

**A Summary of Fish Tagging  
on the Texas Coast:  
November 1975-December 1993**

by  
**B. G. Bowling**

**Management Data Series  
No. 126  
1996**



**COASTAL FISHERIES DIVISION**

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## ABSTRACT

During November 1975-December 1993, 107,717 fishes (63 species) were tagged in Texas bays and offshore waters. Major species tagged included red drum (Sciaenops ocellatus), spotted seatrout (Cynoscion nebulosus), black drum (Pogonias cromis), sheepshead (Archosargus probatocephalus), southern flounder (Paralichthys lethostigma), and striped bass (Morone saxatilis). Overall, 6.9% of the tagged fishes were reported recaptured. Red drum had the highest recapture rate of 11.9%. Most recaptured fishes were caught in the same bay in which they were tagged and within 20 km of their release site. Sheepshead migrated the most, having the highest percentage of fishes that moved to other bay systems. They also traveled greater distances, on average, from their release sites than other species. Black drum were second to sheepshead in average distance traveled and movement to other bays, followed by southern flounder, spotted seatrout, and red drum. All major species (except striped bass) and one minor species, gulf flounder (P. albigutta), were documented moving from bays into the Gulf of Mexico. Only two species, spotted seatrout and black drum, were documented traveling from the gulf into the bays. No observable patterns in movement within bay systems were apparent for any species, except striped bass, which showed downstream and upstream movement within the Trinity River. Most fishes showed no observable patterns in movement between bay systems or within the gulf. Five fishes (two red drum, two black drum, and one spotted seatrout) were recaptured in Mexican waters. Two red drum and one southern flounder were returned from Louisiana. Growth rates for major species are presented.

## INTRODUCTION

Fish tagging on the Texas coast began in 1950 as a cooperative study between the Copano Research Foundation and the Texas Game, Fish and Oyster Commission (Simmons and Breuer 1982, Green 1986). Early tagging efforts occurred in all major bay systems and the Gulf of Mexico. Fishes were marked with monel strap tags, Peterson disc tags, Floy dart tags, and internal abdominal anchor tags with attached streamers. Objectives of early tagging studies were to determine life history information on fishes, especially red drum (Sciaenops ocellatus) and spotted seatrout (Cynoscion nebulosus), and to track movement of fishes between the bay and Gulf of Mexico. From 1950 to 1975, 73,926 fishes were tagged, and 3,386 tagged fishes were recaptured through October 1982 (Green 1986).

In November 1975 the Texas Parks and Wildlife Department (TPWD) expanded and intensified fish tagging efforts on the Texas coast. Ongoing tagging efforts focus mainly on red drum, spotted seatrout, black drum (Pogonias cromis), sheepshead (Archosargus probatocephalus), southern flounder (Paralichthys lethostigma), and striped bass (Morone saxatilis). Other species are tagged infrequently.

The objective of the present study is to summarize fish tagging and tagged fish recaptures from November 1975 through December 1993. Differences between this report and previous reports are a result of updating the database. This report is considered the most accurate.

## MATERIALS AND METHODS

Fishes for tagging were collected from Sabine Lake, Galveston, East Matagorda, Matagorda, San Antonio, Aransas, Corpus Christi, and upper and lower Laguna Madre bay systems; Brazos, San Bernard, and Trinity Rivers; and the Gulf of Mexico during November 1975 through December 1993 (Figure 1). These fishes were obtained during TPWD routine and special sampling using rods and reels, gill nets, trammel nets, bag seines, beach seines, shrimp trawls, trotlines, longlines, and fish traps. Procedures used are described by Matlock and Weaver (1979), Hegen et al. (1984), Fuls (1991), and Boyd et al. (1995). Some stocked hatchery fishes (Dailey 1988) and fishes captured by electrofishing and fish traps (TPWD unpublished data) were also tagged prior to being released into Texas waters. Uniquely numbered internal abdominal anchor tags with external streamers were surgically inserted into a fish's abdominal cavity. Tags were made of rigid glossy blue, green or red-orange plastic (26 x 6 x 1 mm, 14 x 5 x 1 mm or 12 x 3 x 1 mm) with rounded corners. Bright yellow flexible plastic hollow tubing (approximately 50 mm long, O.D. = 2 mm, I.D. = 1 mm) extended from a single hole in the center of each tag. "TEXAS PWD ROCKPORT", "TEXAS PWD SEABROOK", or "TEX. PWD ROCKPORT" was printed on each tag along with a unique alphanumeric or numeric tag number. Only fishes judged to be healthy were tagged using the technique described by Moffett (1961). Date and location of release and length of each tagged fish were recorded. Prior to 1990, only fishes within 25 mm of legal sizes were tagged. Since 1990, tags with tag numbers imprinted additionally on the yellow streamers have been used to tag fishes under or over legal sizes. These tags allow anglers to record the tag numbers and then return fishes to the water with tag intact.

Posters were placed in commercial fish houses, at recreational access points, in sporting goods stores, and on fishing piers to publicize the tagging program. Information on the tagging program was presented on radio and television stations in cities adjacent to each bay system, in newspapers throughout Texas, and in the TPWD magazine. Anglers reporting recaptured tagged fishes were asked date and location of recapture, and length and weight of fishes, if known. A letter was sent to each angler providing a tagging history of their tagged fish. A reward was paid for each tag returned by an angler regardless of information given. For every 100 tags released, there were two preselected \$25 rewards, five \$10 rewards, five \$5 rewards, and 88 \$1

rewards. Rewards were paid by the National Marine Fisheries Service until November 1978 and by the Gulf Coast Conservation Association since December 1978.

From information received by the anglers, distance and direction of travel were determined for each tagged fish, assuming adequate information was received on the recapture location. Distance was determined from nautical charts as the minimum possible distance between the release site and the recapture site by water. Direction of movement was determined from a straight line between release and recapture sites and was recorded in degrees. Growth was calculated as the difference between recapture and release lengths. Recapture lengths reported as "estimates" were not used in growth calculations. Days free was considered to be the difference between recapture and release dates. Daily growth rate was recorded as growth per days free. For growth rate purposes, fishes recaptured on the same day as release were considered to have been free one day. Mean growth rates were adjusted by eliminating outliers following procedures used by Doerzbacher et al. (1988). Recapture rates were calculated as the number of recaptures per releases by species. Fishes recaptured by TPWD personnel on the same day as release and four fishes for which no release information could be found were not included in analyses. Trends in number of recaptures and recapture rates were analyzed using the SAS GLM procedure of least squares regression (SAS Institute Inc. 1987).

