Cape Hatteras, NC	12
5/20/2007	Charleston, SC	6/8/2007	Ocracoke, NC	19
6/4/2009	Southwest Banks, SC	8/7/2009	North Carolina (non specific)	64
6/21/2009	Port St. Lucie, FL	6/30/2009	Stuart, FL	9
No Initial Tag Card		7/3/2000	Holden Beach, NC	

Figure 12. Number of dolphin tagged and recaptured annually.



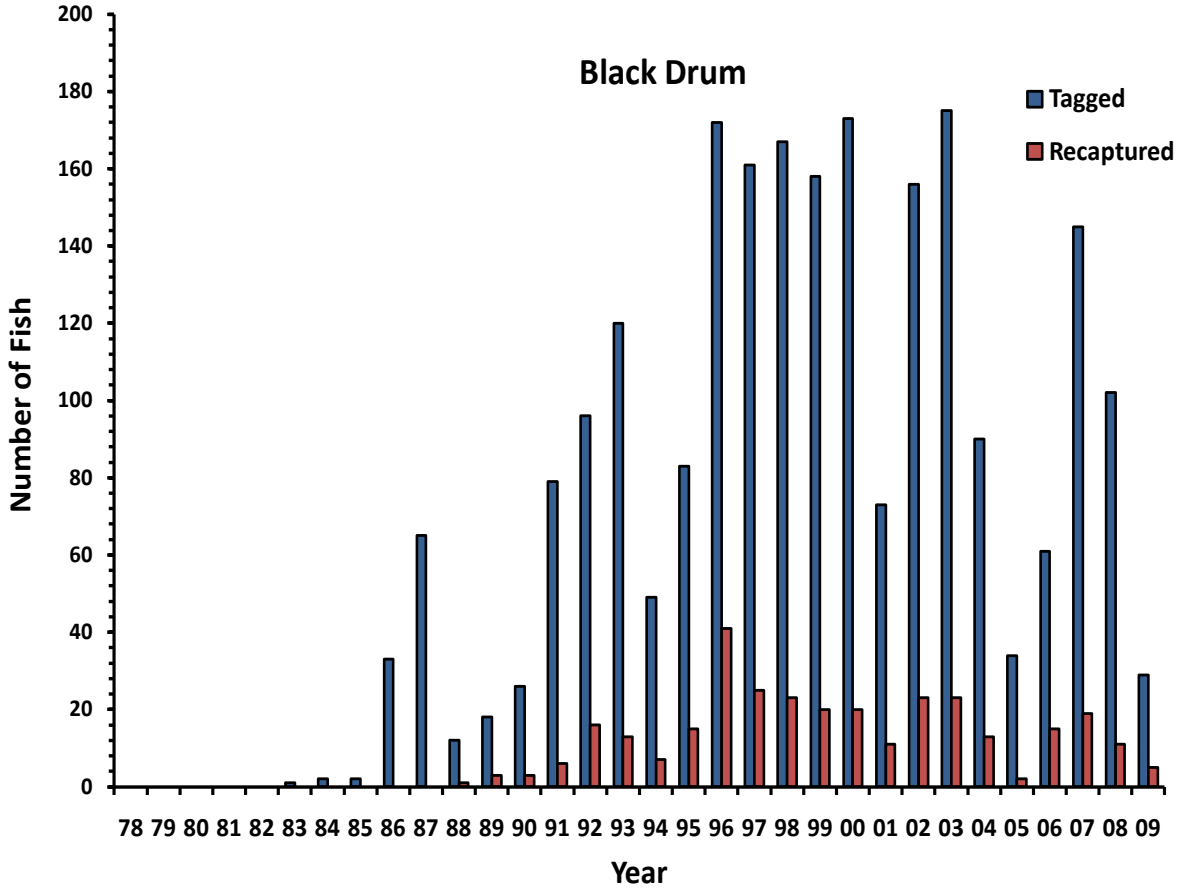
Black Drum
Pogonias cromis

Anglers tagged 2,282 black drum between 1983 and 2009. There were 315 recoveries of tagged black drum (Figure 13). Average time at liberty was 107 days and ranged from 1 to 1,181 days. Although the majority (97%) of recaptures occurred fairly close to the initial tagging locale, there were several instances where fish tagged in South Carolina were recovered in other states (Table 6).

Table 6. Tagged black drum recovered outside South Carolina.

Tagging Date	Location (South Carolina)	Recapture Date	Location	Days Out	Approx. Distance (miles)
7/31/1993	Little River	8/19/1993	Sunset Beach, NC	19	6
6/15/1995	Little River	7/3/1996	Holden Beach, NC	384	18
6/24/1995	Little River	8/5/1995	Ocean Isle Beach, NC	42	11
12/11/1996	Hamlin Creek/Grey Bay	5/3/1997	Morehead City, NC	143	225
9/1/1997	Crabhaul Creek; Bly Creek	5/15/1998	New River, Sneads Ferry, NC	256	136
7/2/1998	Little River	5/20/1999	New River, Sneads Ferry, NC	322	98
4/26/2000	Dewees Island	6/23/2001	Manns Harbor, Outer Banks, NC	423	157
11/9/2000	Pritchards Inlet	12/1/2000	Mayport, FL	22	139
11/24/2002	Georgetown/Winyah Jetties (North Jetties)	1/11/2003	Nassau Sound, FL	48	234
8/1/2003	Georgetown/Winyah Jetties (North Jetties)	2/10/2004	Sebastian Inlet, FL	193	381

Figure 13. Number of black drum tagged and recaptured annually.



Flounder
Paralichthys sp.

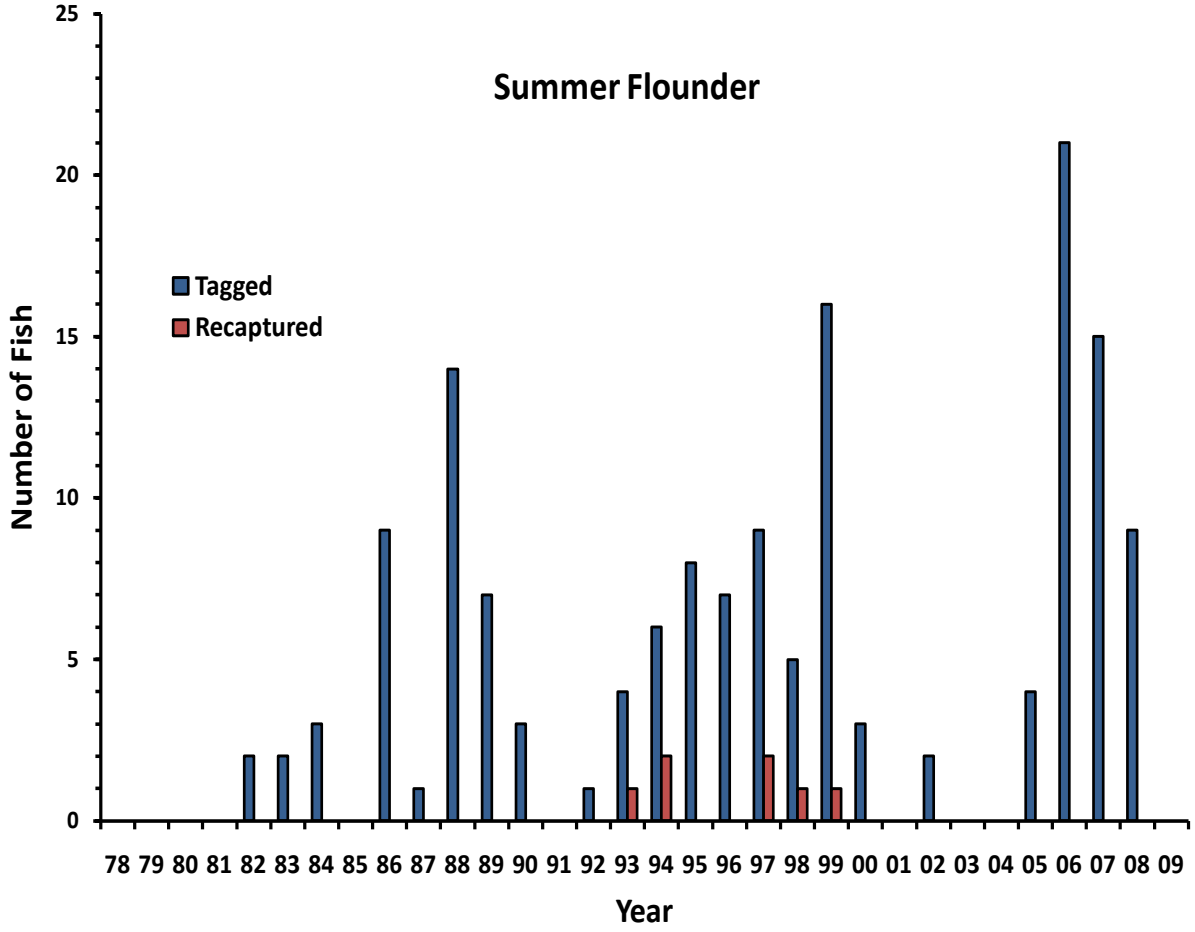
Anglers tagged 5,364 flounder including both summer flounder (*Paralichthys dentatus*) and southern flounder (*Paralichthys lethostigma*) between 1979 and 2009. One hundred fifty one (151) and 751 of these species were tagged respectively (Figures 14 A and B). However, for the majority (83%) of initial tag events reported, anglers did not specify the species of flounder being tagged. Of the three species of flounder found in South Carolina inshore waters, the Gulf flounder (*Paralichthys albigutta*) is the least abundant while the southern flounder is the most abundant (Wenner, 2005). For this reason, it is believed that most of the tagged flounder that were not identified to species were probably southern flounder. Of the 4,462 flounder (species not identified) tagged, 375 were recovered (Figure 14 C). Average time at liberty was 91 days and ranged from 1 to 1,834 days. Where southern flounder was identified, there were 51 recoveries with an average time at liberty of 105 days and ranged from 3 to 590 days. Seven of the 151 summer flounder were recovered with an average time at liberty of 80 days and a range of 10 to 230 days. There were a number of instances where flounder showed significant movement (Table 7).

Table 7. Tagged flounder (species not identified) recovered outside South Carolina.

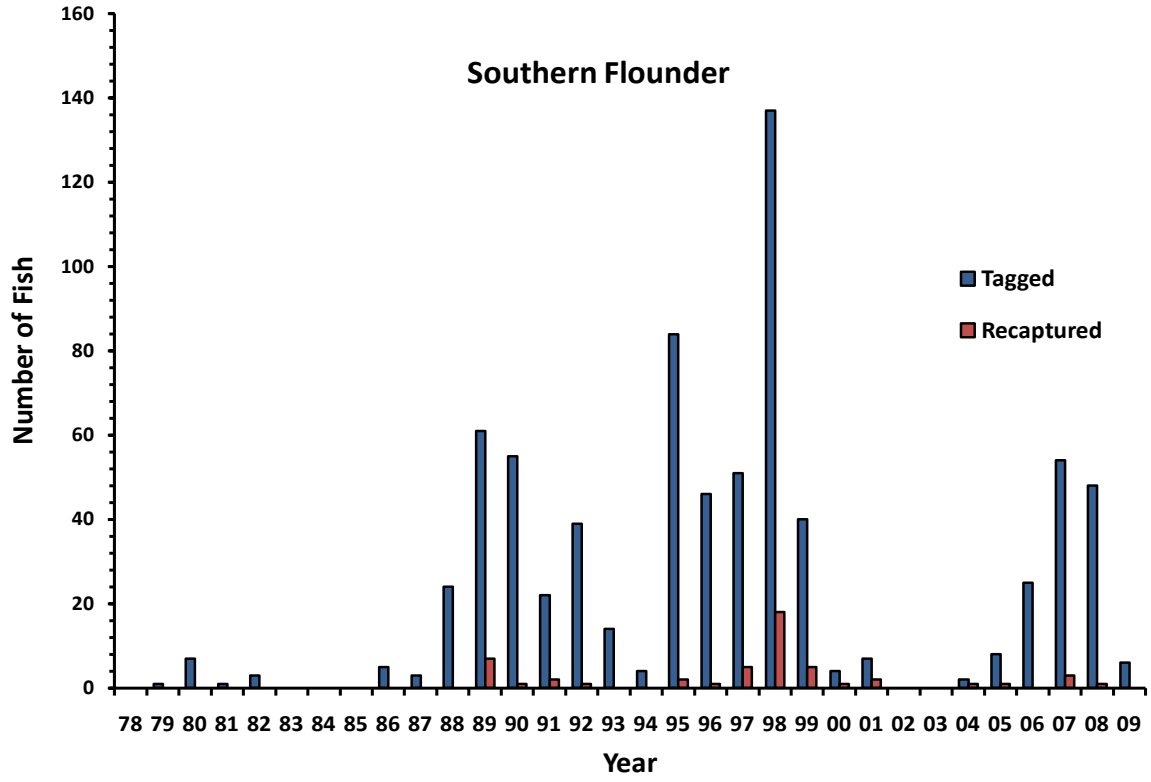
Tagging Date	Location (South Carolina)	Recapture Date	Location	Days Out	Approx. Distance (miles)
8/7/1991	Bass Creek, Kiawah Island	6/13/1992	Bath, NC	311	354
9/16/1991	SW Area Sullivans Island	7/4/1992	Jekyll Island Pier, GA	292	152
8/30/1992	Yellowhouse Creek, Cooper River	6/14/1994	Hillsboro Inlet, FL	653	510
5/28/1993	Bohicket Creek	1/13/1994	New Smyrna Beach, FL	230	274
8/15/1993	Murrells Inlet	7/11/1994	Daytona Beach, FL	330	350
11/7/1993	Charleston Harbor	6/18/1994	St. Augustine, FL	223	205
8/1/1995	Wando River (Middle area)	11/11/1997	Townsend, GA	833	127
4/11/1996	Cooper River at Bushy Park	10/20/1996	Cape Canaveral, FL	192	340
7/28/2000	Skull Inlet/Fripp/Pritchard Island	6/16/2001	Palm Beach, FL	323	410

Figure 14. Number of summer, southern flounder and unidentified species of flounder tagged and recaptured annually.

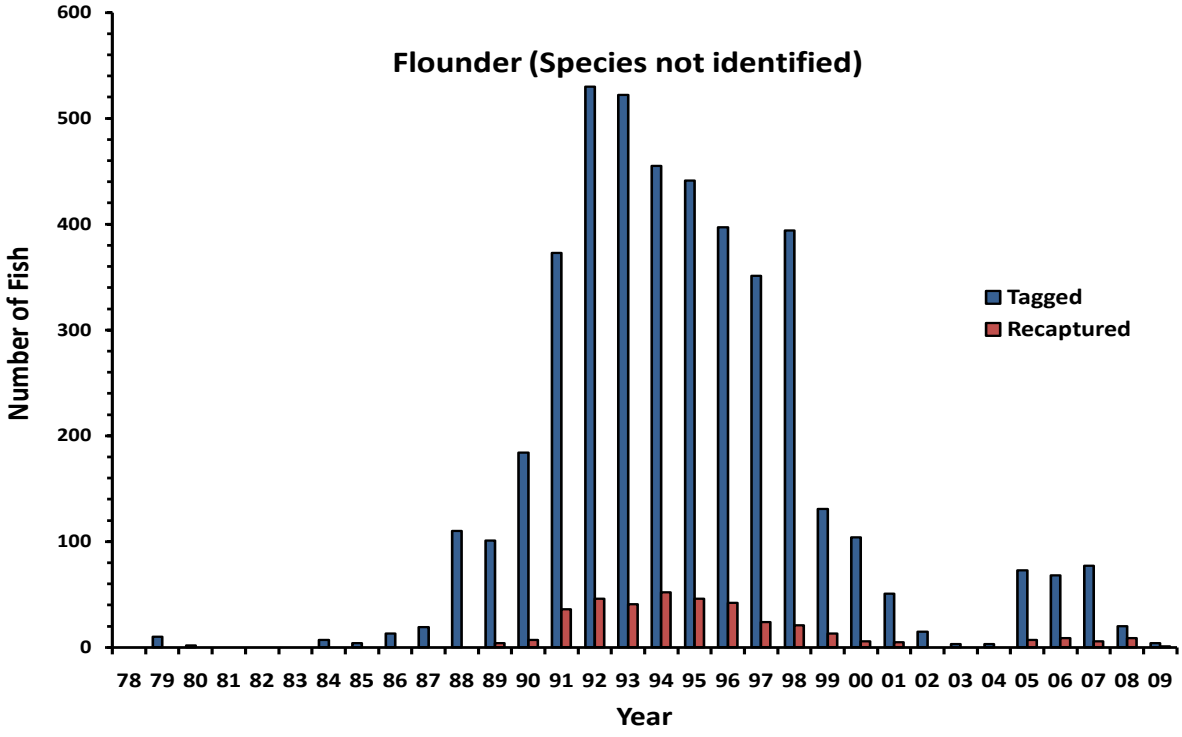
A.



B.


Southern Flounder
Number of Fish
Year
Tagged
Recaptured
0
20
40
60
80
100
120
140
160
78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09

C.

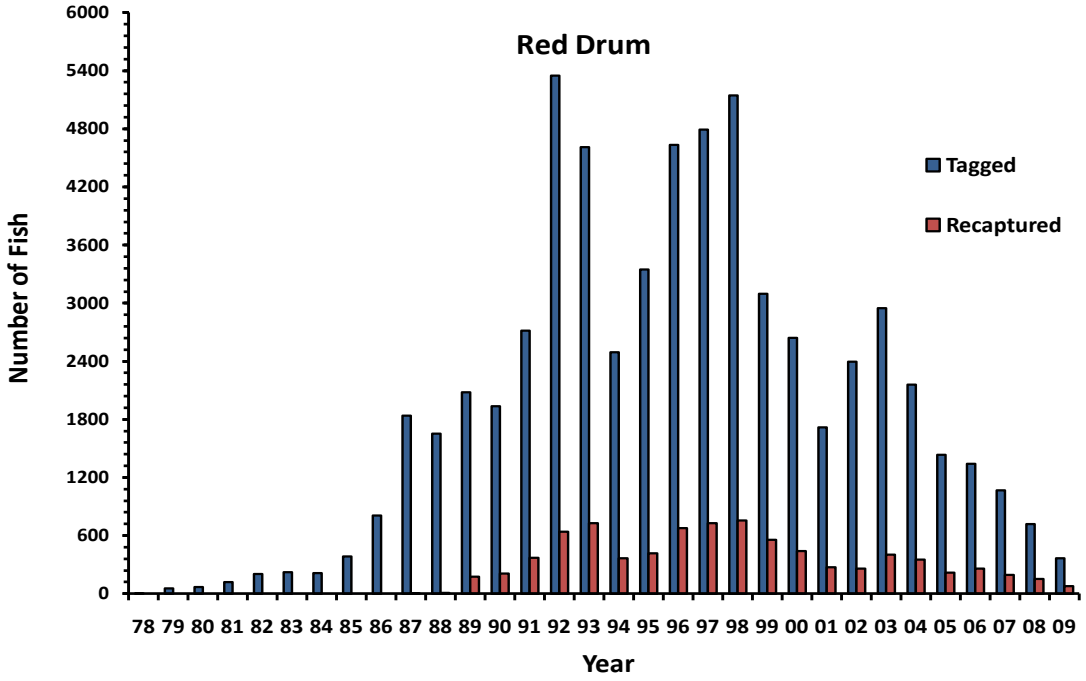

Flounder (Species not identified)
Number of Fish
Year
Tagged
Recaptured
0
100
200
300
400
500
600
78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09

Red Drum

Scianops ocellatus

Red drum constitutes the bulk of tagging activity and accounted for 46% of the total fish tagged in the MGFTP. Between 1978 and 2009, anglers tagged 62,550 red drum, and there were 8,264 recoveries (Figure 15). About 9% of reported recoveries had no associated initial tag information, and in these cases, analysis was not possible. Time at liberty ranged from 0 to 4,388 days with a mean of 190 days.