## RESULTS

In Texas bays and offshore waters 107,717 fishes (63 species) were tagged from November 1975 through December 1993 (Table 1). Red drum constituted 35.7%, black drum 24.9%, and spotted seatrout 19.4% of the total fishes tagged. An average of 5,928 fishes were tagged annually, exclusive of 1975 (an incomplete year). Annual number tagged ranged from 3,111 in 1984 to 10,221 in 1987. Total number of tagged fishes released ranged from 1,404 in Cedar Lakes to 27,605 in Galveston Bay. In the Gulf of Mexico, 1,710 fishes were tagged (Tables 2-3).

Gill nets caught 46.4%, rods and reels caught 20.6%, and trammel nets caught 15.0% of all fishes tagged. Stocked fishes comprised 13.8% of tagged fishes. Other gears were used infrequently.

Overall, 6.9% of tagged fishes were recaptured and reported to TPWD (Tables 4-6). Of 7,396 tags returned, 74.3% were returned by sport anglers, 19.3% by commercial fishers, and 4.6% by TPWD personnel. Mean number of tags returned per year, excluding 1975, was 408. The year with the most recaptures was 1980 with 821 tags returned; 1990 had the least recaptures with 134 tags returned. Aransas Bay had the highest number of recaptures with 1,520, followed by Galveston Bay with 1,140. Number of recaptures and recapture rates declined significantly ( $p < 0.05$ ) from 1975 to 1993. All major species, except striped bass, had significant declines ( $p < 0.05$ ) in recapture rates.

Comparisons of release lengths and recapture lengths (of major species) are presented in Figure 2.

Total monetary rewards paid for returned tags was \$14,241. There were 6,301 \$1 rewards, 311 \$5 rewards, 311 \$10 rewards, and 131 \$25 rewards. Mean annual payment, excluding 1975, was \$791; the greatest amount was paid in 1980 (\$1,605) and the least amount in 1990 (\$172).

### Red Drum

A total of 38,465 red drum was tagged and released; 4,595 were recaptured for a recapture rate of 11.9%, the highest for all returned fishes. Most (86.2%) were caught in the same bay system in which tagged; 4.9% were recaptured in other bay systems, 4.2% released in bays were recaptured in the gulf, and <1% were released in the gulf and recaptured in the gulf. No gulf

released fish were recaptured in the bays. Of the fish that were recaptured in other bay systems, 82.5% were returned from adjacent bay systems.

The majority (82.3%) of recaptured red drum were recovered within 20 km of the release site. Longest distance traveled was 472 km from Galveston Bay to Grand Isle, Louisiana. Another red drum, also released in Galveston Bay, traveled 245 km and was recaptured 60 km southeast of Calcasieu Pass, Louisiana. Two red drum moved into the gulf off Mexico traveling distances of 13 km and 60 km; both were released in lower Laguna Madre. Average distance traveled by recaptured red drum was 12 km. Greatest distance traveled for a gulf released red drum was 44 km.

Recaptured red drum averaged 193 days at large. The longest a recaptured red drum was free was 4,123 days. The fish was tagged in January 1976 in Christmas Bay (Galveston Bay system) and was recaptured in May 1987 by a commercial fisher off High Island (between Galveston Bay and Sabine Lake) in the Gulf of Mexico. The red drum reportedly grew 445 mm in the 11+ years free. Two red drum were recaptured after five years. One was released and recaptured in San Antonio Bay after 2,156 days free. The other was released in Trinity Bay (Galveston Bay system) and recaptured in the Gulf of Mexico 48 km SE of High Island. Most (87.4%) recaptured red drum were caught within the first year after release.

Reported growth of recaptured red drum ranged from -195 mm to 713 mm. Growth rates ranged from -53 mm/day to 20 mm/day. Mean adjusted growth rate (after elimination of outliers) was  $0.40 \pm 0.41$  mm/day.

#### Spotted Seatrout

Spotted seatrout had a recapture rate of 6.5% with 20,912 releases and 1,367 recaptures. Of the recaptures, 83.9% were caught in the same bay where released; 8.4% were recaptured in another bay system (87.8% from an adjacent bay); 5.2% released in the bays were recaptured in the gulf. Two fish tagged in the gulf were recaptured in the bays. One of these was released at the Galveston jetties and recaptured in Sabine Lake. The other was released off Matagorda Island and recaptured in East Matagorda Bay in Caney Creek. Twelve fish tagged in the gulf were recaptured in the gulf.

The majority of spotted seatrout (72.7%) were recaptured within 20 km of their release site; the average distance traveled was 16 km. Longest distance traveled was 219 km from the Tres Palacios River (Matagorda Bay) to the Texas City Dike (Galveston Bay). One spotted seatrout moved into Mexican waters. This fish was released in lower Laguna Madre and recaptured in Laguna Madre de Tamaulipas, Mexico (exact distance unknown). Greatest distance traveled for gulf released fish was 106 km.

The longest that a recaptured spotted seatrout was free was 1,895 days. The fish was released in Galveston Bay and recaptured in the same bay 37 km from its release site. Four spotted seatrout were free between four and five years. All but one was recaptured in the same bay system as released; none were caught more than 26 km from their release site. Average days free for spotted seatrout was 219 days; 81.4% were recaptured within a year of their release.

Growth of recaptured spotted seatrout ranged from -154 mm to 393 mm. Growth rates ranged from -35 mm/day to 62 mm/day with a mean adjusted growth rate of  $0.23 \pm 0.33$  mm/day.

#### Black Drum

Black drum recapture rate was 3.7% with 26,826 releases and 998 recaptures. Of those recaptured, 78.2% were caught in the same bay where released; 1.8% were recaptured in a different bay system (75.4% from adjacent bay systems), and 3.2% were tagged in the bays and recaptured in the gulf.

One black drum released in the gulf was recaptured inland in a bay. Seven black drum released in the gulf were recaptured in the gulf. Two black drum were reported from Mexican waters. Both were released in lower Laguna Madre.

Recaptured black drum traveled from 0 to 330 km, averaging 23.1 km. Most (68.5%) were recovered within 20 km of the release site. Four traveled >300 km. One traveled 330 km from Powderhorn Lake in Matagorda Bay to South Bay in lower Laguna Madre. Another drum traveled 315 km from lower Laguna Madre to the gulf off Soto La Marina, Mexico. The other two drum traveled 313 km and 302 km, from Nueces Bay in Corpus Christi Bay to San Luis Pass in Galveston Bay and from Mesquite Bay in Aransas Bay to Rollover Pass in Galveston Bay, respectively. Greatest distance traveled by a black drum may have been from Moses Lake in Galveston Bay to lower Laguna Madre, but the exact location of recapture and distance traveled is unknown. Farthest distance traveled by a gulf released black drum was 46 km.