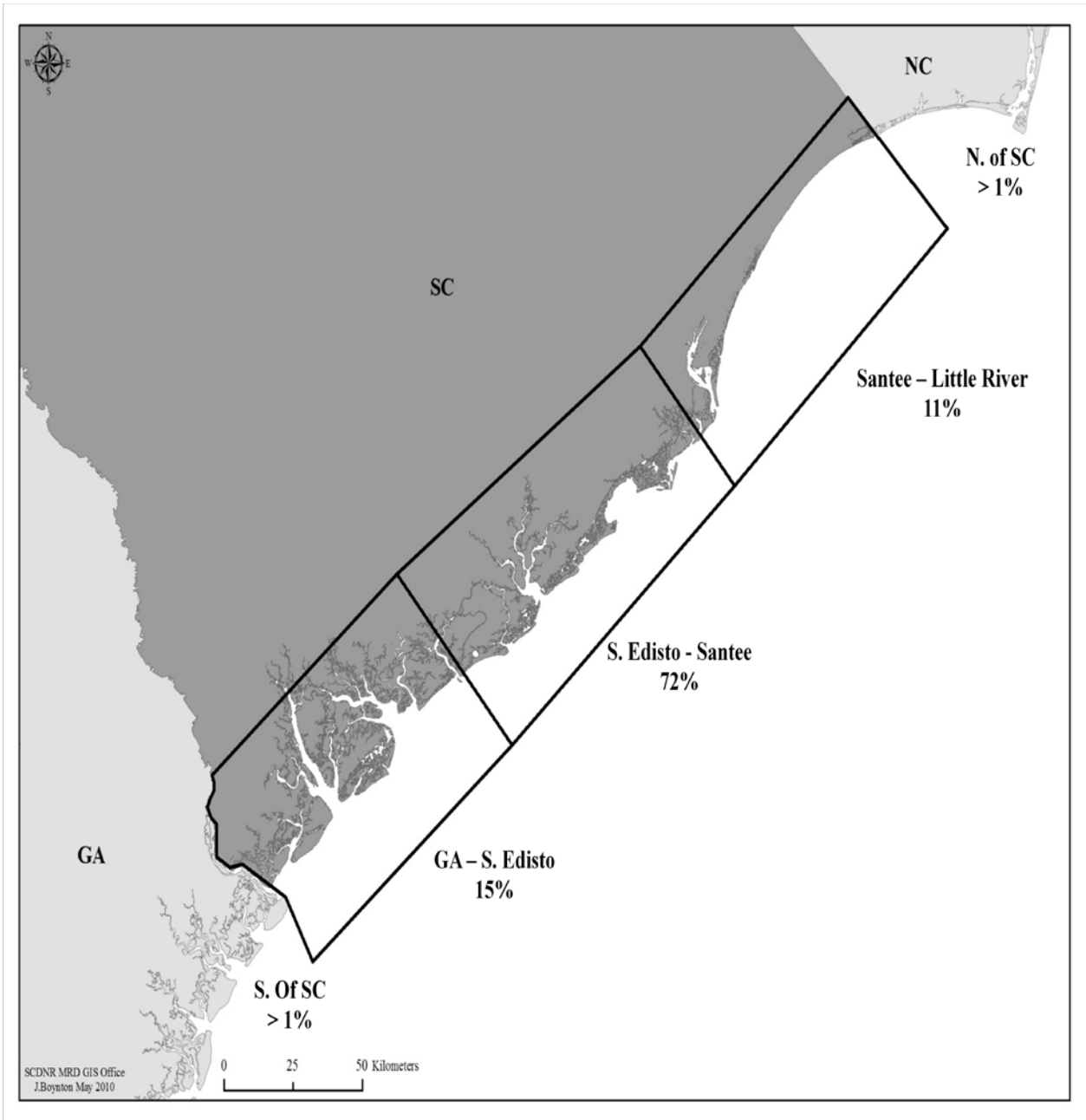
Figure 15. Number of red drum tagged and recaptured annually.



Red drum was designated as a game fish in South Carolina in 1987 and a bag limit of 20 fish per day with one fish greater than 32 inches was implemented. Possibly as a result, the idea of tagging and releasing became an appealing option to recreational anglers, and tagging activity increased dramatically over the coming years. In 1991, the bag limit was reduced to 5 fish per day with a slot limit between 14 and 32 inches. One fish greater than 32 inches could still be retained. The following year (1992) tagging activity peaked at an all time high as more and more anglers became involved in the program. In 1993, anglers tagging red drum were asked to concentrate their efforts on fish over 18 inches, and to not place tags in any fish under that size. As a result, red drum tagging declined dramatically in 1994, despite the fact that private boat catches of red drum indicated that anglers were releasing close to 80% of the red drum they caught (Low, 1999). More than likely, fluctuations in the number of red drum tagged and released annually were related to the level of participant activity, rather than species abundance. Participation would begin with a period of very active tagging after which the volunteer became inactive or focused on other species.

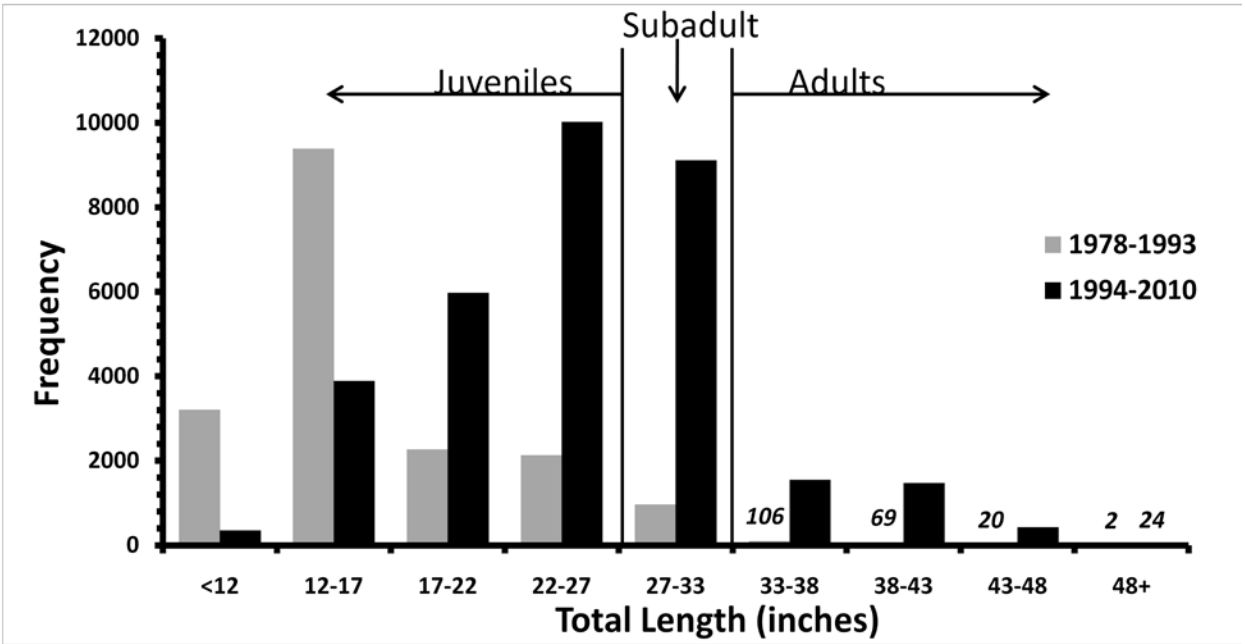
Overall, the tagging effort for red drum is representative of the marine recreational fishery in South Carolina, where the majority of anglers fish inshore targeting red drum, spotted seatrout, and flounder. Among the three, red drum is considered to be the most popular (Responsive Management, 2006). The level of volunteer participation and the availability of estuarine habitat in a given area were the primary factors that influenced tagging activity of red drum. Along the South Carolina coast, the majority of red drum tagged and released by cooperating anglers was greatest between the Edisto and Santee Rivers (Figure 16).

Figure 16. Percent of red drum tagged in South Carolina by region.



Anglers recording size on the initial tag event reported taking a length measurement (as opposed to estimating the length) for 82% of red drum tagged and released. Approximately 94% of red drum tagged were juveniles (birth to 3 years; approx. ½ to 27 inches respectively) or sub-adults (3-5 years; approx. 27-33 inches respectively), and of those the most frequently tagged size was from 22 to 27 inches (Figure 17). Only 7% of tagged red drum were less than 12 inches (requested minimum size for tagging), and the majority of those were tagged prior to 1994. Because adult red drum (fish usually larger than 33 inches) are typically concentrated offshore, they are targeted less frequently by anglers fishing from small boats, and as a result, very few adult fish were tagged and released.

Figure 17. Length frequency characterization of tagged and released red drum (N = 51,291).



Seventy-eight percent (78%) of the recaptures of tagged red drum occurred within one year of the initial tag event and only 2.5% were at liberty for more than 2 years (Figure 18). The longest time at liberty (approximately 12 years) for a red drum tagged in the MGFTP was a 15-inch fish initially tagged on 5/5/1989 in Flag Creek (Cooper River) and was recaptured on 5/10/2001 near Plum Island off Charleston Harbor and was measured at 30.25 inches. This also represents the longest time at liberty of any species tagged in the MGFTP. However, the most notable red drum recapture documented in the program occurred in 2003. On 8/15/2003, a 41-inch tagged red drum was recovered in Raritan Bay, New Jersey. Initial tag information revealed the fish, which was around 12 inches at the time, and had been tagged on 9/23/1991 near Ft. Johnson off Charleston Harbor, S.C. (Days out: 4,344 days, Approx. distance traveled: 700 miles).

Multiple recaptures of tagged red drum are somewhat uncommon, but there were five documented cases where tagged red drum had been recaptured six times (Table 8). Only 7% of reported red drum recaptures were fish that had been caught 3 or more times, including the initial

tag and release. Because multiple recaptures provide numerous data points (hence the reason for asking people to release recaptured tagged fish with the tag still intact) a more accurate picture of movement and growth trends can often be determined.

Movement of juvenile and sub-adult red drum is mostly confined to the estuary. However, and for reasons unknown, there are instances where these fish will re-locate to an adjacent estuarine system. Distance traveled (straight line) of fish recaptured multiple times ranged from 2.1 nm (3.88 km) to 143.1 nm (265 km) and averaged 9.2 nm (17.03 km) (Figure 19).

Figure 18. Number of red drum recoveries by days at large.

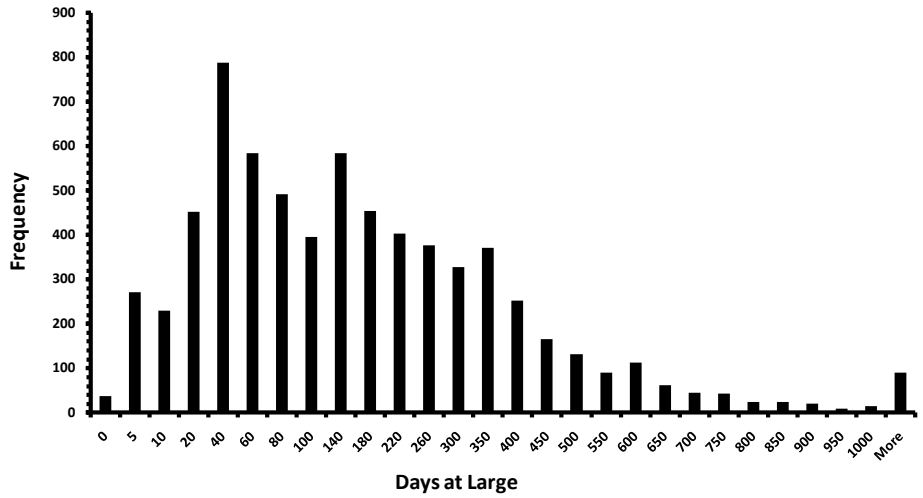
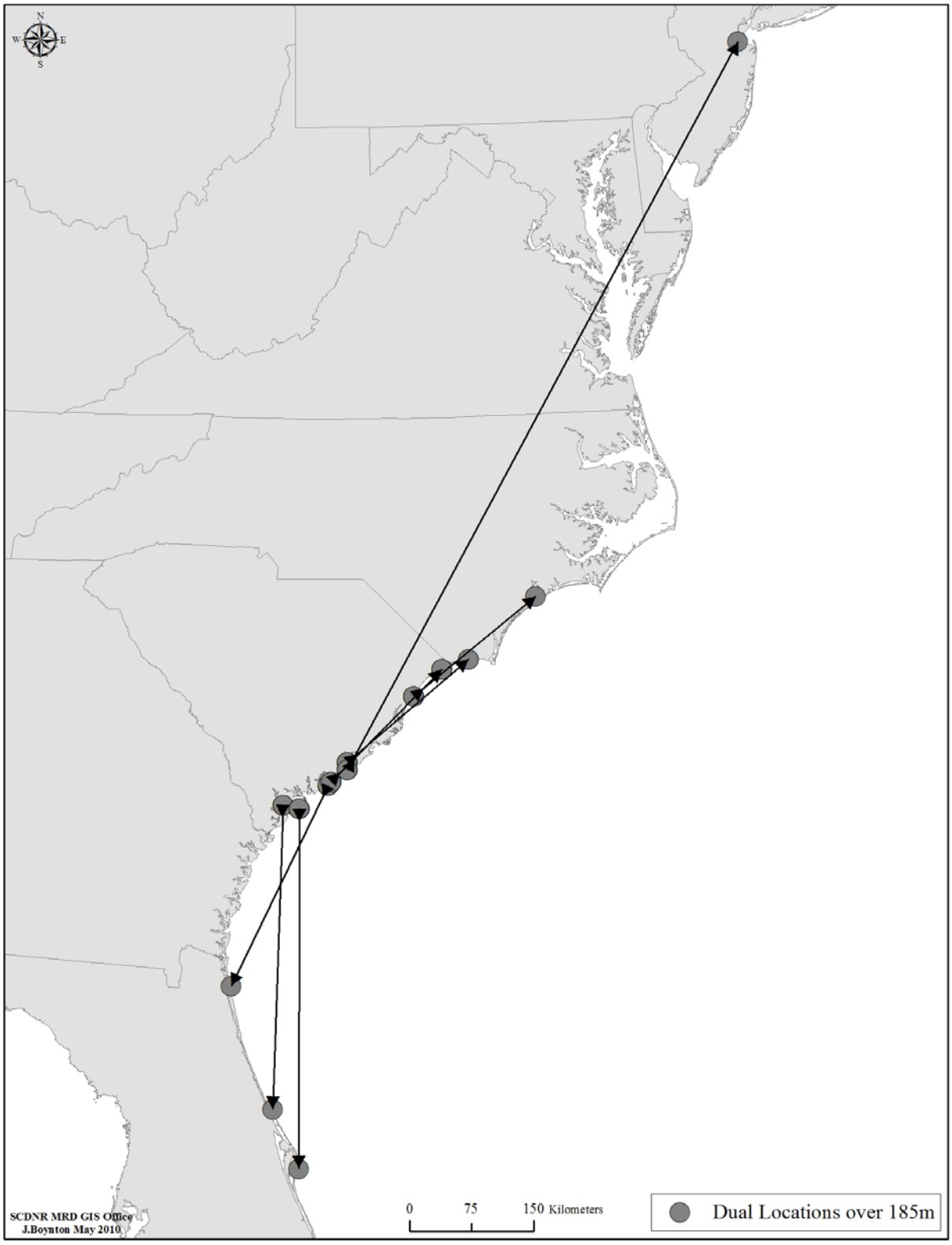


Table 8. Tagged red drum with 6 recapture occurrences.

Tagging Length (Inches)	Tagging Date	Locality Name	Recapture Length (Inches)	Recapture Date	Locality Name	Days Out
12	8/28/1990	Grice Cove/Ft. Johnson	13.3	9/19/1990	Grice Cove/Ft. Johnson	22
			14	10/27/1990	Grice Cove/Ft. Johnson	60
			15.5	1/29/1991	Grice Cove/Ft. Johnson	154
			20	7/8/1991	Grice Cove/Ft. Johnson	314
			23.5	1/16/1992	Grice Cove/Ft. Johnson	506
			28	1/22/1993	Grice Cove/Ft. Johnson	878
22.5	7/23/1994	Charleston Harbor (Non Specific)	22.5	1/19/1995	Charleston Harbor (Non Specific)	180
			25.9	4/17/1996	Plum Island/ Dill Creek/ Mill Creek/ James Island Creek mouth	634
			26.8	7/2/1996	Plum Island/ Dill Creek/ Mill Creek/ James Island Creek mouth	710
			28	10/10/1996	Plum Island/ Dill Creek/ Mill Creek/ James Island Creek mouth	810
			28.8	2/3/1997	Plum Island/ Dill Creek/ Mill Creek/ James Island Creek mouth	926
			28.9	2/12/1997	Plum Island/ Dill Creek/ Mill Creek/ James Island Creek mouth	935
18	6/28/1996	Grice Cove/Ft. Johnson	21	10/9/1996	Grice Cove/Ft. Johnson	103
			20	1/3/1997	Grice Cove/Ft. Johnson	189
			26.3	2/10/1998	Grice Cove/Ft. Johnson	592
			26.3	5/22/1998	Grice Cove/Ft. Johnson	693
			29	10/4/1998	Grice Cove/Ft. Johnson	828
			29	10/7/1998	Grice Cove/Ft. Johnson	831
30	4/9/2007	NW Area of Sullivans Island/ Breach Inlet	31.5	10/3/2007	NW Area of Sullivans Island/ Breach Inlet	177
			34	11/25/2007	NW Area of Sullivans Island/ Breach Inlet	230
			34	6/20/2008	NW Area of Sullivans Island/ Breach Inlet	438
			33	9/15/2008	NW Area of Sullivans Island/ Breach Inlet	525
			33	10/9/2008	NW Area of Sullivans Island/ Breach Inlet	549
			34	11/8/2008	NW Area of Sullivans Island/ Breach Inlet	579
30	6/19/2007	Hamlin Creek/ Grey Bay	30	7/26/2007	Hamlin Creek/ Grey Bay	37
			30	8/6/2007	Hamlin Creek/ Grey Bay	48
			28.5	8/27/2007	SW Area of Sullivans Island/ Grillage	69
			31	6/20/2008	NW Area of Sullivans Island/ Breach Inlet	367
			31	9/10/2008	NW Area of Sullivans Island/ Breach Inlet	449
			34	11/8/2008	NW Area of Sullivans Island/ Breach Inlet	508

Figure 19. Movement of red drum > 100 nm (185 km).