Recaptured black drum were free from 0 to 4,213 days. Average days free was 226, and 80.2% were returned with one year of release. Only three black drum were recaptured greater than six years at large. Two of those were recaptured in different bays systems from their release.

Growth of recaptured black drum ranged from -155 mm to 362 mm. Growth rates ranged from -34 mm/day to 17 mm/day. Mean adjusted growth rate was  $0.20 \pm 0.39$  mm/day.

#### Sheepshead

Out of 4,637 tagged sheepshead, 126 were recaptured for a recapture rate of 2.7%. Only 61.9% of recaptured sheepshead were caught in the same bay as their release; 17.5% were caught in another bay system (68.2% to adjacent bay systems), and 19.0% were released in the bays and recaptured in the gulf. No sheepshead were both tagged and recaptured in the gulf.

Recaptured sheepshead traveled 0 to 315 km from the site of release. Average distance traveled was 27.7 km. Longest distance traveled by a recaptured sheepshead was 315 km from Three Islands in lower Laguna Madre to East Matagorda Bay. The majority (66.3%) of sheepshead were recaptured within 20 km of the release site.

Recaptured sheepshead averaged 172 days free with 83.4% being recaptured within the first year after release. Days free ranged from 2 to 1,070 days. Three sheepshead were recaptured between two and three years after release, but none were free longer than three years.

Growth ranged from -166 mm to 154 mm. Growth rate ranged from -13 mm/day to 5 mm/day. After adjusting for outliers, the mean adjusted growth rate showed negative growth and, hence, will not be presented.

#### Southern Flounder

A total of 3,469 southern flounder was tagged, and 184 were recaptured for a recapture rate of 5.3%. Most southern flounder (81.5%) were recaptured in the same bay as their release; 10.3% were recaptured in another bay system (94.7% in an adjacent bay system), and 2.2% tagged in the bays were recaptured in the gulf. One flounder released in the gulf was recaptured in the gulf. None released in the gulf were recaptured in the bays.

Southern flounder traveled an average distance of 14 km from their release site. Most southern flounder (73.9%) were recaptured within 20 km of the release site. Longest distance traveled was 182 km from Rahal Bayou in San Antonio Bay to Chocolate Bayou in Matagorda Bay. One flounder traveled 167 km from Trinity Bay in Galveston Bay to Big Lake near Hackberry, Louisiana. All other flounder traveled < 90 km from their release sites.

Average days free for recaptured southern flounder was 172 days. Days free ranged from 0 to 1,114 days with 89.9% returned within a year of their release. Only two flounder were free for more than two years.

Growth ranged from -96 mm to 178 mm. Growth rates ranged from -11 mm/day to 19 mm/day, with an mean adjusted growth rate of  $0.26 \pm 0.41$  mm/day.

### Striped Bass

Nearly 85% of the 11,219 striped bass tagged and released were hatchery-raised fish or brood stock from state and federal hatcheries. They were released into four bay systems: Sabine Lake (780 fish), Galveston Bay (7,582 fish), Cedar Lakes (1,098 fish), and Matagorda Bay (4 fish). Another 14% were caught using electroshocking methods and released in the Trinity River (just below the Lake Livingston dam) which empties into Galveston Bay. Only 189 fish were actually caught, tagged and released in a major bay system; all but one of those fish were released into Galveston Bay. Overall recapture rate for striped bass was 0.7% with 82 recaptures. Recapture rate for stocked fish was 0.1%, for electroshocked fish was 3.8%, and for all other gears was 4.9%. All fish were recaptured in the same bay system as the release; Trinity River was considered as part of Galveston Bay. Eighty recaptures were from Galveston Bay, and two recaptures were from the Cedar Lakes area.

Sixty recaptured striped bass were released at the Lake Livingston dam; 50 of those fish were recaptured at the dam. The other 10 fish released at the dam traveled down the Trinity River. Two were recaptured in the river; two were caught 161 km south of the dam at the mouth of the river, and six were recaptured 167 km away at the Houston Lighting & Power (HL&P) cooling pond outfall in Trinity Bay. Days free for those released at the dam ranged from 15 to 1,164 days, averaging 195 days. The majority (84.1%) were recaptured within a year of release. Only two fish were free more than two years.

Nine recaptured fish were tagged and released in Galveston Bay proper. All were tagged at the HL&P cooling pond outfall in Trinity Bay. All but one were recaptured at the same release site. One fish traveled up the Trinity River and was caught at the Lake Livingston dam. All were recaptured within one year of release, the longest time free being 222 days.

Thirteen striped bass recaptures were from stocked fish. Two were released and recaptured in the Brazos River. Eleven were released in the Trinity River between Lake Livingston and Trinity Bay. Of those 11 fish, six traveled upstream and were recaptured below Lake Livingston dam. Three traveled downstream and were recaptured in Trinity Bay. The other two were recaptured in the river. Average distance traveled was 66 km. Recaptured stocked fish were free from 30 to 1,176 days, averaging 365 days free. Nine (69.2%) were recaptured within one year of release.

Overall mean adjusted growth rate of recaptured striped bass was  $0.28 \pm 0.39$  mm/day, ranging from 0 to 6 mm/day. Mean adjusted growth rate was  $0.36 \pm 0.57$  mm/day for fish released at Lake Livingston dam,  $0.45 \pm 0.28$  mm/day for stocked fish, and  $0.11 \pm 0.22$  mm/day for all other fish.

### Other Species

Other recaptured species included Atlantic croaker (*Micropogonias undulatus*), hardhead catfish (*Arius felis*), blue catfish (*Ictalurus furcatus*), alligator gar (*Lepisosteus spatula*), gulf kingfish (*Menticirrhus littoralis*), tarpon (*Megalops atlanticus*), bull shark (*Carcharhinus leucus*), gulf flounder (*P. albigutta*), and red snapper (*Lutjanus campechanus*) (Table 1). All were recaptured within a year of their release except the alligator gar (430 days free) and the gulf kingfish (608 days free). All were recaptured in the same bay or area of release with two exceptions. The recaptured tarpon was tagged and released from a TPWD gill net sample in Copano Bay (Aransas Bay system).

Twenty days later the tarpon was recaptured in a TPWD gill net in upper San Antonio Bay near Swan Point, traveling a distance of 53 km. One gulf flounder released in lower Laguna Madre was recaptured in the gulf at an oil platform 42 km off Port Aransas.

The 21 recaptured red snapper were among 265 red snapper tagged and released at the Port Aransas Liberty Ship (33 km SE of Port Aransas) in 1979. All were caught at the same site. Longest time free was 75 days. Another 48 red snapper, all juveniles, were tagged and released from trawl samples off Port Aransas between 1990 and 1992. No recaptures have been reported from this group.

## DISCUSSION

Table 7 summarizes recapture rates presented in this study and those of previous studies. The extremely low recapture rate for stocked striped bass suggests that these fish may not be good candidates for tagging, possibly due to their small size or the method of handling. Texas does not have an extensive striped bass fishery and directed efforts to catch striped bass are concentrated almost entirely at the Lake Livingston dam and HL&P cooling pond outfall in Galveston Bay (TPWD unpublished data). Lack of a directed fishery in areas where stocked striped bass are released may also account for the low recapture rate. Absence of recaptures from other species is likely due to the low number of those species tagged (Beaumariage and Wittich, 1966). Reasons for significant declines in recapture rates are unknown. Simmons and Breuer (1982) suggest that survival of tagged fishes and, thus, recapture rates depend on several factors: 1) method of capture, 2) shock and stress during handling, 3) the type of tag used and the skill of the person tagging the fishes, 4) tag shedding rates, 5) natural mortality, and 6) fishing mortality. Green (1986) states that mass tagging at single sites yields fewer recaptures than scattered tagging or tagging of smaller groups over a time period.

Rawston (1971) and Matlock (1981) report that monetary rewards increase reporting rates by anglers. High Florida recapture rates may have been influenced by extensive publicity and payment of high monetary rewards (Matlock and Weaver 1979). When rewards as high as \$10,000 were offered to Florida anglers, they returned over 50% of the tagged red drum released (Beaumariage 1969). Beaumariage and Wittich (1966) report that recaptures decreased sharply after the high rewards were withdrawn. They also noticed an increase in reported growth and movement errors when the motivation for returning tagged fishes was primarily monetary. Excessive rewards and extensive publicity may also result in biased estimates of exploitation rates of population sizes if anglers actively seek tagged fishes or have privileged knowledge of when and where fishes were released (Ingle et al. 1962, Matlock 1981).

Most recaptured fishes were caught in the same bay in which tagged and within 20 km from the release site. This corresponds with previous findings (Matlock and Weaver 1979, Osburn et al. 1982, Osburn and Matlock 1984, Marwitz 1989). Sheepshead migrated the most, having the highest percentage of fish moving to other bay systems and to the gulf. They also traveled a greater distance, on average, from their release sites than the other major species. Black drum was second to sheepshead in average distance traveled and movement to other bays, followed by southern flounder, spotted seatrout, and red drum. In contrast, Green (1986) found that black drum traveled greater distances than other fishes, and southern flounder were most likely to move out of the bay of release. In that study 88.1% of sheepshead remained in the same bay as release compared to 61.9% in this study. All major species, except striped bass, and one minor species, gulf flounder, were documented moving from bays into the gulf. Only two species, spotted seatrout and black drum, were documented traveling from the gulf into the bays. No observable patterns in direction of movement within bay systems were apparent for any species, except striped bass which showed downstream and upstream movement within the Trinity River. Most species showed no observable patterns in direction of movement between bay systems or within the gulf. However, previous studies have

documented movement patterns related to seasons and water temperatures (Stokes 1977, Ross et al. 1982, Baker et al. 1986), and a more detailed analysis of the present data may reveal the same.

Five fishes (two red drum, two black drum, and one spotted seatrout) were reported to have traveled into Mexican waters and three (two red drum and one southern flounder) into Louisiana waters. Simmons and Breuer (1982) documented a red drum released in San Antonio Bay and recovered in Tampa Bay, Florida. They also recorded several black drum that were released in lower Laguna Madre and returned from Mexico. The percentage of fishes traversing state and international borders is probably higher than suggested by this study. Language barriers and political distrust, along with lack of publicity about the tagging program, have most likely hampered reporting rates from Mexico. Lack of publicity may also affect reporting rates from other states. To what degree fishes leave state waters will be hard to determine. However, the fact that some fishes do travel outside Texas waters indicates that bordering countries' and states' fishery management programs may have some effect, though possibly small and localized, on fish populations in Texas waters.

Although growth and growth rates are reported in this paper, the data should be used with caution due to the variability of reported recapture lengths. Nearly 14.5% of reported recapture lengths showed negative growth. Although some shrinkage in length is possible from starvation, desiccation, or freezing, reported mean shrinkages have not exceeded 10 mm (Ingle et al. 1962, Rice et al. 1989). Any difference greater than this should be considered suspect, due to erroneous release or recapture measurements, estimated lengths reported as accurate lengths, or possibly errors in the reported tag numbers. Ferguson et al. (1984) reported that anglers tended to round measurements to the nearest whole English unit which would cause measurement errors up to  $\pm 12.7$  mm. Green et al. (1983) found that the differences between TPWD measurements and anglers' measurements showed a mean of  $-4 \pm 5$  mm and ranged between  $\pm 76$  mm. Extremes in both positive and negative growth should be examined with care. Elimination of some outliers is possible, but there is no guarantee that the rest of the measurements are more accurate or precise than the obvious outliers. Growth data from this study may be used to show general trends in growth over time, but more detailed analyses would require more precise methods of measurements (Ferguson et al. 1984). Better estimates could be obtained by using a less conservative approach to eliminating outliers than that suggested by Doerzbacher et al. (1988) and by limiting the data to fish that had been free for a minimum amount of time. Beaumariage and Wittich (1966) and Ferguson et al. (1984) suggested obtaining growth information only from fishes that have been free for a relatively long time (such as a year or more).

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Table 1. Number of tag releases, recaptures, and subsequent recapture rates by species for fishes tagged and released into Texas bays and offshore waters from November 1975-December 1993.