Gag Grouper
Mycteroperca microlepis

Between 1983 and 2009 anglers tagged 1,545 gag grouper of which 165 have been recovered (Figure 20). Average time at liberty was 184 days and ranged from 1 to 2,859 days. Recaptures of gag grouper show very little movement from the initial tagging location. Of the 165 recaptures, 30% were fish recaptured on the Hilton Head Reef that were tagged at the same reef. The only tagged gag grouper that showed significant movement was a fish tagged at the Eagles Nest Reef (off Port Royal) on 9/6/1994 that was recovered off Cape Canaveral, FL on 5/6/1998. The approximate distance between these two locations is 271 miles.

Red Grouper
Epinephelus morio

From 1993 to 2009 cooperating anglers tagged 263 red grouper (Figure 21). There were 39 recoveries with an average time at liberty of 274 days and ranged from 4 to 1,341 days. The majority (72%) of red grouper tagged in the MGFTP were tagged off Florida, and subsequent recoveries indicate very little movement.

Warsaw Grouper
Epinephelus nigritus

Between 1994 and 2009 anglers tagged 216 warsaw grouper of which 159 were recaptured (Figure 22). This represents a 74% recapture rate and is the highest of any species recaptured in the MGFTP. The average time at liberty was 192 days and ranged from 7 to 1,211 days. Almost all of the warsaw grouper tagging occurred off Sebastian Inlet, FL and was done by Capt. Ron Rincones. Capt. Rincones recaptured the majority of the fish he tagged and since he was providing GPS coordinates for both the initial tag event and recapture location, we know that most of these fish exhibited strong site fidelity. Tagged fish were typically recovered only a few hundred yards from where they were initially tagged.

Crevalle Jack
Caranx hippos

During 1981 to 2009, 1,311 crevalle jack were tagged and 11 were recaptured (Figure 23). The average time at liberty was 115 days and ranged from 18 to 489 days. There was a southerly movement of tagged fish recovered outside South Carolina (Table 9). Like other coastal migratory species, there is a north to south summer to winter migration respectively. Charleston Harbor is considered a world class crevalle jack fishing destination. These fish, averaging 20-35 pounds, and travelling in schools, can typically be found in the harbor between May and September.

Table 9. Tagged crevalle jack recovered outside South Carolina.

Tagging Date	Location (South Carolina)	Recapture Date	Location	Days Out	Approx. Distance (miles)
9/1/1991	North Inlet, Winyah Bay	10/19/1991	Offshore Melbourne Beach, FL	48	425
6/30/1998	Bay Point, Hilton Head	11/1/1999	Offshore Palm Beach, FL	489	420
8/4/1998	South Beach, Hilton Head	4/7/1999	Offshore St. Augustine, FL	246	159

Figure 20. Number of gag grouper tagged and recaptured annually.

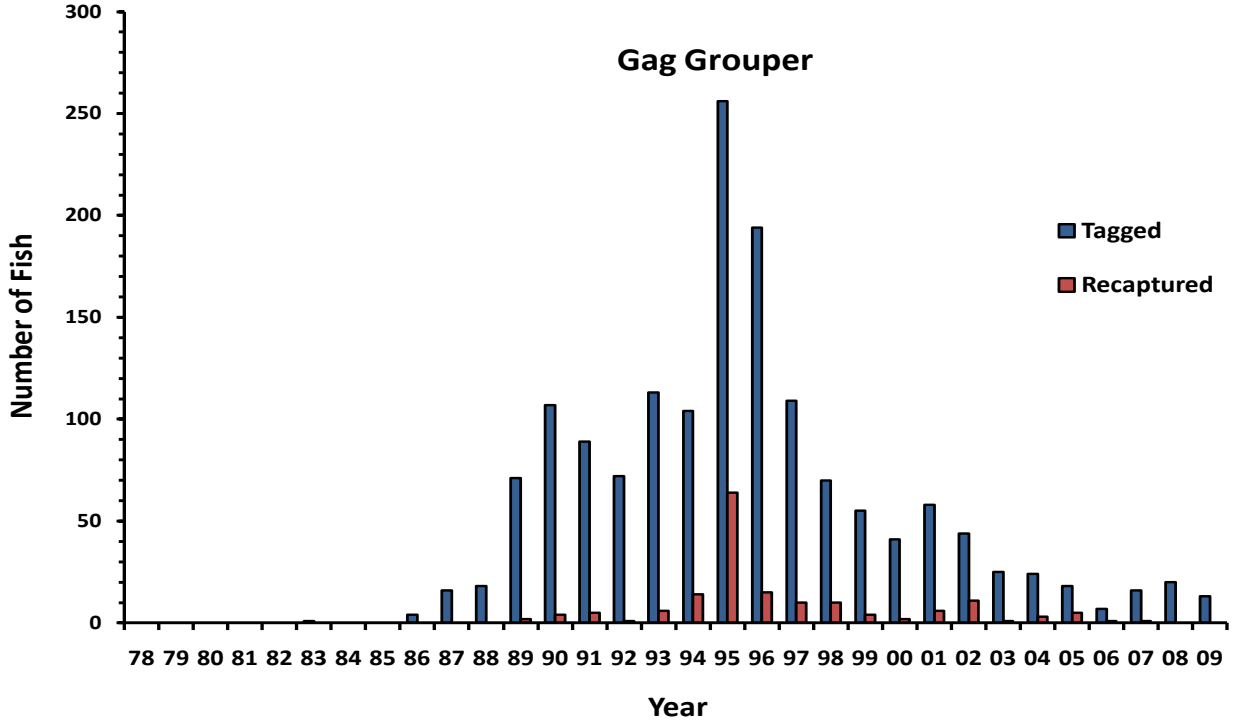


Figure 21. Number of red grouper tagged and recaptured annually.

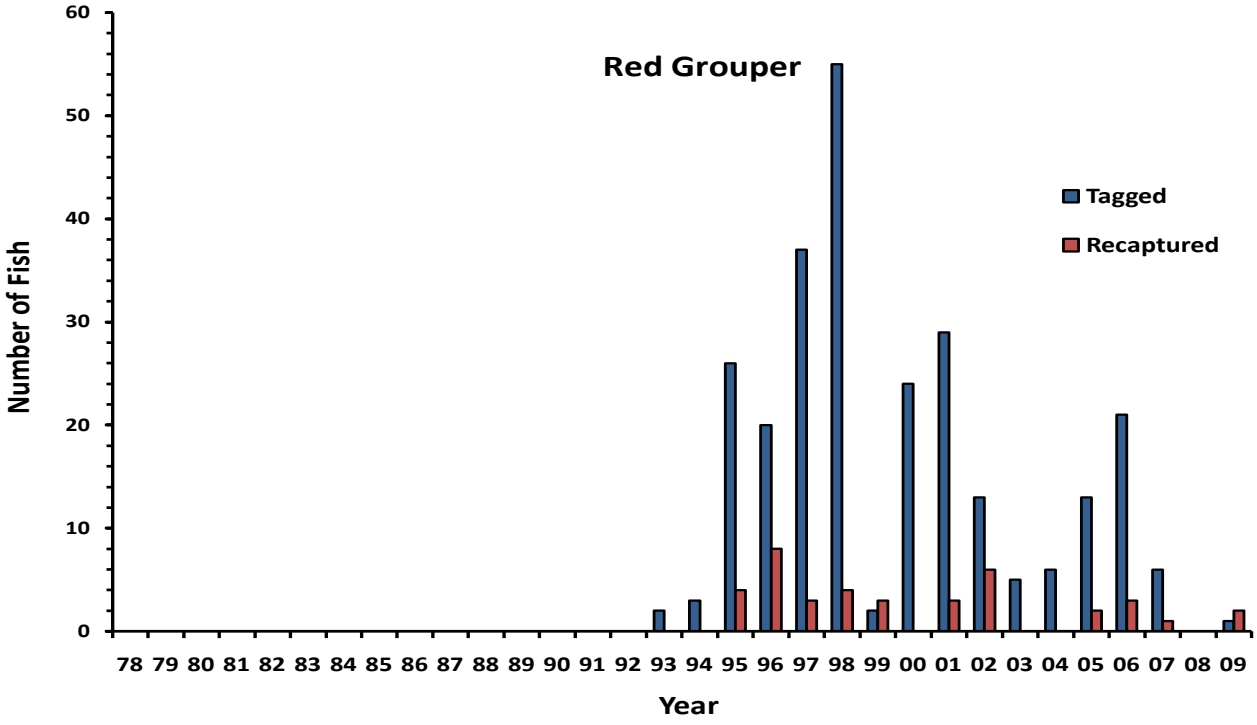


Figure 22. Number of warsaw grouper tagged and recaptured annually.

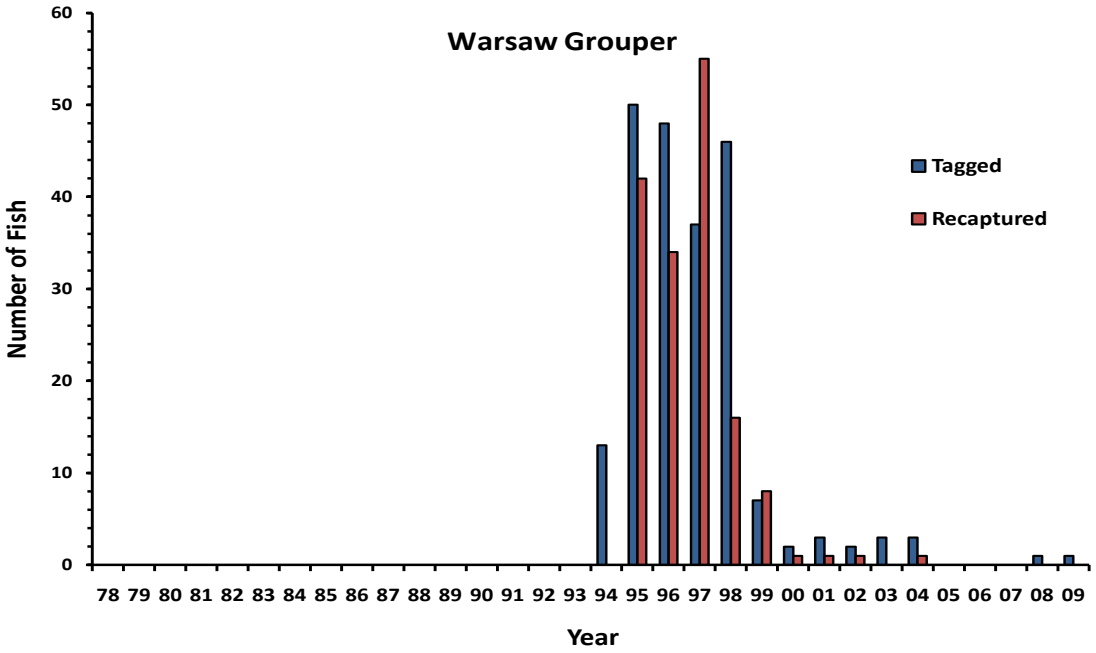
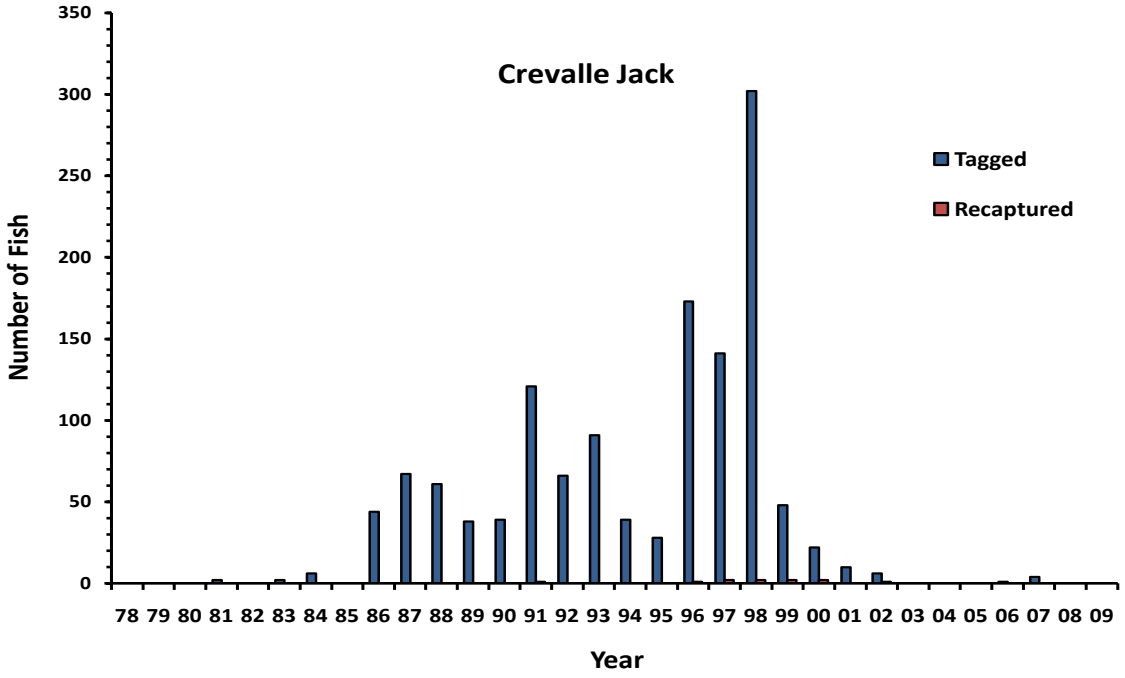


Figure 23. Number of crevalle jack tagged and recaptured annually.



King mackerel

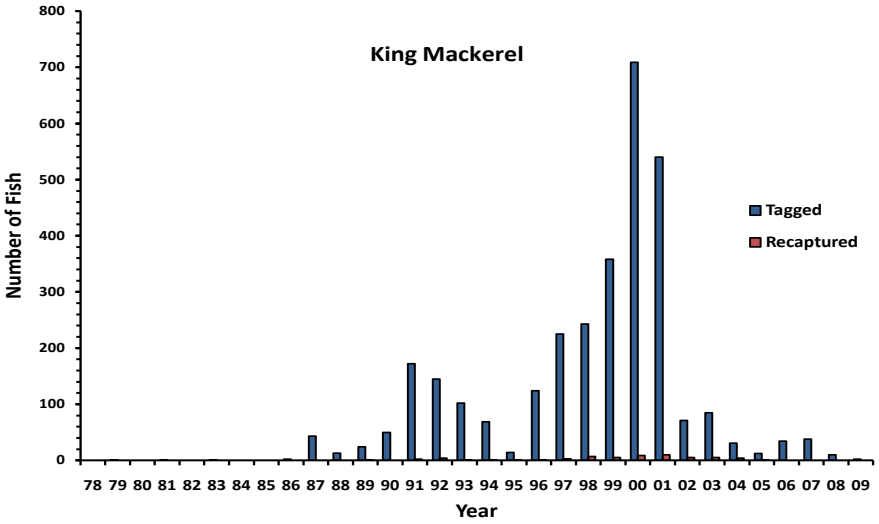
Scomberomorus cavalla

From 1979 to 2009, anglers tagged 3,119 king mackerel and 60 were reported recaptured (Figure 24). Tagging of king mackerel peaked in 2000 and 2001. Forty percent (40%) of all king mackerel tagging occurred over the course of these two years, primarily as a result of promotion through the Governor's Cup King Mackerel Series. A portion of the tournament structure for the series awarded points for king mackerel tagged and released by participants. The series was discontinued in 2002 and as a result tagging of king mackerel fell off dramatically. The recapture rate for king mackerel is around 2%. The average time at liberty was 485 days and ranged from 29 to 2,154 days. Tag and recapture data supports a north south summer winter (respectively) migratory pattern (Table 10). There were no documented recoveries of tagged king mackerel in the Gulf of Mexico.

Table 10. Examples of king mackerel recoveries by month.

Month Tagged	Year	Location	Month Recaptured	Year	Location
August	1991	Off Georgia	May	1992	Offshore Jupiter, FL
August	1991	Off Charleston, SC	June	1992	Off Charleston, SC
August	1991	Off Charleston, SC	December	1992	Off Sebastian Inlet, FL
August	1992	Savannah Shipping Channel, GA	June	1995	Off Sebastian Inlet, FL
August	1996	Savannah Light Tower, GA	June	1998	Off Cape Canaveral, FL
August	1996	Off Charleston, SC	March	1997	Off North Carolina
August	1998	Off Charleston, SC	September	1998	Off North Carolina
August	2001	Off Charleston, SC	March	2002	Off North Carolina
July	1997	Off Edisto, SC	November	1998	Off North Carolina
July	1997	Off Hilton Head, SC	May	1998	Off Palm Beach, FL
June	1998	Off Charleston, SC	May	2004	Off Stuart, FL
June	1999	Off Port Royal, SC	September	1999	Off Palm Beach, FL
June	2000	Off Georgetown, SC	December	2000	Off North Carolina
June	2000	Off Kiawah, SC	June	2001	Off North Carolina
June	2001	Off Charleston, SC	May	2003	Offshore Jupiter, FL
June	2003	Off Georgetown, SC	August	2003	Off North Carolina
May	1993	Off Edisto, SC	August	1993	Off Palm Beach, FL
May	1995	Off Murrells Inlet, SC	May	1996	Off North Carolina
May	1998	Off Charleston, SC	July	2003	Off Miami, FL
May	1998	Off Charleston, SC	July	2001	Off Mayport, FL
May	1999	Off Edisto, SC	May	2003	Off Ft. Pierce, FL
May	1999	Off Edisto, SC	March	2000	Off Sebastian Inlet, FL
May	2001	Off Charleston, SC	November	2001	Off New Smyrna, FL
November	1998	Off Charleston, SC	April	2000	Off North Carolina
October	1998	Off Charleston, SC	July	2000	Off Ponte Vedra, FL
September	2000	Off Charleston, SC	December	2002	Off North Carolina

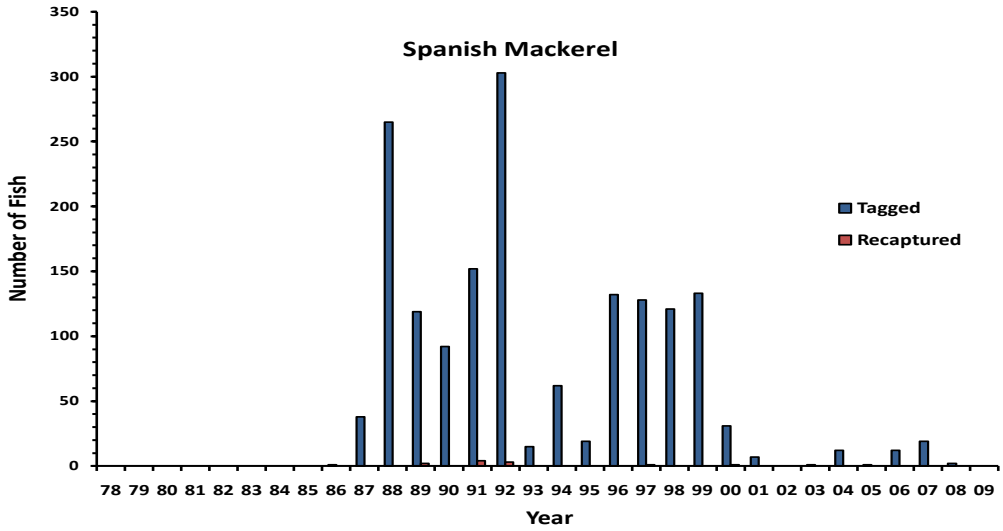
Figure 24. Number of king mackerel tagged and recaptured annually.



Spanish mackerel
Scomberomorus maculates

During 1986 to 2009, participating anglers tagged 1,665 spanish mackerel and 11 were recaptured (Figure 25). Average time at liberty was 73 days and ranged from 4 to 147 days. Five of the 11 recoveries were fish tagged in South Carolina that were subsequently recaptured in North Carolina. One Spanish mackerel tagged in Charleston Harbor on 5/8/1991 traveled approximately 460 miles in little over a month (6/12/1991) before being recaptured in the Chesapeake Bay (Virginia side).

Figure 25. Number of Spanish mackerel tagged and recaptured annually.



Billfish

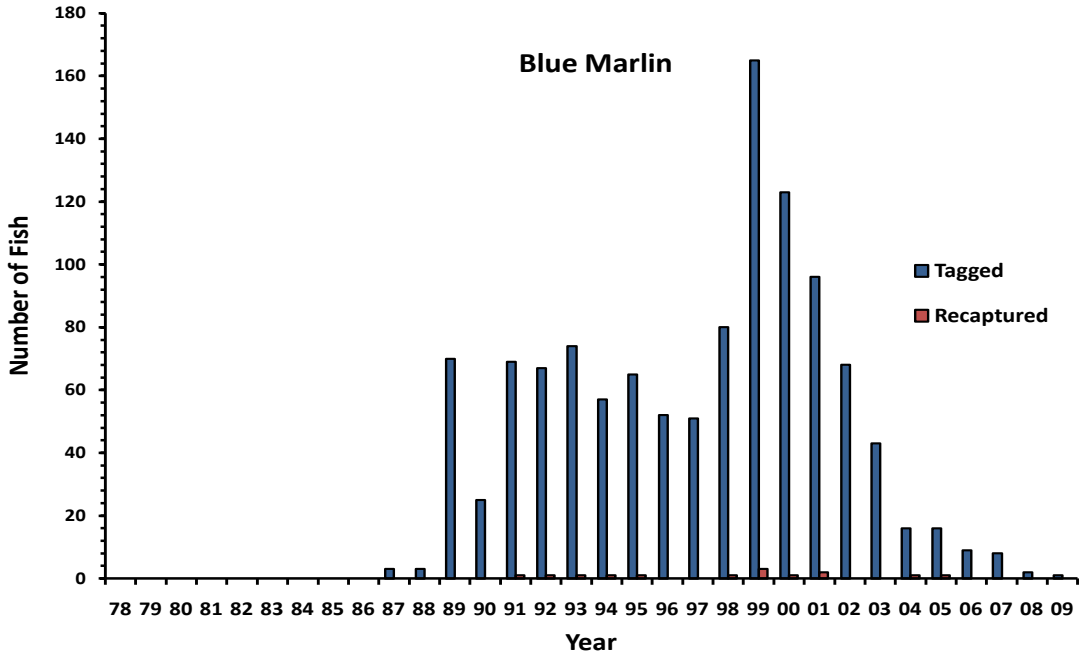
Between 1985 and 2009 1,163 blue marlin, 492 white marlin, and 1,790 sailfish were tagged by anglers and 14, 6 and 21 recoveries were reported respectively (Figure 26 A, B, and C). Tagging of billfish became the foundation for establishing a catch and release ethic among blue water anglers and the practice was promoted in South Carolina through the Governor's Cup Billfish Series which began in 1989. From 1989 to 2002, 30% of billfish tagged in the MGFTP were tagged during Governor's Cup competition. In 2003, it was decided to discontinue billfish tagging as a part of the series points system, and as a result, there was a decline in the number of billfish tagged. The recapture rate for billfish is about 1% however, the highly migratory nature of these fish has resulted in some significant recoveries. The average time at liberty for billfish was around 420 days and ranged from 9 to 1,441 days (Table 11). In January 1993, a blue marlin was recovered in an area 750 miles east of Brazil by a Japanese longline vessel. The fish, which was initially tagged off Georgetown, South Carolina during the summer of 1992, marked the first documented transequatorial crossing of an Atlantic blue marlin. Of the three, sailfish are the most commonly caught species off South Carolina and both the number tagged and recaptured in the MGFTP reflect this fact.

Table 11. Recoveries of tagged billfish in the MGFTP.

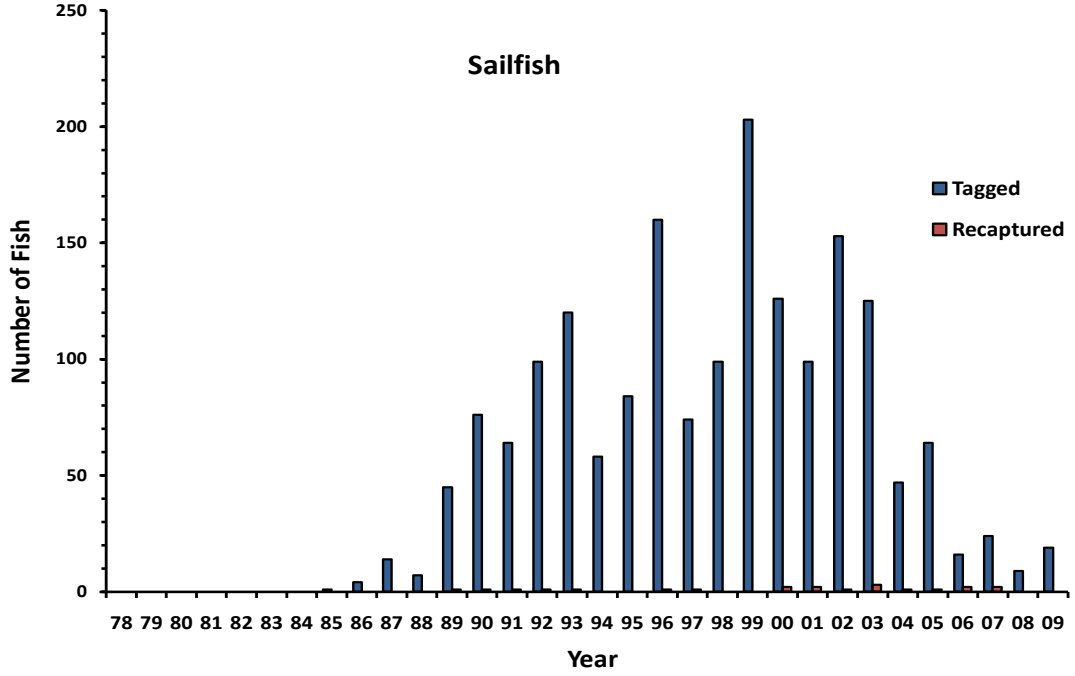
Species	Year Tagged	Tagging Date	Location	Year Recaptured	Recapture Date	Location	Days Out
Blue Marlin	1991	5/18/1991	OFF GEORGETOWN, SC	1991	7/4/1991	OFF NORTH CAROLINA	47
Blue Marlin	1991	5/18/1991	OFFSHORE CHARLESTON, SC	1992	6/11/1992	OFFSHORE ST. AUGUSTINE, FL	390
Blue Marlin	1992	5/16/1992	OFFSHORE CHARLESTON, SC	1993	1/14/1993	BRAZIL (APP. 750 MILES EAST)	243
Blue Marlin	1992	8/8/1992	GEORGETOWN HOLE, SC	1994	3/26/1994	OFFSHORE CAPE CANAVERAL, FL	595
Blue Marlin	1994	5/6/1994	OFF EDISTO, SC	1995	5/13/1995	OFFSHORE SEBASTIAN INLET, FL	372
Blue Marlin	1996	6/6/1996	OFFSHORE CHARLESTON, SC	1998	6/1/1998	BAHAMAS, ANDROS	725
Blue Marlin	1999	6/26/1999	OFFSHORE CHARLESTON, SC	1999	9/24/1999	OFF FLORIDA GULF COAST	90
Blue Marlin	1999	6/26/1999	OFFSHORE CHARLESTON, SC	1999	7/24/1999	380 DUMP, SC	28
Blue Marlin	1998	7/10/1998	GEORGETOWN HOLE, SC	1999	6/11/1999	VENEZUELA	336
Blue Marlin	NO INITIAL TAG INFORMATION			2000	10/1/2000	VENEZUELA	
Blue Marlin	2001	5/28/2001	OFFSHORE CHARLESTON, SC	2001	7/4/2001	OFF NORTH CAROLINA	37
Blue Marlin	2000	5/30/2000	OFFSHORE CHARLESTON, SC	2001	11/29/2001	OFF DOMINICA	548
Blue Marlin	NO INITIAL TAG INFORMATION			2004	2/2/2004	VENEZUELA	
Blue Marlin	2002	7/18/2002	AMMO DUMP, SC	2005	9/15/2005	OFF CUBA	1155
Sailfish	1987	12/3/1987	OFF FLORIDA KEYS	1989	8/20/1989	LOUSIANNA, GULF OF MEXICO	626
Sailfish	1990	6/22/1990	OFFSHORE CHARLESTON, SC	1990	10/2/1990	OFFSHORE MIAMI, FL	102
Sailfish	1991	6/22/1991	180' REEF, SC	1991	8/6/1991	OFFSHORE FROM PORT ROYAL SOUND, SC	45
Sailfish	1992	1/3/1992	OFFSHORE STUART, FL.	1992	1/30/1992	OFF FLORIDA KEYS	27
Sailfish	1991	6/28/1991	OFFSHORE CHARLESTON, SC	1993	5/8/1993	OFFSHORE POMPANO BEACH, FL	680
Sailfish	1996	5/25/1996	OFFSHORE CHARLESTON, SC	1996	11/27/1996	OFFSHORE PALM BEACH, FL	186
Sailfish	1995	9/16/1995	OFFSHORE CHARLESTON, SC	1997	4/4/1997	OFFSHORE MIAMI, FL	566
Sailfish	2000	9/14/2000	VENEZUELA	2000	9/23/2000	VENEZUELA	9
Sailfish	2000	10/9/2000	VENEZUELA	2000	10/28/2000	VENEZUELA	19
Sailfish	2000	6/20/2000	OFFSHORE CHARLESTON, SC	2001	4/10/2001	OFF FLORIDA KEYS	294
Sailfish	NO INITIAL TAG INFORMATION			2001	1/27/2001	OFF FLORIDA KEYS	
Sailfish	NO INITIAL TAG INFORMATION			2002	1/24/2002	OFFSHORE CAPE CANAVERAL, FL	
Sailfish	2001	7/12/2001	OFFSHORE CHARLESTON, SC	2003	5/7/2003	OFF CUBA	664
Sailfish	2003	7/10/2003	226 HOLE, SC	2003	9/27/2003	OFFSHORE JUPITER INLET, FL	79
Sailfish	2003	7/12/2003	226 HOLE, SC	2003	10/4/2003	OFF NORTH CAROLINA	84
Sailfish	NO INITIAL TAG INFORMATION			2004	6/26/2004	OFFSHORE NEW SMYRNA, FL	
Sailfish	2001	6/5/2001	OFFSHORE CHARLESTON, SC	2005	5/16/2005	OFFSHORE MIAMI, FL	1441
Sailfish	2002	6/18/2002	OFFSHORE CHARLESTON, SC	2006	1/22/2006	OFFSHORE MIAMI, FL	1314
Sailfish	2005	5/20/2005	226 HOLE, SC	2006	4/16/2006	OFFSHORE MIAMI, FL	331
Sailfish	2004	7/24/2004	OFFSHORE CHARLESTON, SC	2007	1/27/2007	OFFSHORE MIAMI, FL	917
Sailfish	2005	7/17/2005	OFFSHORE CHARLESTON, SC	2007	5/22/2007	OFF CUBA	674
White Marlin	1990	5/25/1990	GEORGETOWN HOLE, SC	1990	8/15/1990	OFF CUBA	82
White Marlin	1992	9/2/1992	OFF NORTH CAROLINA	1993	10/15/1993	VENEZUELA	408
White Marlin	1992	6/14/1992	OFFSHORE CHARLESTON, SC	1993	8/15/1993	OFF MARYLAND	427
White Marlin	1996	6/17/1996	OFFSHORE CHARLESTON, SC	1996	7/26/1996	OFF NEW JERSEY	39
White Marlin	1997	7/26/1997	OFFSHORE CHARLESTON, SC	2000	12/27/2000	OFF CUBA	1250
White Marlin	NO INITIAL TAG INFORMATION			2000	7/8/2000	OFFSHORE MAYPORT, FL.	

Figure 26. Number of billfish tagged and recaptured annually by species.

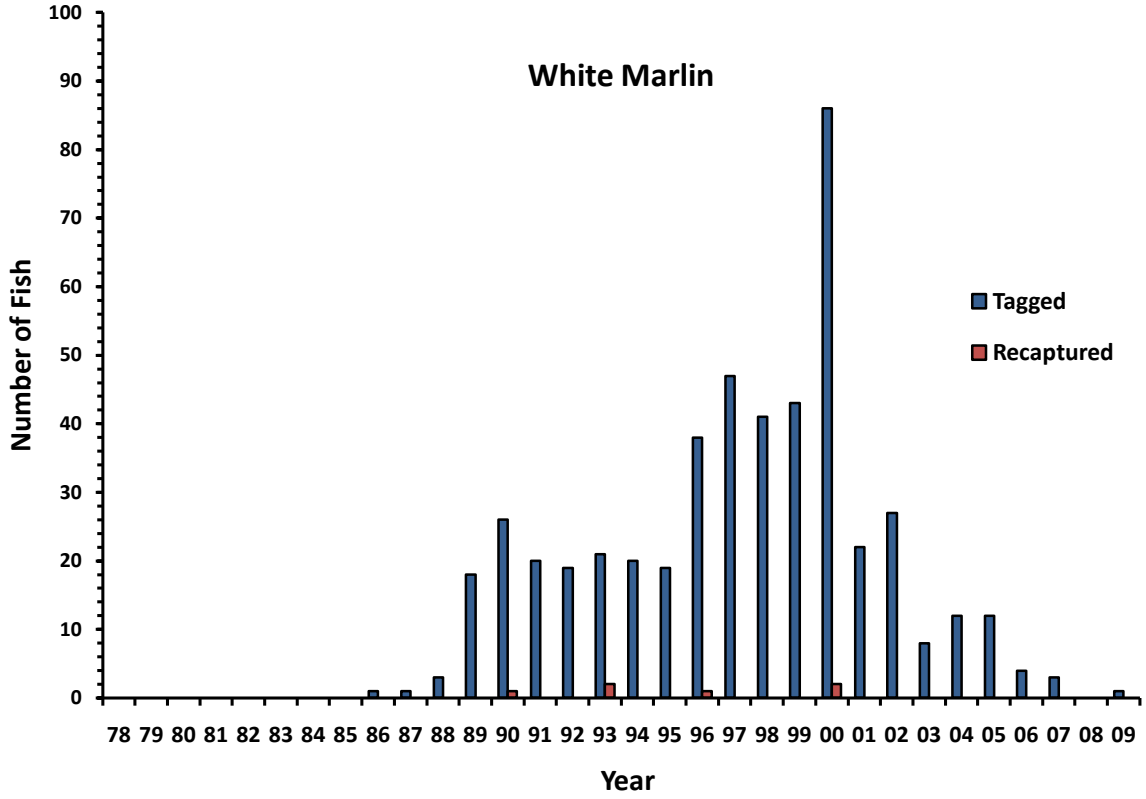
A.



B.



C.



Florida Pompano
Trachinotus carolinus

Between 1983 and 2009, cooperating anglers tagged 105 Florida pompano and 3 recoveries have been reported (Figure 27). Average time at liberty was 53 days and ranged from 35 to 84 days. Two fish were recovered at Pawleys Island shortly after having been tagged in the same general area. The third fish was recovered in West Palm Beach, Florida after traveling approximately 400 miles in just over a month from its initial tag location in the Folly River.

Red Porgy
Pagrus pagrus

Between 1982 and 2009, anglers tagged 218 red porgy and 5 recoveries were reported (Figure 28). Tagging of red porgy peaked between 1999 and 2002 as a result of greater emphasis being placed on the tagging and release of species in the snapper-grouper complex. Average time at liberty was 234 days and ranged from 15 to 454 days. Recoveries showed very little movement between tag and recapture locations.

Figure 27. Number of Florida pompano tagged and recaptured annually.