Common name	Scientific name	Releases	Recaptures	Recapture rate
Alligator gar	<u>Lepisosteus spatula</u>	14	1	7%
Atlantic croaker	<u>Micropogonias undulatus</u>	340	4	1%
Atlantic sharpnose shark	<u>Rhizoprionodon terraenovae</u>	3		
Atlantic spadefish	<u>Chaetodipterus faber</u>	19		
Atlantic stingray	<u>Dasyatis sabina</u>	3		
Black drum	<u>Pogonias cromis</u>	26,826	998	4%
Blacktip shark	<u>Carcharhinus limbatus</u>	1		
Blue catfish	<u>Ictalurus furcatus</u>	38	1	3%
Bluefish	<u>Pomatomus saltatrix</u>	4		
Bonnethead	<u>Sphyrna tiburo</u>	2		
Bull shark	<u>Carcharhinus leucas</u>	24	1	4%
Common carp	<u>Cyprinus carpio</u>	9		
Common snook	<u>Centropomus undecimalis</u>	299		
Cownose ray	<u>Rhinoptera bonasus</u>	7		
Crested cusk-eel	<u>Ophidion welshi</u>	1		
Crevalle jack	<u>Caranx hippos</u>	11		
Fat snook	<u>Centropomus parallelus</u>	2		
Finescale menhaden	<u>Brevoortia gunteri</u>	1		
Finetooth shark	<u>Carcharhinus isodon</u>	1		
Flathead catfish	<u>Pylodictis olivaris</u>	1		
Florida pompano	<u>Trachinotus carolinus</u>	47		
Gafftopsail catfish	<u>Bagre marinus</u>	267		
Gag	<u>Mycteroperca microlepis</u>	1		
Gizzard shad	<u>Dorosoma cepedianum</u>	8		
Gray snapper	<u>Lutjanus griseus</u>	6		
Great hammerhead	<u>Sphyrna mokarran</u>	1		
Greater amberjack	<u>Seriola dumerili</u>	3		
Gulf flounder	<u>Paralichthys albigutta</u>	270	12	4%
Gulf kingfish	<u>Menticirrhus littoralis</u>	57	1	2%
Gulf menhaden	<u>Brevoortia patronus</u>	2		
Hardhead catfish	<u>Arius felis</u>	69	2	3%
Hybrid bass	<u>Morone saxatilis x chrysops</u>	3		
King mackerel	<u>Scomboromorus cavella</u>	3		
Ladyfish	<u>Elops saurus</u>	3		
Lane snapper	<u>Lutjanus synagris</u>	3		
Largemouth bass	<u>Micropterus salmoides</u>	4		
Lemon shark	<u>Negaprion brevirostris</u>	1		
Ocellated flounder	<u>Ancylopsetta quadrocellata</u>	4		
Palometa	<u>Trachinotus goodei</u>	5		
Pigfish	<u>Orthopristis chrysoptera</u>	4		
Pinfish	<u>Lagodon rhomboides</u>	8		
Red drum	<u>Sciaenops ocellatus</u>	38,465	4,595	12%
Red snapper	<u>Lutjanus campechanus</u>	313	21	7%
Remora	<u>Remora remora</u>	1		
Sand seatrout	<u>Cynoscion arenarius</u>	15		
Sheepshead	<u>Archosargus probatocephalus</u>	4,637	126	3%
Silver seatrout	<u>Cynoscion nothus</u>	1		
Smallmouth buffalo	<u>Ictiobus bubalus</u>	8		
Southern flounder	<u>Paralichthys lethostigma</u>	3,469	184	5%
Southern kingfish	<u>Menticirrhus americanus</u>	21		
Southern stargazer	<u>Astroscopus y-graecum</u>	3		
Southern stingray	<u>Dasyatis americanus</u>	1		
Spinner shark	<u>Carcharhinus brevipinna</u>	2		
Spot	<u>Leiostomus xanthurus</u>	92		
Spotted gar	<u>Lepisosteus oculatus</u>	3		
Spotted seatrout	<u>Cynoscion nebulosus</u>	20,912	1,367	7%
Striped bass	<u>Morone saxatilis</u>	11,219	82	1%
Striped mullet	<u>Mugil cephalus</u>	112		
Tarpon	<u>Megalops atlanticus</u>	51	1	2%
Tripletail	<u>Lobotes surinamensis</u>	9		
White bass	<u>Morone chrysops</u>	6		
White perch	<u>Morone americana</u>	1		
Yellow bass	<u>Morone mississippiensis</u>	1		

Table 2. Number of major fishes tagged with internal abdominal anchor tags for each calendar year during November 1975-December 1993.

Release location	Year	Red drum	Spotted seatrout	Black drum	Sheeps-head	Southern flounder	Striped bass	Other species	All species
Sabine Lake	1975	5	0	2	0	0	0	0	7
	1976	5	0	8	0	0	0	0	13
	1986	105	17	150	0	36	0	4	312
	1987	92	5	90	0	20	0	1	208
	1988	77	4	51	6	4	0	3	145
	1989	79	1	50	3	5	0	0	138
	1990	61	0	19	3	3	0	0	86
	1991	36	1	26	5	1	780	6	855
	1992	351	1	30	1	1	0	3	387
	1993	118	1	52	10	6	0	11	198
Total		929	30	478	28	76	780	28	2,349
Galveston Bay	1975	80	0	47	8	2	0	0	137
	1976	248	572	335	27	47	0	61	1,290
	1977	162	65	192	26	41	0	0	486
	1978	302	133	284	70	86	0	1	876
	1979	260	227	173	37	33	0	1	731
	1980	241	803	11	17	19	0	0	1,091
	1981	126	762	109	25	14	0	0	1,036
	1982	210	869	43	11	5	0	0	1,138
	1983	1,682	703	94	11	3	0	8	2,501
	1984	856	176	141	34	35	0	5	1,247
	1985	1,425	300	218	20	47	39	1	2,050
	1986	678	59	136	1	6	91	2	973
	1987	252	51	199	0	37	7,118	0	7,657
	1988	206	53	217	2	37	436	8	959
	1989	139	54	216	23	20	172	4	628
	1990	360	103	209	7	29	24	2	734
	1991	57	46	278	17	22	393	19	832
	1992	561	128	288	14	42	931	42	2,006
	1993	629	80	317	18	30	132	27	1,233
Total		8,474	5,184	3,507	368	555	9,336	181	27,605
Cedar Lakes area	1984	4	125	0	0	1	0	0	130
	1988	0	0	0	0	0	408	0	408
	1989	101	0	0	0	0	115	0	216
	1990	57	4	0	0	0	575	0	636
	1991	13	0	1	0	0	0	0	14
Total		175	129	1	0	1	1,098	0	1,404
East Matagorda Bay	1976	78	0	216	13	47	0	0	354
	1977	73	0	143	78	67	0	0	361
	1978	79	0	96	56	22	0	0	253
	1979	53	0	45	4	10	0	0	112
	1980	102	0	47	30	2	0	0	181
	1981	37	327	27	13	4	0	0	408
	1982	83	453	106	27	11	0	0	680
	1983	102	605	110	95	8	0	0	920
	1984	108	35	63	33	17	0	0	256
	1985	42	0	76	25	3	0	0	146
	1986	792	0	44	33	38	0	0	907
	1987	487	0	65	2	14	0	0	568
	1988	91	1	80	12	17	0	0	201
	1989	112	2	147	28	19	0	0	308
	1990	100	11	77	54	30	0	0	272
1991	62	0	74	33	18	0	0	187	
1992	118	5	176	28	20	0	0	347	
1993	367	31	188	52	29	0	0	667	
Total		2,886	1,470	1,780	616	376	0	0	7,128
Matagorda Bay	1975	74	0	29	0	11	0	0	114
	1976	466	1	323	36	58	0	5	889
	1977	539	0	480	80	28	0	2	1,129
	1978	521	217	267	79	27	0	0	1,111
	1979	771	0	155	60	18	0	5	1,009
	1980	285	0	63	10	8	0	0	366
	1981	121	405	22	8	3	0	0	559