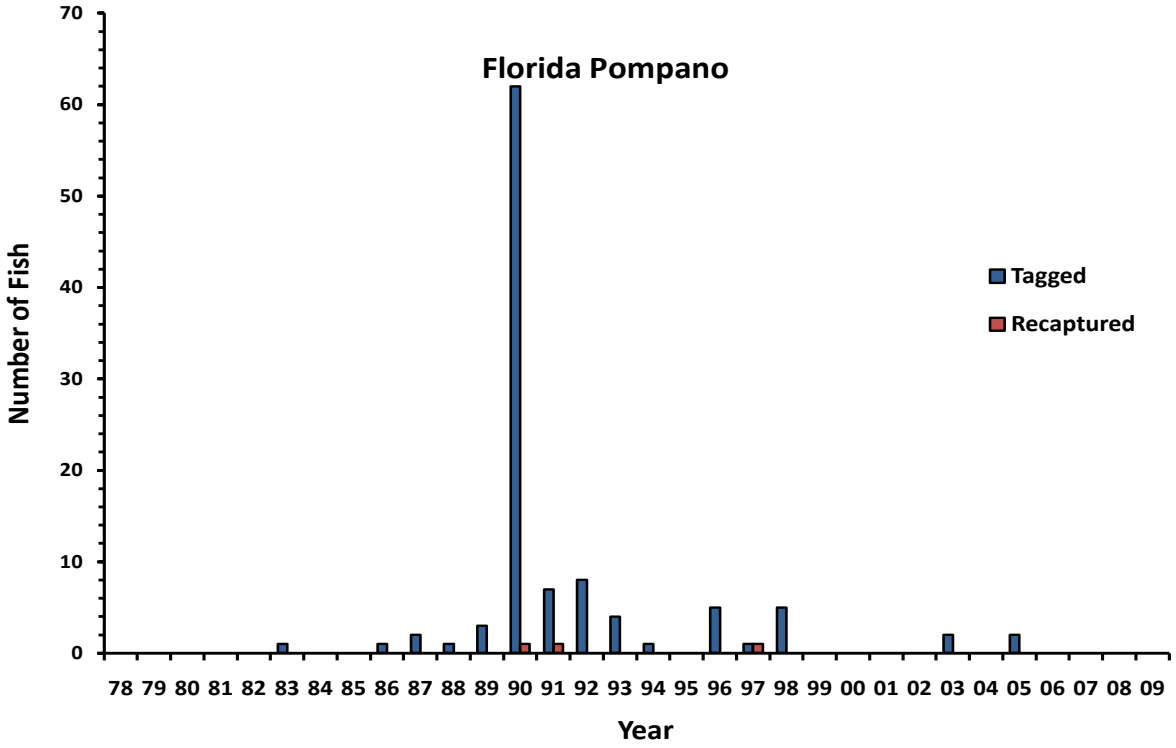
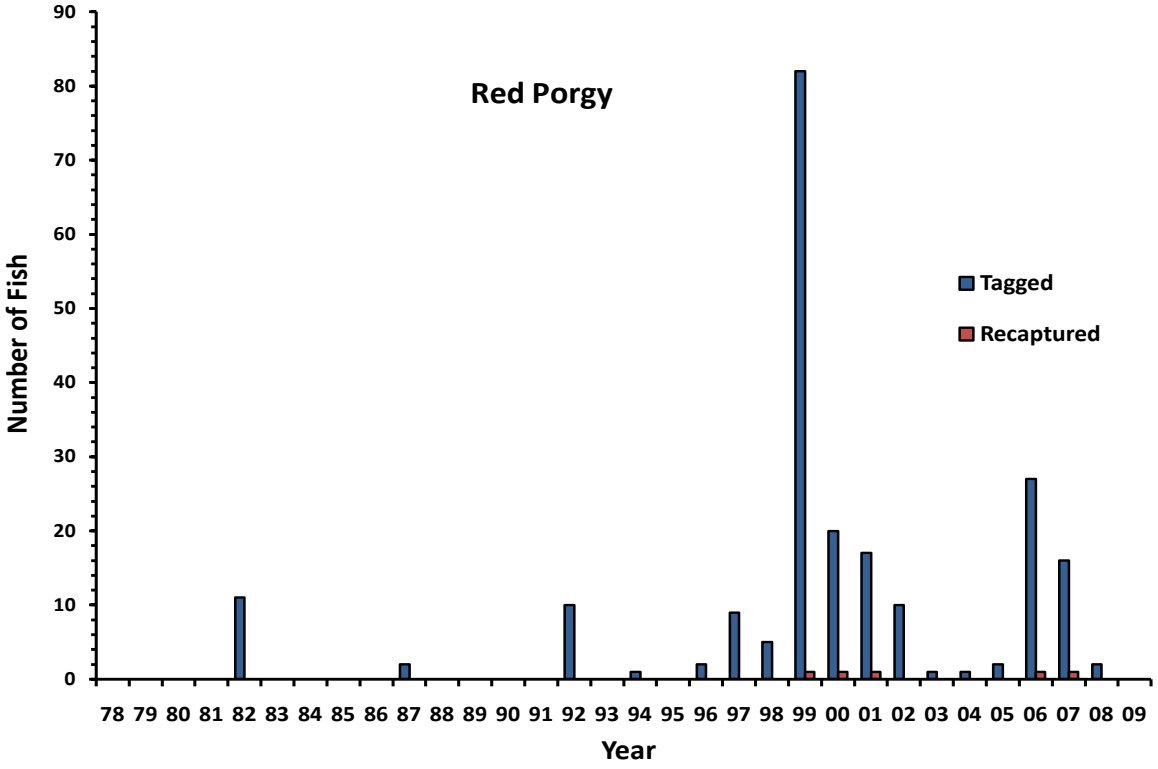


Figure 28. Number of red porgy tagged and recaptured annually.



Scamp

Mycteroperca phenax

During 1987 to 2009, 1,410 scamp were tagged and 76 recoveries were reported (Figure 29). Average time at liberty was 281 days and ranged from 4 to 1,903 days. Recoveries of scamp that were tagged off Florida (Sebastian Inlet) and recovered in the same area, account for 33% of recoveries. While most of these fish were recovered a short time (less than a year) after having been tagged, one fish tagged on 12/15/1995 was recovered on 5/2/1998 (869 days out). Another fish tagged in 240 feet of water off Charleston, SC on 9/13/2002 was recovered on 11/29/2007 (1,903 days out) in the same general area.

Black Sea bass

Centropristis striata

From 1978 to 2009, anglers tagged 1,316 black sea bass and 155 recoveries were reported (Figure 30). Average time at liberty was 52 days and ranged from 1 to 428 days. Of the 135 recoveries with complete information (to allow for the determination of days out), 49% of fish were recovered within a month of having been tagged. Of all reported recoveries, in 43% of cases either the tagging and or recapture location was associated with an artificial reef or wreck. Over half (55%) of fish tagged on manmade structure were recaptured on that same piece of structure, and overall, there was very little (if any) movement between tagging and recovery location.

Figure 29. Number of scamp tagged and recaptured annually.

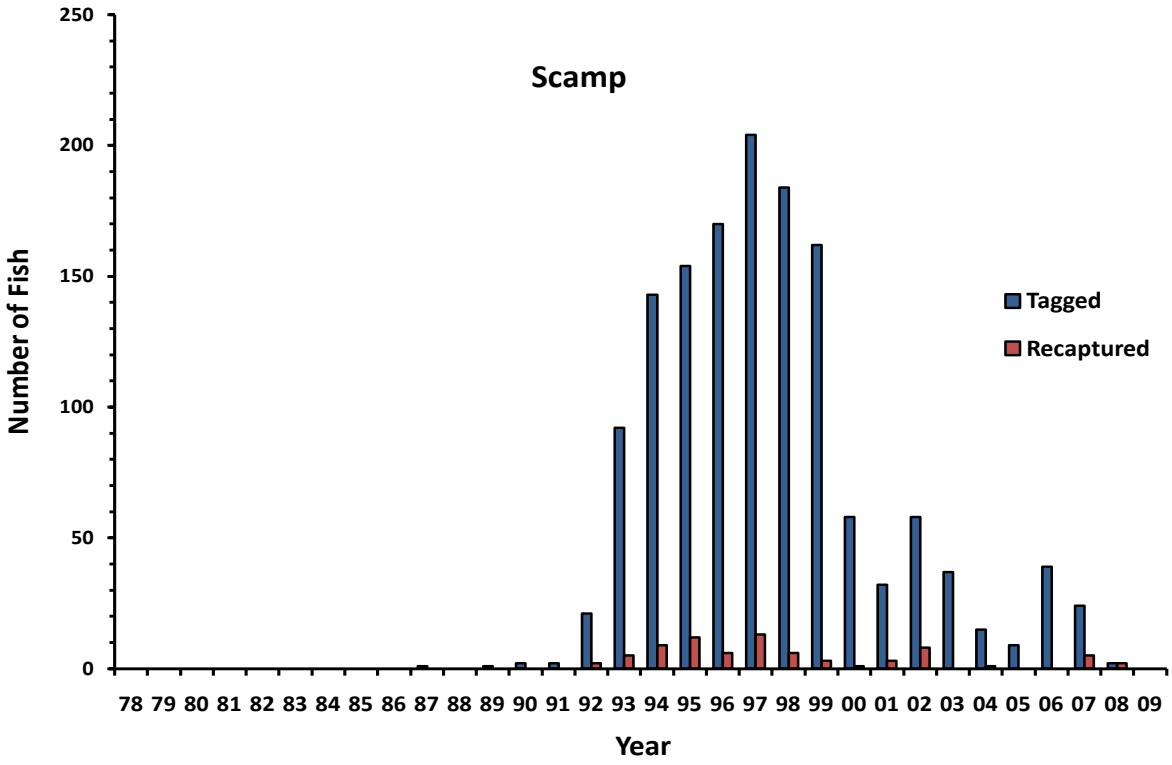
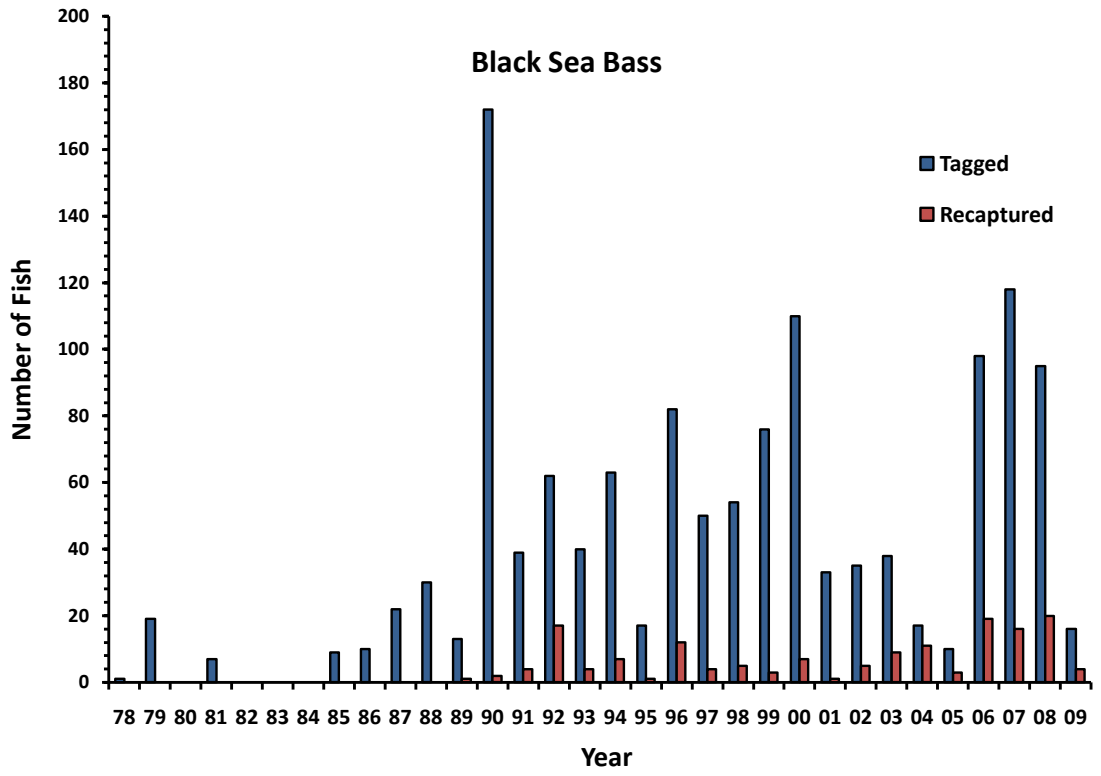


Figure 30. Number of black sea bass tagged and recaptured annually.



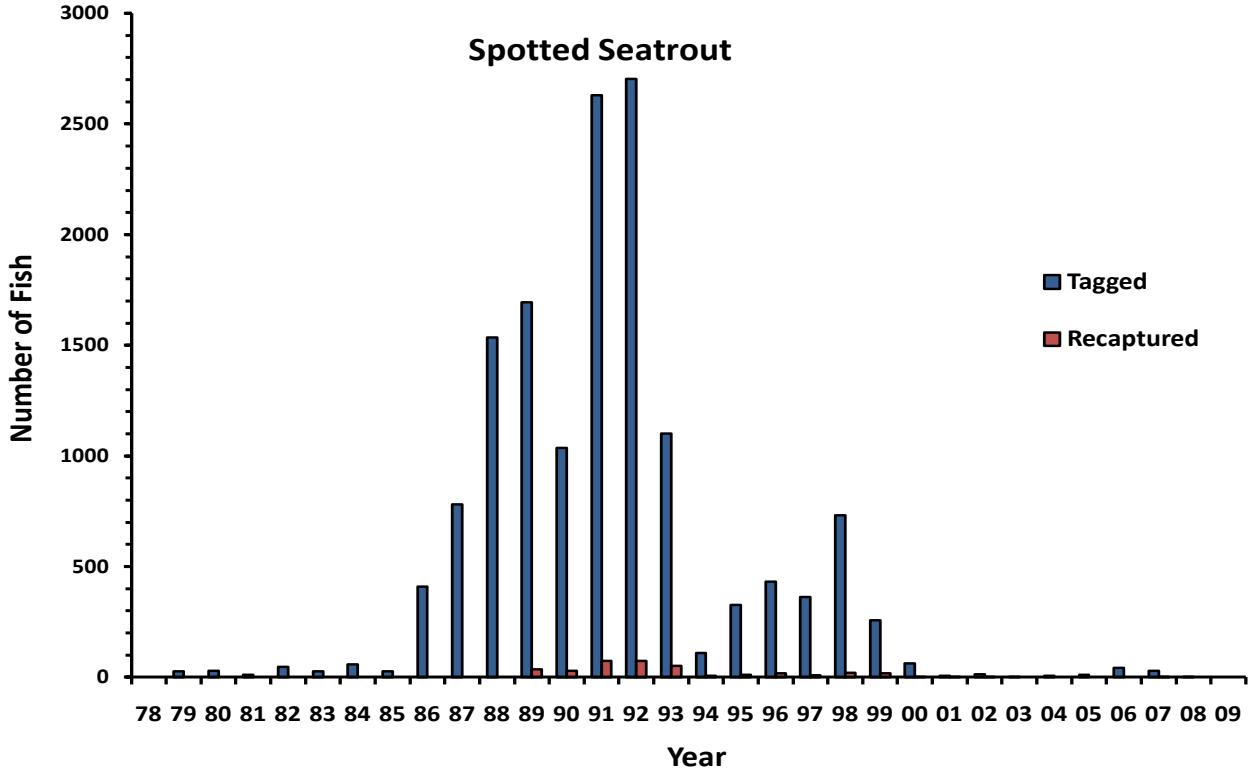
Spotted Seatrout
Cynoscion nebulosus

Spotted seatrout were the second most frequently tagged species in the MGFTP and accounted for 11% of the total species tagged. Between 1979 and 1993, anglers tagged 12,118 spotted seatrout (Figure 31). During 1986, spotted seatrout were declared a gamefish in South Carolina, and a bag limit of 25 fish per person with a minimum size limit of 12 inches was established. The following year tagging activity began to increase and continued up through 1993. In 1994, anglers were asked to discontinue tagging seatrout because of data (very low recapture rate) that suggested high post-release mortality. Regardless, some anglers continued to tag these fish, and between 1994 and 2009 another 2,398 fish were tagged.

There were 348 recoveries reported between 1978 and 2009 which represents a 2.4% recapture rate. Time at liberty ranged from 1 to 1,506 days with a mean of 102 days. Seventy four percent (74%) of recoveries occurred within four months after tagging and only 18 recaptures were at large for more than a year. Spotted seatrout are not as resilient as other inshore species like red drum, and are especially susceptible to natural mortality caused from predators (a favorite food of bottlenose dolphin), parasites, diseases and environmental factors like water temperature. Over the last twenty years, there have been at least two instances where spotted seatrout stocks were adversely affected by cold water temperatures that occurred during the winter months (Wenner, 2006).

Spotted seatrout typically spend their entire life within the estuary to which they were spawned. It's not surprising that tag and recapture data shows very little movement. For recaptures reported between 1978 and 1992, the average distance traveled was only 1.3 nm (2.4 km). The greatest distance moved was a 12 inch fish that traveled 115 nm (212.9 km) from North Inlet, South Carolina to Topsail Beach, North Carolina in 85 days (Davy, 1993).

Figure 31. Number of spotted seatrout tagged and recaptured annually.



Requiem Sharks
Carcharhinidae sp.

Requiem sharks refers to all members of the family Carcharhinidae, which makes up the largest number of living sharks. These include migratory, live bearing sharks of warm seas. The MGFTP focused tagging efforts on 12 different target species.

Anglers tagged 8,184 requiem sharks of various species between 1978 and 2009 (Figure 32). Of those tagged, there were 178 recaptures reported (Figure 33). The most commonly tagged requiem sharks were Atlantic sharpnose, bonnethead, and blacktip which accounted for 47%, 23%, and 19% of the total tagged respectively. Time at liberty ranged from 0 to 2,198 days with an average of 381 days.

The Atlantic sharpnose is the most common small coastal species off the southeastern U.S. coast and the Gulf of Mexico (Branstetter, 1990), and is regularly encountered by

recreational anglers fishing inshore and nearshore waters of South Carolina. Over 60% of reported recaptures of Atlantic sharpnose occurred within a year of the initial tagging event, and on only a few (8%) were recovered outside South Carolina (Table 12).

Table 12. Atlantic sharpnose recoveries outside South Carolina.

Tagging Date	Location	Recapture Date	Location	Days Out	Approx. Distance (miles)
6/11/1998	Parris Island, SC	9/22/1998	20 mi. off Cape Canaveral, FL	103	296
5/27/1998	South Beach, Hilton Head, SC	8/15/1998	20 mi. off Cape Canaveral, FL	80	275
5/17/1999	Surfside Pier, SC	7/2/1999	Carolina Beach, NC	46	80
5/25/1989	Charleston Jetties, SC	6/29/1989	Hatteras Inlet, NC	35	295

The bonnethead shark, also known as shovelnose shark because of its "shovel shaped" head, is another common small coastal species that frequents inland waters of South Carolina particularly during the summer months. The species has become a popular target for guides as well as recreational anglers because of its fighting ability. It's believed that estuarine waters of South Carolina may serve as a primary spawning site for bonnetheads, and reported recoveries within the MGFTP support strong seasonal site fidelity. Forty six percent (46%) of recoveries had a time at liberty greater than seven months, and of those, 63% were recovered in the same location (or in close proximity) as the initial tag event. Only 7% of recoveries occurred outside South Carolina (Table 13).

Table 13. Bonnethead recoveries outside South Carolina.