Table 2. (Cont'd)

Release location	Year	Red drum	Spotted seatrout	Black drum	Sheeps-head	Southern flounder	Striped bass	Other species	All species
Matagorda Bay (cont'd)	1982	72	633	67	10	4	0	0	786
	1983	166	626	100	30	16	1	44	983
	1984	46	305	60	33	3	4	0	451
	1985	63	0	107	15	12	0	1	198
	1986	200	0	133	35	24	0	0	392
	1987	139	0	93	10	19	0	0	261
	1988	118	1	98	14	12	0	0	243
	1989	61	1	141	10	22	0	0	235
	1990	122	0	102	17	12	0	1	254
	1991	76	3	65	5	7	0	0	156
	1992	33	1	72	27	4	0	0	137
	1993	112	8	202	41	13	0	1	377
	Total		3,985	2,201	2,579	520	301	5	59
San Antonio Bay	1975	96	0	76	0	6	0	0	178
	1976	532	1	186	95	40	0	20	874
	1977	182	0	106	70	21	0	11	390
	1978	276	66	103	40	47	0	2	534
	1979	676	0	154	179	73	0	8	1,090
	1980	278	0	179	80	14	0	2	553
	1981	143	343	132	128	19	0	4	769
	1982	50	637	47	2	4	0	0	740
	1983	60	616	51	3	26	0	0	756
	1984	83	23	28	3	28	0	0	165
	1985	62	0	64	11	45	0	0	182
	1986	169	0	65	5	48	0	0	287
	1987	212	42	127	8	44	0	0	433
	1988	156	6	112	14	7	0	0	295
	1989	153	35	126	25	11	0	0	350
	1990	88	7	81	37	26	0	60	299
	1991	58	7	100	26	30	0	62	283
	1992	219	8	314	43	44	0	153	781
	1993	184	24	462	33	29	0	55	787
Total		3,677	1,815	2,513	802	562	0	377	9,746
Aransas Bay	1975	36	0	61	0	3	0	0	100
	1976	345	23	412	240	38	0	34	1,092
	1977	147	0	135	38	28	0	0	348
	1978	409	73	238	110	33	0	0	863
	1979	443	164	226	157	46	0	0	1,036
	1980	1,194	219	188	98	51	0	0	1,750
	1981	692	703	150	104	44	0	0	1,693
	1982	296	760	297	70	50	0	0	1,473
	1983	131	686	209	49	30	0	0	1,105
	1984	63	34	74	24	36	0	0	231
	1985	122	9	61	12	31	0	280	515
	1986	127	2	87	4	14	0	0	234
	1987	79	4	79	4	3	0	0	169
	1988	90	11	97	3	10	0	0	211
	1989	92	26	260	17	31	0	0	426
	1990	169	37	212	23	31	0	0	472
	1991	120	7	74	0	20	0	0	221
1992	168	12	156	18	28	0	0	382	
1993	257	45	589	17	7	0	0	915	
Total		4,980	2,815	3,605	988	534	0	314	13,236
Corpus Christi Bay	1975	60	0	54	28	39	0	10	191
	1976	155	18	135	131	46	0	111	596
	1977	225	1	77	56	29	0	11	399
	1978	268	10	108	127	43	0	20	576
	1979	337	106	113	98	53	0	25	732
	1980	307	160	49	29	26	0	0	571
	1981	190	445	106	7	12	0	0	760
	1982	96	673	65	3	3	0	0	840
	1983	46	632	113	0	8	0	0	799
	1984	80	36	113	11	24	0	0	264
	1985	142	18	39	27	29	0	0	255
	1986	124	49	115	8	41	0	0	337
	1987	113	70	85	7	19	0	10	304
1988	119	20	189	10	17	0	0	355	

Table 2. (Cont'd)

Release location	Year	Red drum	Spotted seatrout	Black drum	Sheeps-head	Southern flounder	Striped bass	Other species	All species
<b>Corpus Christi Bay (cont'd)</b>	1989	122	33	284	48	17	0	0	504
	1990	188	62	220	95	44	0	0	609
	1991	325	64	140	15	58	0	19	621
	1992	3,124	126	377	39	47	0	10	3,723
	1993	372	159	1,244	47	55	0	30	1,907
	Total	6,393	2,682	3,626	786	610	0	246	14,343
<b>Upper Laguna Madre</b>	1975	31	0	129	0	6	0	0	166
	1976	121	8	248	6	3	0	49	435
	1977	65	3	102	5	0	0	0	175
	1978	94	27	1,463	0	15	0	0	1,599
	1979	113	49	96	0	2	0	0	260
	1980	203	44	124	22	8	0	0	401
	1981	92	353	142	0	7	0	0	594
	1982	66	624	78	0	17	0	0	785
	1983	40	602	41	0	12	0	0	695
	1984	86	0	85	0	2	0	0	173
	1985	201	9	241	0	24	0	0	475
	1986	51	4	208	1	21	0	0	285
	1987	77	4	208	0	3	0	0	292
	1988	73	1	285	3	5	0	0	367
	1989	28	14	544	7	3	0	0	596
	1990	50	1	290	23	4	0	10	378
	1991	986	26	255	10	46	0	0	1,323
	1992	112	63	323	18	9	0	0	525
	1993	179	17	547	13	6	0	0	762
Total	2,668	1,849	5,409	108	193	0	59	10,286	
<b>Lower Laguna Madre</b>	1975	32	0	72	0	13	0	0	117
	1976	199	16	209	20	15	0	181	640
	1977	139	2	285	10	11	0	0	447
	1978	421	174	481	242	31	0	0	1,349
	1979	183	57	140	75	21	0	25	501
	1980	218	53	90	8	6	0	0	375
	1981	298	467	54	10	4	0	0	833
	1982	185	637	38	0	2	0	0	862
	1983	96	612	7	0	5	0	0	720
	1984	160	21	7	0	0	0	0	188
	1985	349	11	153	0	1	0	0	514
	1986	133	0	163	1	23	0	0	320
	1987	82	3	168	2	20	0	0	275
	1988	109	2	145	1	6	0	0	263
	1989	116	6	106	0	1	0	0	229
	1990	201	8	263	0	2	0	0	474
	1991	270	15	65	0	25	0	0	375
	1992	464	26	128	1	8	0	0	627
	1993	395	39	395	29	4	0	0	862
Total	4,050	2,149	2,969	399	198	0	206	9,971	
<b>Gulf of Mexico off Sabine Lake</b>	1987	0	2	2	0	1	0	0	5
	1988	3	41	8	1	2	0	47	102
	1989	2	18	25	0	4	0	0	49
	1990	0	15	11	0	1	0	0	27
	1991	14	29	18	0	4	0	10	75
	1992	1	3	0	0	2	0	0	6
	1993	0	3	2	0	1	0	22	28
Total	20	111	66	1	15	0	79	292	
<b>Gulf of Mexico off Galveston Bay</b>	1976	9	0	0	0	0	0	0	9
	1977	8	0	0	0	0	0	0	8
	1987	0	3	0	0	1	0	0	4
	1988	2	59	6	1	7	0	28	103
	1989	4	49	6	0	4	0	0	63
	1990	1	32	3	2	0	0	0	38
	1991	3	29	3	1	12	0	0	48
	1992	3	37	3	2	4	0	0	49
	1993	1	31	31	4	5	0	0	72
Total	31	240	52	10	33	0	28	394	

Table 2. (Cont'd)

Release location	Year	Red drum	Spotted seatrout	Black drum	Sheeps-head	Southern flounder	Striped bass	Other species	All species
Gulf of Mexico off Matagorda Bay	1981	7	0	0	0	0	0	0	7
	1982	3	0	0	0	0	0	0	3
	1987	4	11	8	0	0	0	0	23
	1988	7	50	9	1	0	0	0	67
	1989	3	26	15	1	0	0	0	45
	1990	5	12	26	0	0	0	11	54
	1991	19	17	9	2	0	0	10	57
	1992	28	33	33	3	3	0	15	115
	1993	1	4	11	0	0	0	15	31
Total		77	153	111	7	3	0	51	402
Gulf of Mexico off Corpus Christi Bay	1979	0	0	0	0	0	0	270	270
	1987	0	5	3	0	2	0	0	10
	1988	1	8	5	1	0	0	0	15
	1989	6	16	35	1	2	0	15	75
	1990	12	16	27	1	3	0	31	90
	1991	41	15	43	0	3	0	22	124
	1992	15	8	3	0	1	0	19	46
	1993	38	2	2	0	1	0	0	43
	Total		113	70	118	3	12	0	357
Gulf of Mexico off Laguna Madre	1988	0	6	1	1	0	0	0	8
	1989	2	1	2	0	0	0	0	5
	1990	1	6	4	0	0	0	0	11
	1991	0	0	3	0	0	0	0	3
	1992	4	1	2	0	0	0	0	7
Total		7	14	12	1	0	0	0	34
Coastwide	1975	414	0	470	36	80	0	10	1,010
	1976	2,158	639	2,072	568	294	0	461	6,192
	1977	1,540	71	1,520	363	225	0	26	3,745
	1978	2,370	700	3,040	724	304	0	37	7,175
	1979	2,836	603	1,102	610	256	0	341	5,748
	1980	2,828	1,279	751	294	134	0	11	5,297
	1981	1,706	3,805	742	295	107	0	11	6,666
	1982	1,061	5,286	741	123	96	0	2	7,309
	1983	2,323	5,082	725	188	108	1	55	8,482
	1984	1,486	755	571	138	146	4	11	3,111
	1985	2,406	347	959	110	192	39	298	4,351
	1986	2,379	131	1,101	88	251	91	17	4,058
	1987	1,537	200	1,127	33	183	7,118	23	10,221
	1988	1,052	263	1,303	70	124	844	127	3,783
	1989	1,020	282	1,957	163	139	287	39	3,887
	1990	1,415	314	1,544	262	185	599	126	4,445
	1991	2,080	259	1,154	114	246	1,173	157	5,183
1992	5,201	452	1,905	194	213	931	255	9,151	
1993	2,653	444	4,042	264	186	132	182	7,903	
Grand Total		38,465	20,912	26,826	4,637	3,469	11,219	2,189	107,717

Table 3. Number of "other species" of fishes tagged with internal abdominal anchor tags for each calendar year during November 1975-December 1993.