Tagging Date	Location	Recapture Date	Location	Days Out
8/10/1993	Braddock Point/Cove, South Beach, Hilton Head,	9/15/1993	Daytona Beach, FL	36
8/10/1993	Braddock Point/Cove, South Beach, Hilton Head,	9/9/1993	Ponte Vedra, FL	30
7/18/1994	Braddock Point/Cove, South Beach, Hilton Head,	7/30/1997	St. Simons island, GA	1108
5/16/1998	Broad River at Parris Island, SC	9/27/2001	Cape Canaveral, FL	1230
7/7/1998	Braddock Point/Cove, South Beach, Hilton Head,	9/20/1998	Nassau Sound, FL	75
8/2/2000	Fripp Inlet, SC	11/24/2000	Cape Canaveral, FL	114

The third most frequently tagged requiem shark is the blacktip. Blacktips have also become a popular target for recreational anglers over the last several years. Their popularity due in part to the aerial acrobatics they often display when hooked. Between 1978 and 2009, there were 33 recoveries reported, of which 78% were at liberty for less than a year. One blacktip tagged on 7/29/2000 in the Broad River was recovered 3 years later (5/10/2003) in the same area. There were several recoveries which occurred outside South Carolina (Table 14).

Table 14. Blacktip recoveries outside South Carolina.

Tagging Date	Location	Recapture Date	Location	Days Out
8/11/1995	Calibogue Sound, SC	8/11/1996	Mayport, FL	366
8/17/1999	Seabrook Island, SC	8/14/2000	St. Andrews Sound, GA	363
7/23/1999	Charleston harbor, SC	2/1/2000	Stuart, FL	193
8/23/1994	Winyah Bay Jetties, SC	2/12/1995	Riviera Beach, FL	173
10/1/1994	Cape Romain Harbor, SC	1/15/1995	Jensen Beach, FL	106
7/8/1998	NW Area Sullivans Islan/Breach Inlet, SC	8/29/1998	Ft. Pierce, FL	52

Figure 32. Number of requiem sharks tagged annually.

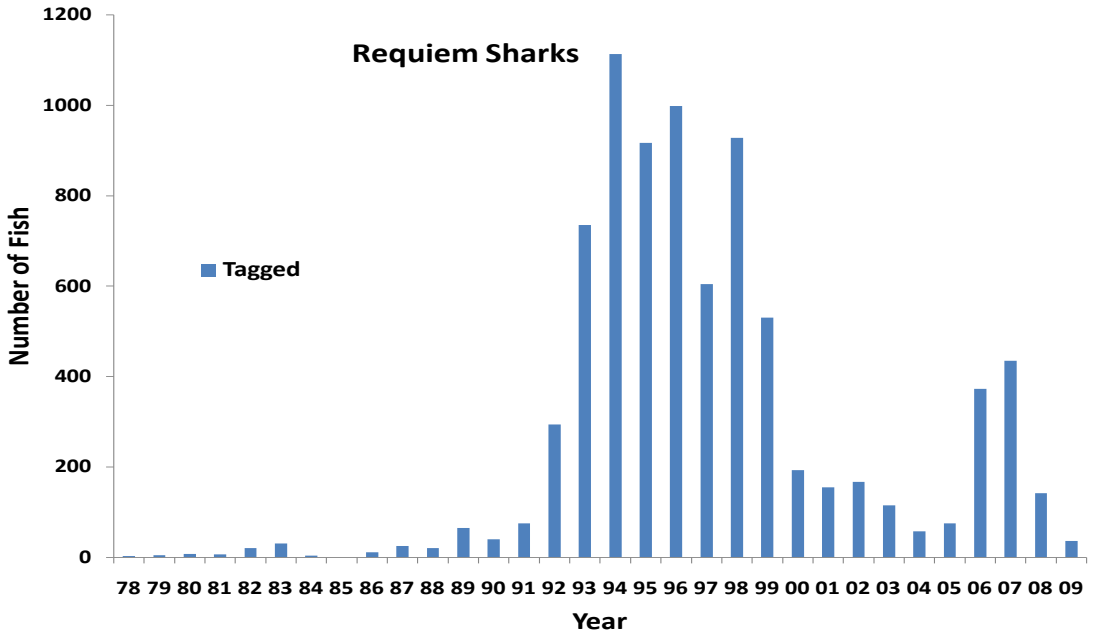
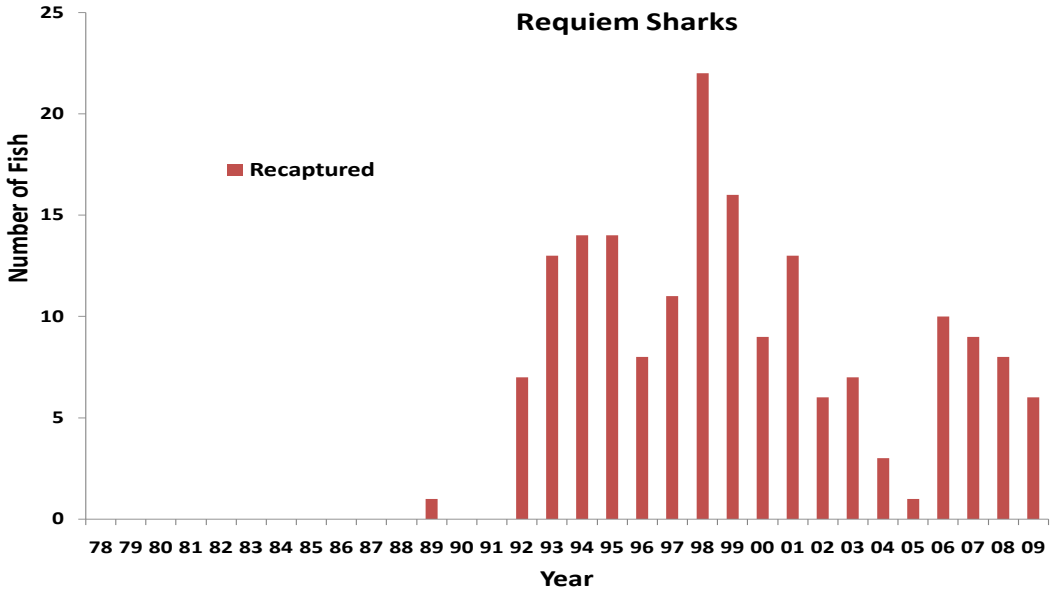


Figure 33. Number of requiem sharks recaptured annually.



Sheepshead

Archosargus probatocephalus

From 1979 to 2009, cooperating anglers tagged 8,928 sheepshead and 1,050 tags were recovered (Figure 34). The average days at large was 131 days, and ranged from 0 to 1,874 days. Sheepshead exhibit strong site fidelity, and with the exception of some seasonal movement between inshore and nearshore waters, tend to stay in the same area. Forty percent (40%) of reported recoveries were fish that were initially tagged around Sullivan's Island and an adjacent area known as "The Grillage". Of those, 85% were recaptured in the same area. One fish that was initially tagged at the Fort Moultrie rocks on 12/6/1998 was recaptured offshore of the Savannah River on 3/23/1999, an approximate distance traveled of 76 miles. Other recaptures of fish tagged in and around major inlets, suggest that some sheepshead move offshore in the winter and return to inshore waters in the spring (Table 15).

Figure 34. Number of sheepshead tagged and recaptured annually.

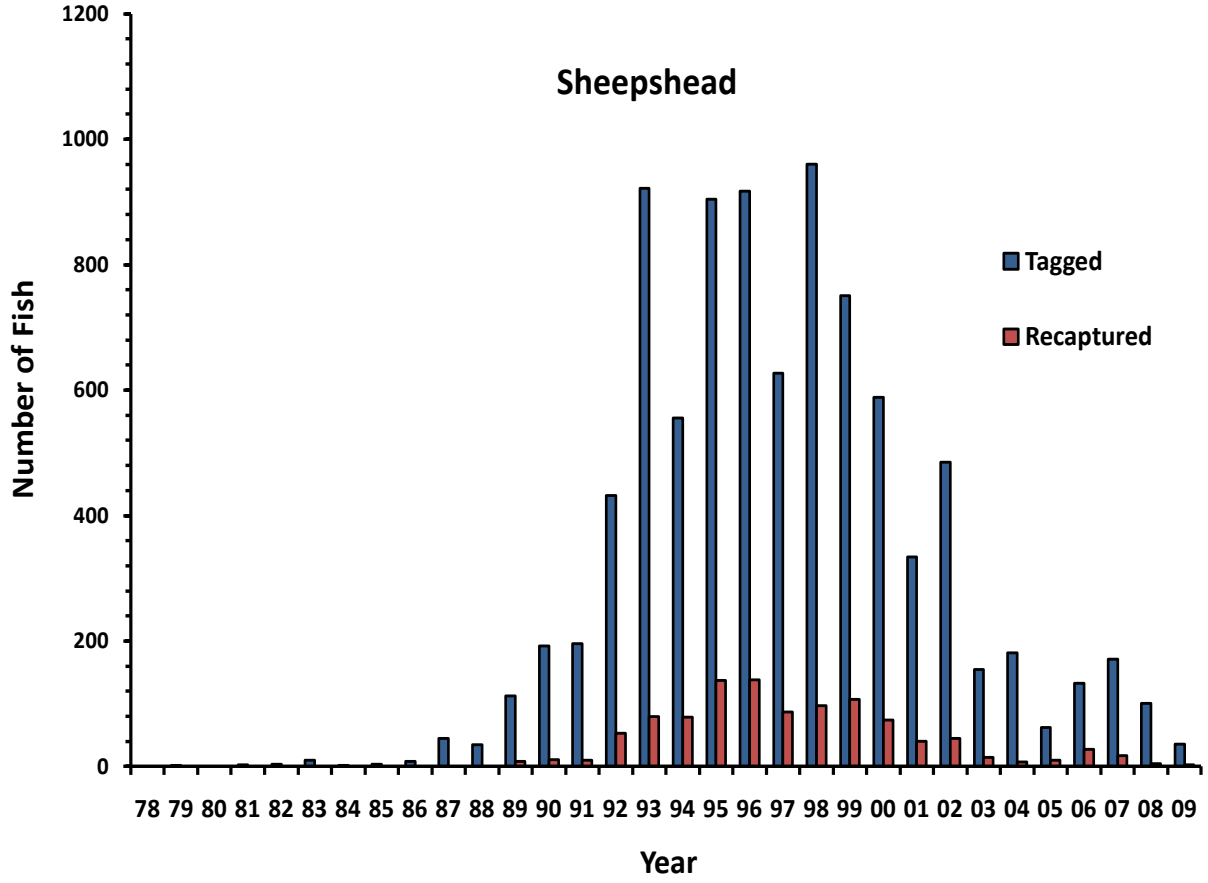


Table 15. Sheepshead seasonal movement between inshore and offshore locations.

Date	Initial Tag Month	Year	Locality Name	Date	Recapture Month	Year	Locality Name	Days Out
4/15/1998	April	1998	Whitewater Reef	5/5/1998	May	1998	Broad Creek at Lighthouse Landing	20
4/5/1995	April	1995	Fish America Reef	4/13/1995	April	1995	Broad Creek at Lighthouse Landing	8
4/21/1996	April	1996	Charleston Jetties/Dynamite Hole	5/4/1997	May	1997	Capers Reef (R-8)	378
4/5/1996	April	1996	Capers Reef (R-8)	3/8/1997	March	1997	Capers Inlet	337
4/11/1998	April	1998	Capers Reef (R-8)	6/20/1998	June	1998	Price Inlet, Capers Island North	70
8/3/1998	August	1998	Trenchard's Inlet/Skull Creek	1/1/1999	January	1999	General Gordon Wreck	151
2/13/1994	February	1994	Capers Reef (R-8)	9/18/1994	September	1994	Capers Inlet	217
2/28/1998	February	1998	Capers Reef (R-8)	6/13/1998	June	1998	Bullyard Sound	105
2/16/2002	February	2002	Fripp Island Reef (Tire Reef)	10/12/2002	October	2002	Fripp Inlet	238
2/16/2002	February	2002	Capers Reef (R-8)	6/4/2002	June	2002	Price Inlet, Capers Island North	108
2/9/2003	February	2003	Kiawah Reef (4 KI)	10/5/2003	October	2003	Privateer Creek/Seabrook	238
6/4/1994	June	1994	Bull Island	4/6/1997	April	1997	Capers Reef (R-8)	1037
6/14/1997	June	1997	Capers Reef (R-8)	8/1/1997	August	1997	Price Inlet, Capers Island North	48
6/23/1999	June	1999	Charleston Jetties/Dynamite Hole	5/20/2000	May	2000	Kiawah Reef (4 KI)	332
3/4/1990	March	1990	Savannah Light Tower	10/1/1990	October	1990	Oyster Creek/Bull River	211
3/14/1992	March	1992	Capers Reef (R-8)	5/26/1992	May	1992	Price Inlet, Capers Island North	73
3/12/1995	March	1995	Fish America Reef	4/13/1995	April	1995	Broad Creek at Lighthouse Landing	32
3/22/1996	March	1996	Capers Reef (R-8)	3/8/1997	March	1997	Capers Inlet	351
3/10/1997	March	1997	Capers Reef (R-8)	4/6/1997	April	1997	Capers Inlet	27
3/22/1999	March	1999	Savannah Reef	5/9/1999	May	1999	Broad Creek at Lighthouse Landing	48
3/16/2002	March	2002	Capers Reef (R-8)	12/3/2002	December	2002	Price Inlet, Capers Island North	262
3/29/2002	March	2002	Capers Reef (R-8)	6/10/2002	June	2002	Price Inlet, Capers Island North	73
5/5/1996	May	1996	Charleston Jetties/Dynamite Hole	4/6/1997	April	1997	Capers Reef (R-8)	336
5/4/1997	May	1997	Capers Reef (R-8)	7/6/1997	July	1997	Price Inlet, Capers Island North	63
11/16/1998	November	1998	Bay Point, Hilton Head	1/16/1999	January	1999	General Gordon Wreck	61
10/31/2002	October	2002	Trenchard's Inlet/Skull Creek	4/5/2006	April	2006	General Gordon Wreck	1252
10/20/2003	October	2003	Charleston Jetties/Dynamite Hole	3/3/2004	March	2004	Capers Reef (R-8)	135
9/18/2001	September	2001	NW Area of Sullivan's Island/Breach Inlet	3/10/2002	March	2002	Capers Reef (R-8)	173

Red Snapper

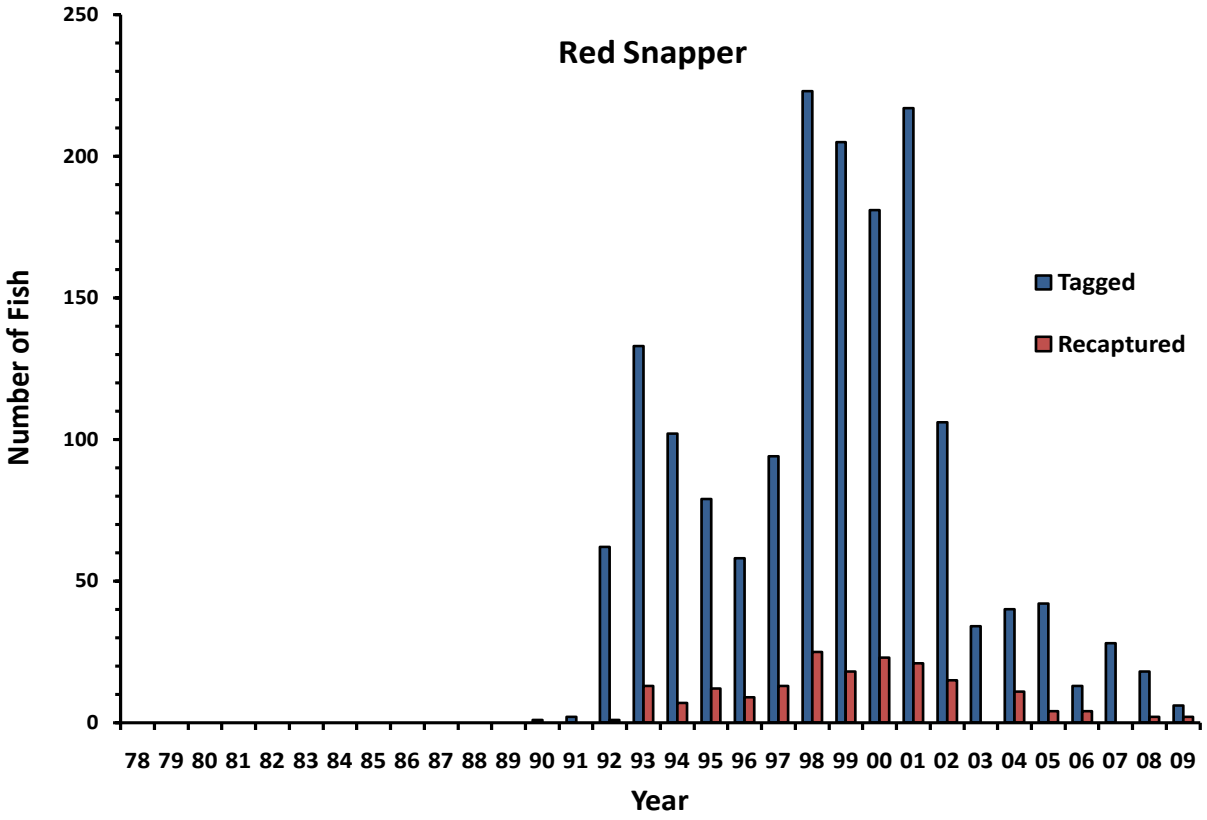
Lutjanus campechanus

During 1990 to 2009, 1,644 red snapper were tagged and 181 recoveries were reported (Figure 35). Average time at liberty was 263 days and ranged from 0 to 2,239 days. Twenty seven percent (27%) of red snapper recaptures were fish tagged off Sebastian Inlet, Florida, and recaptured in the same general area. However, between 1996 and 2002, there were 7 reported recaptures of red snapper off Cape Canaveral, FL that had initially been tagged off Sebastian Inlet, FL; a distance traveled of approximately 68 miles. Because movements of most snapper grouper species is not of a highly migratory nature, measuring distance between the initial tag event and subsequent recovery is difficult unless GPS coordinates are include in both instances.

Table 16. Number of red snapper tagged between 1990 and 2006 and minimum and maximum size range, as provided for SEDAR 15 data workshop (SAFMC, 2007).

Year	Number Measured	Range (inches)	Year	Number Measured	Range (inches)
1990	1	10.5	**1999**	205	6-29.8
1991	2	11.5-14	**2000**	181	10-22
1992	52	13-20	**2001**	199	11-33
1993	133	10-20	**2002**	105	13-29.5
1994	102	6-19.5	**2003**	34	12-19.5
1996	56	9-24	**2004**	40	14-30
1997	91	11-21	**2005**	42	14-20.5
1998	223	9-20.5	**2006**	13	13.5-19.5

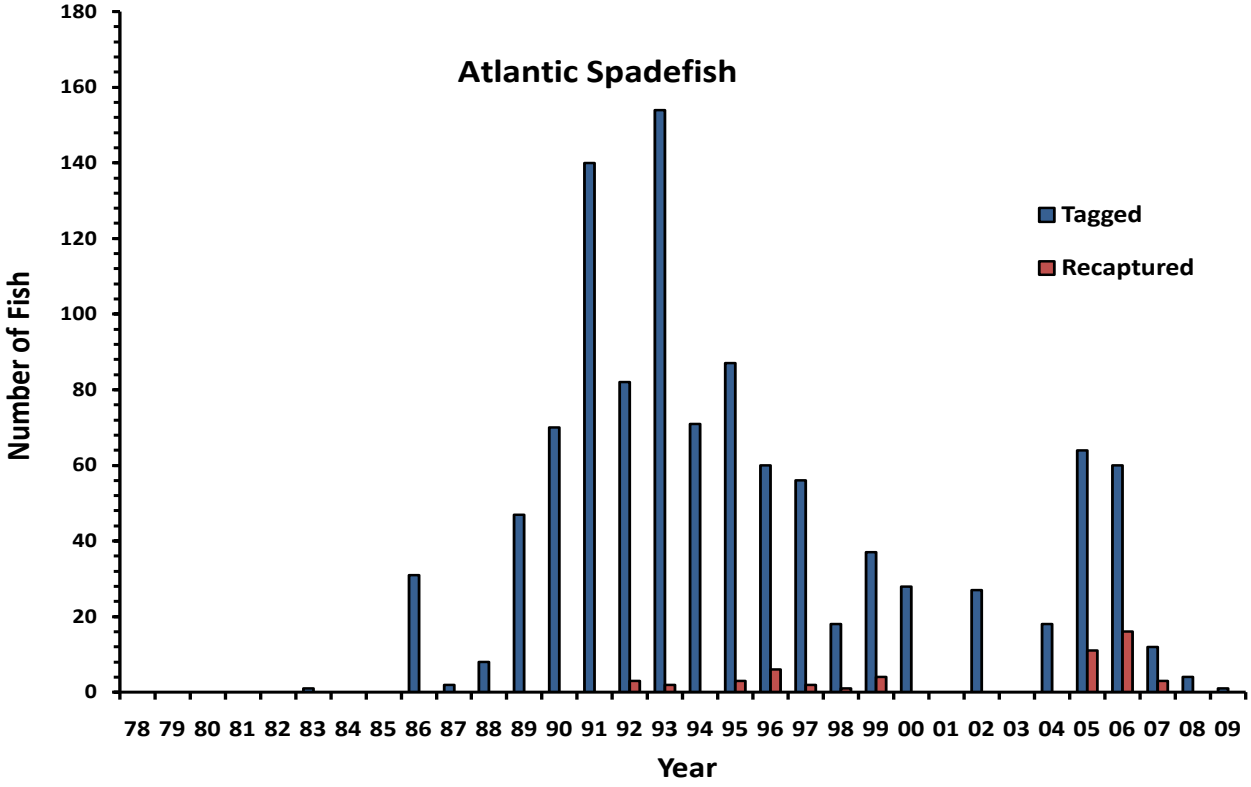
Figure 35. Number of red snapper tagged and recaptured annually.



Atlantic Spadefish
Chaetodipterus faber

Between 1983 and 2009, cooperating anglers tagged 1,078 Atlantic spadefish, and 51 were recovered (Figure 36). Spadefish became a popular fishery starting in the early nineties, and is evident by tagging activity which peaked between 1990 and 1993. Since spadefish are commonly found around offshore structure like artificial reefs, the majority (73%) of fish were tagged and released on artificial reefs off South Carolina. Average time at liberty for recoveries was 18 days and ranged from 0 to 100 days. All recaptured fish were caught at the same location where they were initially tagged.

Figure 36. Number of Atlantic spadefish tagged and recaptured annually.



Tarpon

Megalops atlanticus

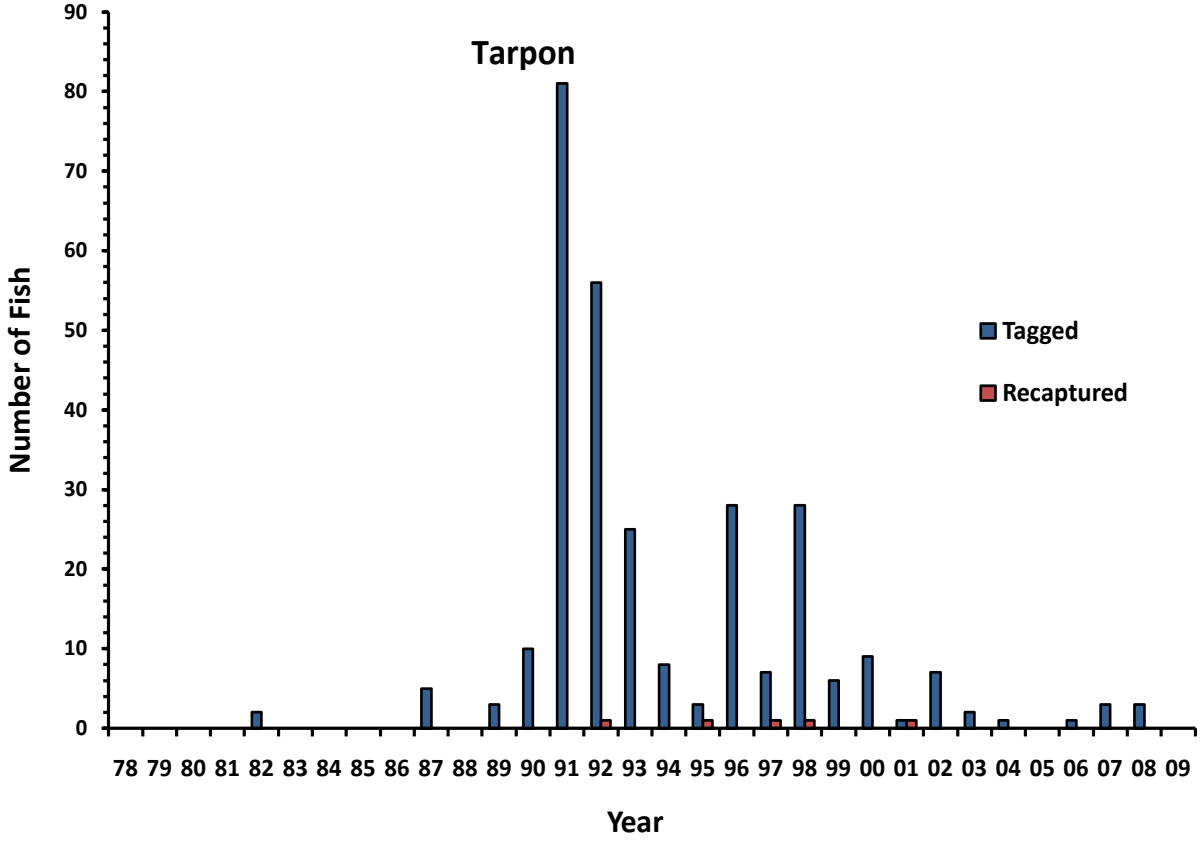
Between 1982 and 2009, anglers tagged 289 tarpon and 5 were recovered (Figure 37). Average time at liberty was 262 days and ranged from 17 to 578 days. Ninety-one percent (91%) of tarpon in the MGFTP were tagged in South Carolina, and all but one of the recaptures were fish initially tagged in South Carolina waters. Although there were only a few recoveries, there is some evidence of seasonally related site fidelity (Table 17).

Table 17. Tagged tarpon recoveries in the MGFTP, 1982 to 2009.

Tagging Date	Locality Name	Length (Inches)	Recapture Date	Locality Name	Days Out
9/19/1992	Lighthouse Island, Charleston Harbor, SC	8.2	10/7/1992	Rantowles Creek, Stone River, SC*	18
8/23/1993	Port Royal Sound, SC	75	3/24/1995	Folly River, SC	578
8/9/1996	Braddock Point/Cove, Hilton Head, SC	60	6/20/1997	Flordias Keys	315
12/6/1998	Indian River, FL	21	12/23/1998	Indian River, FL	17
7/17/2000	Racoon Key, SC	66	8/3/2001	Racoon Key, SC	382

*** Fish caught in cast net and released with tag intact.**

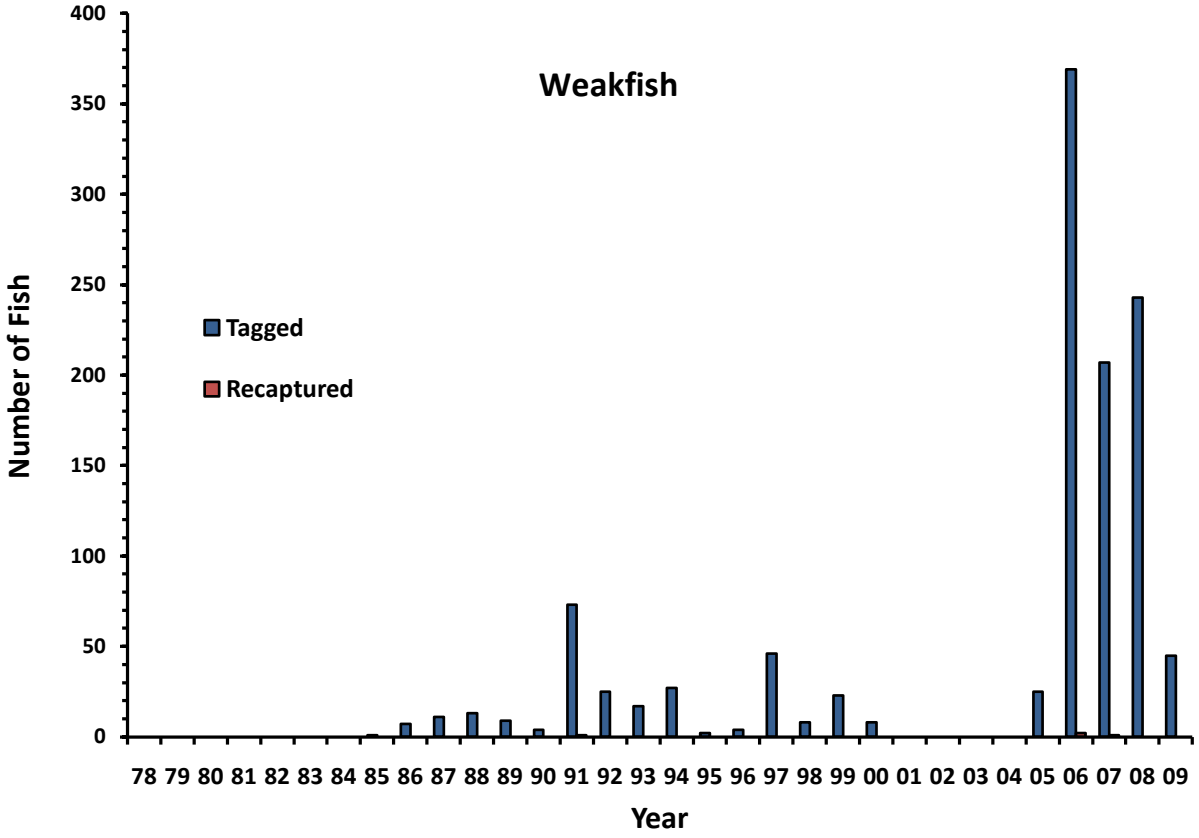
Figure 37. Number of tarpon tagged and recaptured annually.



Weakfish
Cynoscion regalis

During 1985 to 2009, anglers tagged 1,167 weakfish and only 4 were recaptured (Figure 38). The mean time at liberty was 18 days and ranged from 6 to 34 days. Weakfish were tagged with the standard small nylon dart tags (E series), and in 2005, t-bar tags (applied with a tag gun) were utilized as a more effective and "fish friendly" means with which to mark the fish. All reported recaptures were of fish tagged using the nylon dart tags. The low recapture rate may be a result of a several factors. Tags were placed on the dorsal surface of the fish between the pterygiophores, but the soft flesh of weakfish probably resulted in many tags falling off, especially when the dart tags were employed. As their name implies, weakfish are not as hardy as many other fish, and may not survive the tagging and release process, thus are subject to higher than average tag induced mortality. Another factor that may have contributed to low recapture rates is the lack of a robust recreational fishery directed towards the species, which overall reduces the chances of anglers encountering tagged fish.

Figure 38. Number of weakfish tagged and recaptured annually.



DISCUSSION

Data generated by this program has been used in a number of fisheries management decisions not only in South Carolina but also for the South Atlantic region as a whole. As a result of amberjack tagged off South Carolina during the mid-summer that were consistently recovered off South Florida during April and May, the South Atlantic Fisheries Management Council (SAFMC) was able to identify spawning aggregations which eventually lead to the implementation of harvest restrictions during April (SAFMC, 1991).

Information on red snapper, greater amberjack, and king mackerel has been provided to the SAFMC for use in stock assessments. The Atlantic States Marine Fisheries Commission (ASMFC) has utilized data generated by this program in developing management plans for red drum and spotted seatrout (Davy, 1993).

In 1993, the program gained international recognition with the first documented recapture of a tagged Atlantic blue marlin crossing the equator. The International Commission for the Conservation of Atlantic Tunas (ICCAT), an inter-governmental fishery organization responsible for the conservation of tunas and tuna-like species in the Atlantic Ocean and its adjacent seas, used this information as justification for dropping the 5 degree line for managing billfish stocks.

Participation

Regardless of the number of cooperating anglers participating during any given year, there has remained a core group of taggers. These individuals have exhibited a high degree of commitment toward the program and typically account for the majority of fish tagged each year (Table 18). Many of these individuals have expressed the opinion that the satisfaction they get from being able to tag and release makes their fishing trips that much more enjoyable.

The MGFTP will occasionally utilize volunteers that tag and release fish in waters other than SC, but this has been limited to only those anglers fishing offshore waters in the South Atlantic. These individuals usually are the most experienced in a particular fishery for which a directed tag and release effort is needed. For example, a Florida based charter captain proved to be the most qualified to provide adequate numbers of red snapper he tagged and released. Anglers fishing offshore from East coast ports other than South Carolina have cooperated in tagging highly migratory species like billfish.

Anglers often become involved with the program with the best intentions. They are provided a tagging kit, have the enthusiasm to actively participate, but for any number of reasons, never get around to actually tagging any fish. Not wanting to deny a request from an enthusiastic angler anxious to participate for the first time, and at the same time recognizing the monetary loss to the program if the tags are not used, has been a challenge the program has faced for years. In the mid 1980's an award program was initiated in an effort to get new taggers to actively participate. A conservation award was given to those anglers that tag and release a minimum of 30 eligible fish within a calendar year. In addition to receiving credit for a typical tag and release, anglers also receive credit for a tag and release if they catch a fish that already

has a tag (regardless of the project the tag is associated with) and release the fish with the tag left intact.

It was determined in the mid 1990's that a tag kit consisting of 5 tags, postage paid information cards, and applicator cost the program around 15 dollars. A survey of anglers was completed shortly afterwards to determine their willingness to pay a fee for tag kits. Of the 1,400 who completed and mailed back the survey, 79% indicated they would be willing to pay for tag kits (Davy, 1999). Unfortunately, the complex nature of the state government accounting system has made it difficult to implement a system that allows the division to charge for tag kits.

Tags

During the early years of the program a number of different tag styles were used with limited success. Peterson disc tags were found being engulfed by new tissue growth. Dart tags manufactured by Floy Tag and Mfg. were found to fall apart over a 3 to 6 month period as the glue connecting the head of the tag to the streamer lost adhesion (Davy, 1993). Cinch-up spaghetti tags, also produced by Floy Tag and Mfg. were found to quickly accumulate barnacles and algae.

The introduction of polyethylene dart tags manufactured by a company in South Australia (Hallprint, Ltd.) in the mid 1980's were durable, relatively inexpensive, easy to apply, and maintained good retention when embedded between the pterygiophores. The program has consistently used bright yellow as it contrasts well the black lettering of the legend, and is more visible on fish. The color is unique among other tags (mostly orange) used by other DNR programs, and has become the unofficial designation for tags used by recreational angler volunteers.

The legend printed on the streamer portion of tags originally included the Marine Resources Divisions' address, preceded by the words "Reward-Mail To:". It was later determined through public input that some anglers who recovered a tagged fish were under the impression that "Mail To" implied the tag needed to be removed from the fish and mailed to the address in order to receive a reward. Shortly thereafter, the legend was modified by removing the "Mail To" phrase, before eventually being changed altogether (with the implementation of the toll free reporting number) to read, "REWARD-Release and Report Tag No. to SCDNR at 1-888-824-7472".

Angler Based Tagging

The use of anglers to tag fish is not without problems, and the MGFTP has not been immune to the challenges of directing a large volunteer effort. Communication, especially in the form of consistent feedback, has played a critical role in the success of the programs' operation. The response time with which anglers receive feedback after they have reported a recapture may sometimes affect their willingness to report future recoveries of tagged fish. If it takes several weeks for an individual to receive information (and a reward) on a tag recovery, they may be less likely to report in the future. For this reason, any research project that involves a tagging component which relies on the public for reporting recoveries, should recognize that the ability

to provide feedback in a timely manner will not only have an effect on that project, but other tagging projects with similar objectives.

Perhaps one of the most significant things to come out of the tagging effort through the MGFTP was a change in angler behavior. From the long standing practice of catch and keep to the practice of catch and release, tagging has provided anglers with a reason to release their catch, while at the same time providing a level of satisfaction similar to that of being able to "show off" a catch. Short and long term recaptures further provide tangible evidence of the benefits of catch and release. A fish that is caught and released can be caught again.

Training

Incorporating training workshops as a requirement to participate has proven to be an effective quality control measure as well as an equitable way of reducing the overall size of the program in terms of participation. Training workshops give taggers an opportunity to practice tagging on dead fish allowing them to hone their technique before inserting a tag into a live fish. Additionally, because project staff are able to watch the tagging, problems can be corrected beforehand. The value of the personal face to face interaction between staff and volunteers cannot be overemphasized.

Popularity of Tag and Release

The Marine Division's angler based tagging program continues to generate public interest. Anglers are now much more knowledgeable about fisheries management and understand that quality data is essential for managing fish stocks and ensuring the future health of these resources. They also recognize that resource agencies are woefully underfunded and as a result, understaffed, and thus are anxious to volunteer in any capacity. The tagging program and other such volunteer programs provide the perfect opportunity. It is unlikely that there will ever be a shortage of volunteer anglers willing to tag and release fish or collect any other meaningful data related to their fishing activity.

Table 18. Anglers who have been active participants for 10 or more years and/or have tagged 100 or more fish during the time period. Shown in alphabetical order by last name.

Angler Name	Fish Tagged	Years Participated
ABLE, MICHAEL J.	184	17
ADEN, ALLEN	90	10
AIMAR, BUDDY	57	10
ALLEN, CHARLES K.	399	16
ALLEN, DENNIS M.	799	21
ALLEN, WENDY	365	20
ALTMAN, RANDY	188	15
AMMANN, LARRY	161	10
ARMSTRONG, DAVID	569	11
BENNETT, RICK	84	11
BLAKE, FRANKIE	120	12
BOENSCH, JOHN	119	11
BOWEN, TOM JR.	464	10
BOWLING, ROY M.	96	10
BOYD, BRAD	37	10
BOYD, JOE	47	14
BRANHAM, LARRY	145	10
BROOKSHIRE, DENNIS	39	11
BROWN, CHARLES A	279	11
BROXTON, DON	1719	13
BUIST, THOMAS	142	11
BURN, EDWARD	38	10
BUSH, MIKE	528	11
CAGLE, JOHN	51	11
CHAKIDES, PHILIP G.	259	18
CHAPLIN, STEVE	60	12
CONKLIN, ROBERT	404	13
CORDINA, WALT	824	15
COX, JOHN	308	14
CRABTREE, DARRELL	184	13
CURREY, HAL S.	44	11
DARLINGTON, PETE	237	12
DAVIS, MIKE	93	10
DELOACH, JON	413	14
DENBRAVEN, GARY	1822	15
DENNIS, JEFF	241	17
DETYENS, JOE	795	10
DEVANE, JOHN	61	12
DICKSON, PHILIP GENE	1834	11
DONEGAN JR., ROBERT	77	12
DOTTERER, WILLIAM	123	12
DUNPHY, JOHN	1736	12
FISCHER, ROBERT	107	10
FLEMING, TOM	536	11
FRALIN, STEVE	246	13
GLAESNER, MIKE	122	15
GLENN, BILLY	241	10

Table 18. cont.

Angler Name	Fish Tagged	Years Participated
GLUNT, MAURICE	214	13
GODIN, JERRY	52	12
GODLEY, GLENN	163	15
GOULDING, FRITZ	55	10
GRAHAM, BEN	232	10
GULSKI, BRYAN	41	10
GUSTAFSON, GUS	161	10
HABERSTROH, KAROLE	54	12
HAMMOND, DONALD L.	273	14
HAMMOND, SCOTT	76	10
HAMRICK, MIKE	381	12
HARRINGTON, PAT	135	10
HARTER, DAVE	611	20
HEATON II, DOUG	141	12
HEATON SR., DOUG	40	10
HEWITT, JOSEPH B.	1401	19
HIESTER, STEVE	282	14
HIOTT, RICK	302	12
HOWE, JAMES	85	12
JENKINS, CARL	447	11
KENNEDY, BRIAN	390	20
KEY, MATT	46	11
KING, THOMAS P.	39	12
KIRCHNER, KENNETH	89	14
KOCHES, FRANK	2074	10
LAYTON, STEVE	40	10
LEE, ROGER	255	12
LEMAN, BUDDY	916	23
LESCHORN, DAN	373	15
MACHADO, BO	324	12
MADLINGER, GEORGE J.	737	17
MANGUM JR., CHARLES B.	63	10
MCINERNY, SCOTTY	213	11
MCKENZIE, TERRY	225	16
MCNAMARA, JOHN	38	10
MELVIN, GEORGE H.	346	14
MICHALOVE, CHIP	37	10
MICKELSEN, ETHOL	817	11
MICKELSON, VICTOR	1542	13
MILLIKEN JR., TOM	525	14
MIMS, TONY	3662	14
MISCHKE, KEVIN	343	14
MOYER, LEE	90	15
MULLEN, STEVE	63	12
OHLANDT, JOHN D.	771	23
OPALKA, SKIP	46	12
ORVIN, HEATH	31	11
OWENS, DANNY	112	10

Table 18. cont.

Angler Name	Fish Tagged	Years Participated
PARKER, BILL	870	12
PATTERSON, RUSSELL	315	17
PAULLING, RON	69	13
PEARCE, DIXON	80	13
PENDLETON, MIKE	178	14
RAGLAND, RANDY	42	11
REICHLMAYR, PAUL	366	11
RICHARDS, ED	2631	13
RIDER, DEREK	211	12
RINCONES, RON	1451	17
RITTER, H.N.	50	12
ROFF, STEVE	303	12
SALISBURY, TOM	53	10
SCHAEFER, PAGE	81	10
SILVER, TOMMY	161	11
SIMMONS, PAUL H.	159	12
SIMMONS, REED	81	15
SINCLAIR, SHANE	894	12
SMITH, CHAMP	4379	16
SPITZMILLER JR., JOHN	257	11
SPRINGS, ALBERT	29	12
STRINGER, RICK	226	17
STUHR, RICHARD	495	12
STUHR, SANDY	147	12
SUGGS, KENNETH	121	13
SWANN, WALTER L.	428	10
TALLENT, DALE	292	13
TERJESEN, GARY C.	169	13
THAMES, BOB	470	13
THAWLEY, MARK	137	15
THOMPSON, GEORGE	610	17
THORNHILL, CHRIS	49	12
THRASHER, TOMMY	450	17
TISDALE, BUBBA	59	10
TYLER, RUSSELL	58	11
ULRICH, GLENN	55	10
UTLEY, DAN	546	18
VON HARTEN, BO	415	15
WAITS, J.R.	2428	14
WALLER, MICHAEL	1025	13
WESTON, JULIAN	287	14
WIGGERS, ROBERT	122	11
WONG, JOE	36	11
WYNNE, THOMAS	112	16

Acknowledgements

I would first like to thank all the anglers who have participated by tagging and releasing their fish as well as reporting the recovery of tagged fish they encounter. Without their cooperation and dedication this program would not have been possible.

If it were not for the foresight of David Cupka and the tireless efforts of its administrators, Charlie Moore, Don Hammond, and Kay Davy, the program certainly would not have sustained the life it has over the last 36 years. It was their hard work which made me determined to continue this program despite the budget and personnel challenges we have faced over the last decade.

Thanks also to all the DNR staff who have worked on this project and provide insight, including Ernest Muhammad, Ryan Yaden, Kelly Blackburn, and Sara Spring. Jeff Schwenter is thanked for preparing many of the graphs and figures and providing assistance with analysis related to this report. I am also grateful to Jessica Boynton for providing expertise in GIS and bringing the program's data into the 21st century. Thanks to Blaik Pulley for her review and edits of this report.

I would also like to thank Tim Snoots, Director of IT for the Marine Division. Tim's design of the Access database for this program greatly facilitated key punching tag and recapture data as well as producing data reports.

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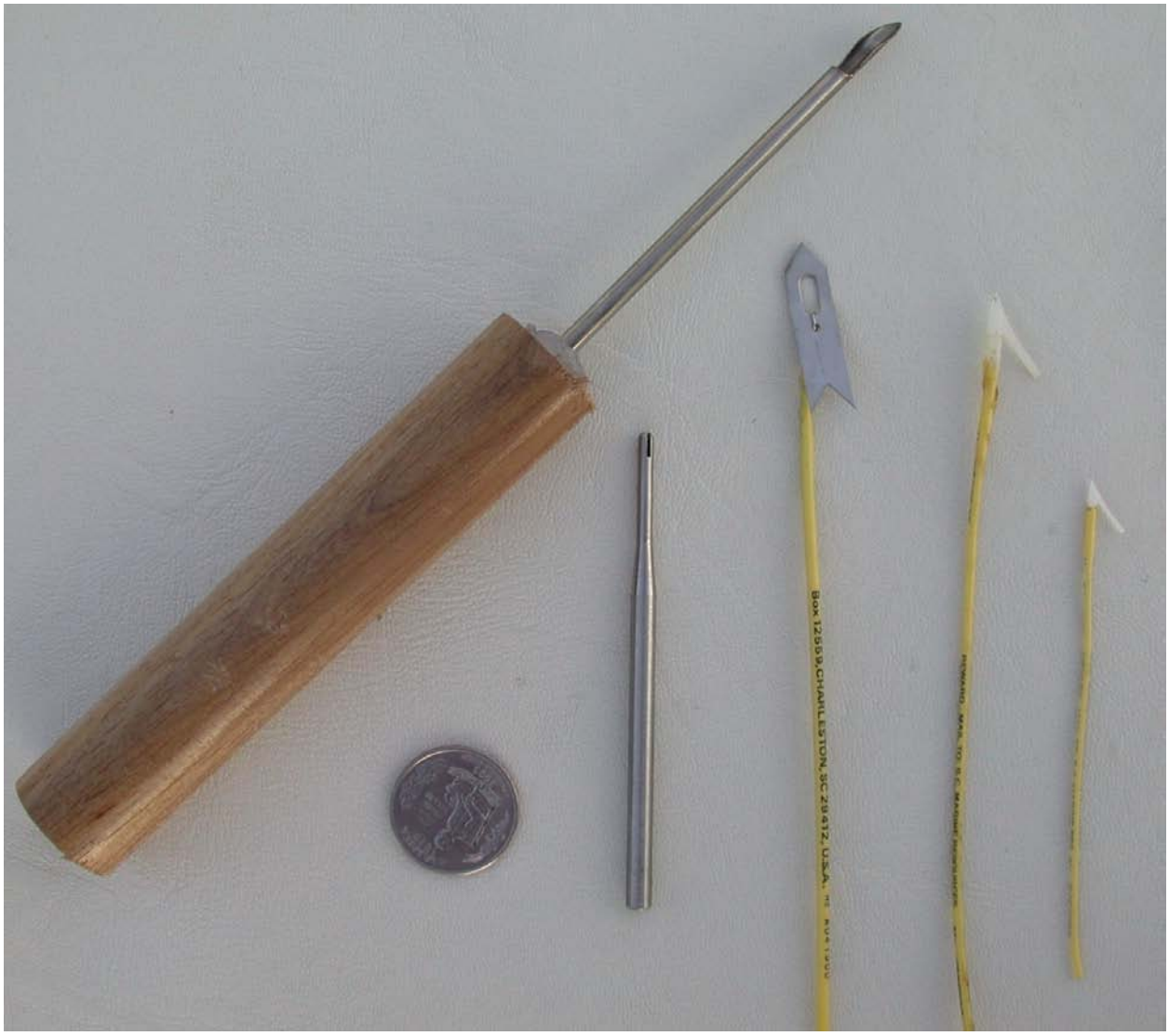
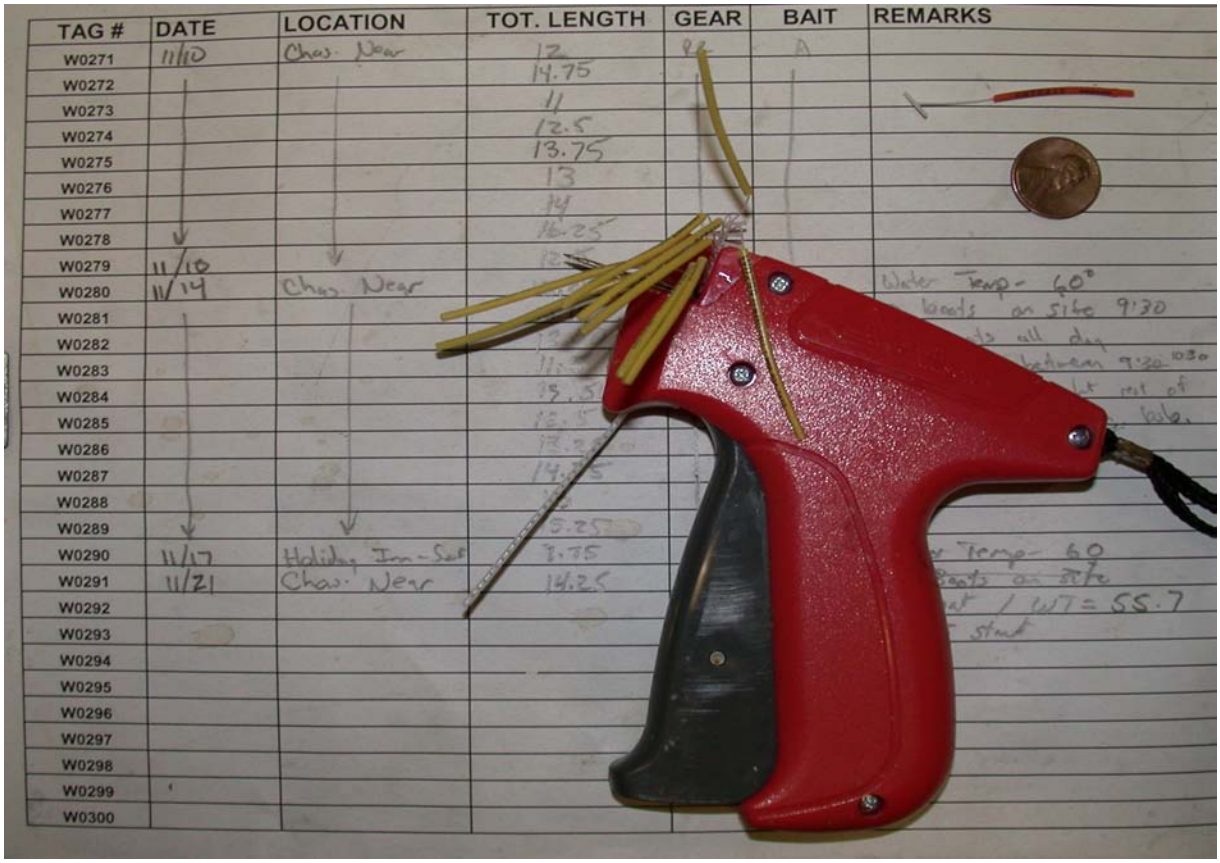
APPENDIX I



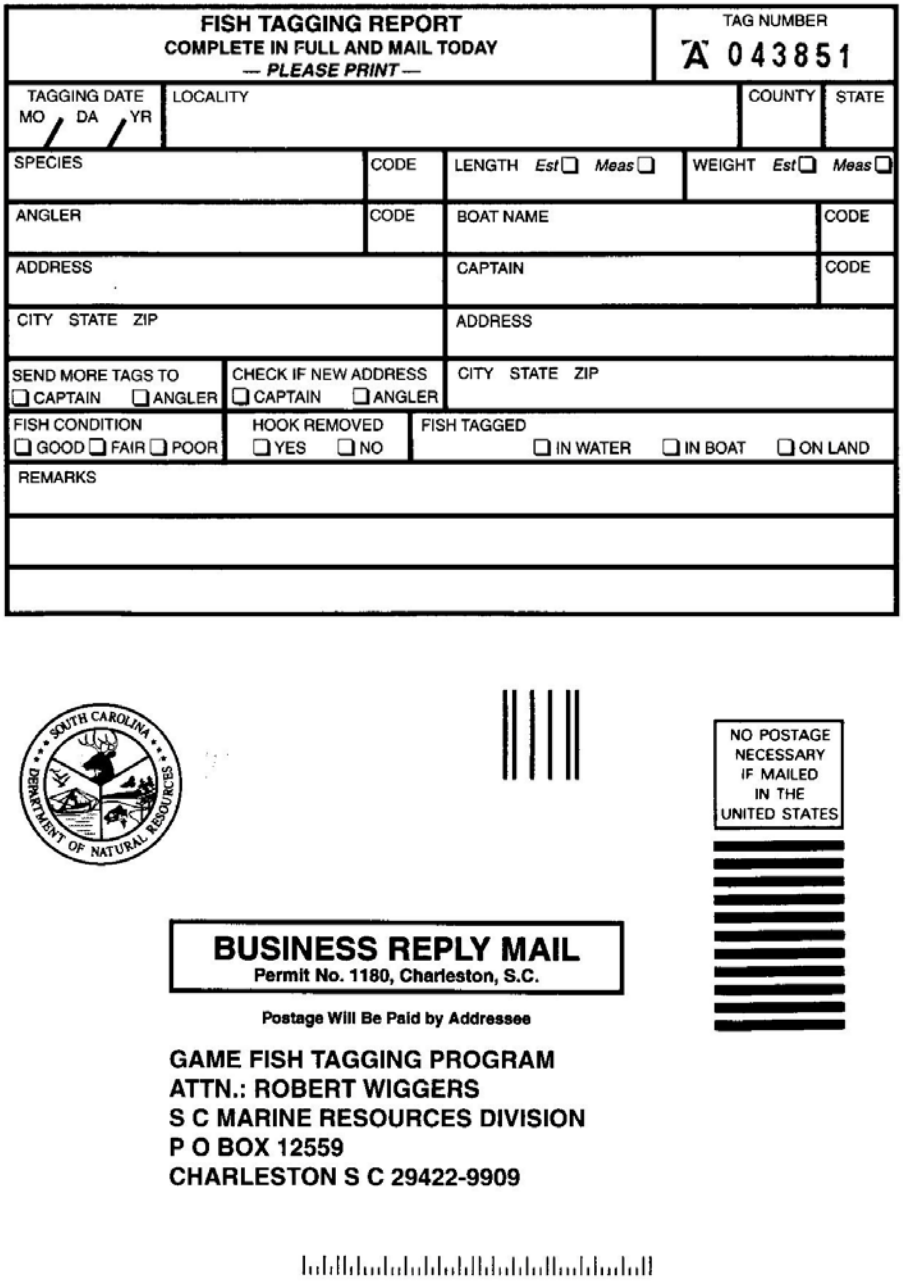
Tagging equipment, from left to right, tag applicator, stainless slotted applicator tip for use with harpoon tags, K series nylon dart tag, E series nylon dart tag.

APPENDIX II



Dennison tag gun with tag strip inserted. Tags come in strips of 50 and T-bar anchor tags (top) exhibit good retention on species with soft tissue. Also shown (background) is a waterproof data sheet for recording catch information.

APPENDIX III



FISH TAGGING REPORT
COMPLETE IN FULL AND MAIL TODAY
— PLEASE PRINT —

TAG NUMBER A 043851

TAGGING DATE MO / DA / YR	LOCALITY			COUNTY	STATE
SPECIES	CODE	LENGTH *Est* ❑ *Meas* ❑		WEIGHT *Est* ❑ *Meas* ❑	
ANGLER	CODE	BOAT NAME		CODE	
ADDRESS		CAPTAIN		CODE	
CITY STATE ZIP		ADDRESS			
SEND MORE TAGS TO ❑ CAPTAIN ❑ ANGLER	CHECK IF NEW ADDRESS ❑ CAPTAIN ❑ ANGLER	CITY STATE ZIP			
FISH CONDITION ❑ GOOD ❑ FAIR ❑ POOR	HOOK REMOVED ❑ YES ❑ NO	FISH TAGGED ❑ IN WATER ❑ IN BOAT ❑ ON LAND			
REMARKS					

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S C MARINE RESOURCES DIVISION
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CHARLESTON S C 29422-9909

Fish tag card included in tagging kits has the tag attached. The back side of the card is printed with the program's address and a bar code used for business reply mail.