Release location	Year	Common name	Number	Release location	Year	Common name	Number
Sabine Lake	1986	Atlantic croaker	4	San Antonio Bay (cont'd)	1979	White bass	5
	1987	Yellow bass	1			Gulf flounder	3
	1988	Atlantic croaker	1		1980	Gulf flounder	1
		Gafftopsail catfish	2			Largemouth bass	1
	1991	Atlantic croaker	1		1981	Gulf flounder	4
		Blue catfish	5		1984	Gulf flounder	1
	1992	Atlantic croaker	1		1986	Florida pompano	1
		Blue catfish	2		1987	Flathead catfish	1
	1993	Atlantic croaker	4		1988	Gulf flounder	4
		Blue catfish	4		1989	Gafftopsail catfish	1
Largemouth bass		3		Gulf flounder	1		
Galveston Bay	1976	Atlantic croaker	47	1990	Hardhead catfish	2	
		Gizzard shad	2		Gafftopsail catfish	40	
		Spot	1		Striped mullet	1	
		Hardhead catfish	6		Blue catfish	1	
		Striped mullet	4		Hybrid bass	1	
		Tripletail	1		Smallmouth buffalo	3	
	1978	Gulf flounder	1		Atlantic spadefish	1	
	1979	Gulf flounder	1		Tripletail	1	
	1983	Atlantic croaker	8		Alligator gar	1	
	1984	Atlantic croaker	5		Spotted gar	2	
	1985	Tarpon	1		Tarpon	1	
	1986	Tarpon	2		Florida pompano	3	
	1988	Atlantic croaker	7	1991	Gulf flounder	2	
		Gizzard shad	1		Atlantic croaker	1	
	1989	Gafftopsail catfish	3			Gizzard shad	1
		Sand seatrout	1			Spot	1
	1990	Gafftopsail catfish	1			Hardhead catfish	4
		Striped mullet	1			Gafftopsail catfish	23
	1991	Atlantic croaker	3			Striped mullet	3
		Gafftopsail catfish	16			Blue catfish	3
	1992	Atlantic croaker	4			Smallmouth buffalo	1
		Gulf menhaden	1			Atlantic spadefish	1
		Gafftopsail catfish	23		Common carp	2	
		Striped mullet	1		Finescale menhaden	1	
		Blue catfish	12		Cownose ray	1	
		Pigfish	1		Alligator gar	4	
		1993	Hybrid bass	2		Atlantic stingray	1
	1993	Atlantic croaker	5		Spotted gar	1	
		Gafftopsail catfish	13		Bluefish	2	
		Blue catfish	6		Bull shark	10	
		Bull shark	1		Gulf flounder	1	
					Finetooth shark	1	
					1992	Atlantic croaker	1
						Gafftopsail catfish	118
	Matagorda Bay	1976	Hardhead catfish	1		Striped mullet	3
Southern kingfish			2		Sand seatrout	1	
Gulf flounder			2		Blue catfish	5	
1977		Hybrid bass	1		Smallmouth buffalo	4	
		Gulf flounder	1		Pinfish	1	
1979		Gulf flounder	5		Common carp	2	
1983		Tarpon	44		Alligator gar	7	
1985		Crested cusk-eel	1		Bluefish	1	
1990	Tripletail	1		Florida pompano	1		
1993	Gulf flounder	1		Bull shark	4		
East Matagorda Bay	1988	Hardhead catfish	4	1993	Gulf flounder	5	
		Hardhead catfish	7		Atlantic croaker	7	
		Tripletail	1		Gizzard shad	1	
		Hybrid bass	1		Hardhead catfish	3	
		Gafftopsail catfish	1		Gafftopsail catfish	25	
San Antonio Bay	1976	Atlantic spadefish	2		Common carp	3	
		Florida pompano	1		Cownose ray	4	
		Gulf flounder	17		Tripletail	1	
	1977	Gulf flounder	11		Atlantic stingray	1	
	1978	White bass	1		Florida pompano	2	
Gulf flounder		1		Bull shark	6		
				Southern kingfish	2		
				Aransas Bay	1976	Gulf menhaden	1
						Gizzard shad	3

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Table 3. (Cont'd)

Release location	Year	Common name	Number	Release location	Year	Common name	Number										
Arasas Bay (cont'd)	1976	Spot	9	Upper Laguna Madre (cont'd)	1976	Hardhead catfish	8										
		Hardhead catfish	3			Striped mullet	4										
		Striped mullet	9			Pinfish	2										
		Alligator gar	2			Gulf flounder	6										
		Gulf flounder	7			1985 Atlantic croaker	8										
	1977	Gulf flounder	2		1988	Atlantic croaker	1										
		Gulf flounder	8			Atlantic spadefish	1										
	1978	Common snook	1		1989	Florida pompano	1										
		Gulf flounder	6			Gulf flounder	2										
	1980	Atlantic croaker	4		1990	Atlantic spadefish	1										
		Gulf flounder	4			Florida pompano	7										
	1981	Gulf flounder	4			Gulf flounder	2										
		Gulf flounder	2			1991	Gulf flounder	1									
	1982	Gulf flounder	2		1992		Atlantic spadefish	4									
		Gulf flounder	2			Cownose ray	2										
	1984	Common snook	280		1993	Gulf flounder	1										
		Gulf flounder	1			Striped mullet	1										
	1985	Gulf flounder	1			Common snook	2										
		Tarpon	1			Florida pompano	4										
1986	Gulf flounder	2															
	Gulf flounder	2															
1987	Common snook	1															
	Tarpon	1															
1988	Gulf flounder	2															
	Tripletail	2															
1989	Tripletail	2															
	Tarpon	1															
Corpus Christi Bay	1975	Atlantic croaker	2	Lower Laguna Madre	1976	Atlantic croaker	57										
		Gulf flounder	8			Spot	40										
	1976	Atlantic croaker	52			1976	Hardhead catfish	23									
		Spot	7				Striped mullet	54									
		Hardhead catfish	8				Pinfish	3									
		Striped mullet	8				Pigfish	3									
	1977	Gulf flounder	36			1978	Gulf flounder	1									
		Atlantic croaker	1				Hybrid bass	2									
		Ocellated flounder	1				Gulf flounder	4									
	1978	Bonnethead	2			1979	Atlantic croaker	21									
		Gulf flounder	7				Gulf flounder	4									
		Ocellated flounder	3				1980 Gulf flounder	3									
	1979	Gulf flounder	17			1981	Atlantic croaker	2									
		Atlantic croaker	9				Gulf flounder	1									
		Hybrid bass	2				1983	Ladyfish	2								
	Southern kingfish	1	Common snook			1											
	1980	Gulf flounder	13			1985	Common snook	1									
		Atlantic croaker	1				1986 Common snook	1									
		Sand seatrout	1				1987 Fat snook	1									
	1984	Gulf flounder	3			1988	Common snook	4									
		Gulf flounder	7				Gulf flounder	1									
	1985	Gulf flounder	7			1990	Common snook	1									
		Gulf flounder	8				1991	Gulf flounder	3								
	1986	Gulf flounder	8			1992		Gulf flounder	4								
		Gulf flounder	10				1993	Atlantic croaker	2								
	1987	Gulf flounder	9					Common snook	5								
		Gulf flounder	1				Florida pompano	1									
	1988	Gulf flounder	1			Gulf of Mexico off Sabine Lake	1987	Atlantic croaker	1								
		Gulf flounder	1					Sand seatrout	1								
	1989	Tripletail	1					1988	Atlantic croaker	25							
		Gray snapper	1						Spot	16							
	1990	Florida pompano	2						1988	Sand seatrout	2						
		Atlantic sharpnose shark	1							Bluefish	1						
	1991	Gulf flounder	14							1989	Florida pompano	3					
		Hybrid bass	1								Atlantic croaker	1					
	1992	Striped mullet	1								1989	Striped mullet	4				
		Gray snapper	3									1990 Florida pompano	2				
	1993	Bull shark	1									1991	Atlantic croaker	8			
		Gulf flounder	4										Atlantic spadefish	1			
	1993	Atlantic croaker	5										1993	Florida pompano	1		
		Gafftopsail catfish	1											Spot	4		
	1993	Pinfish	2											1993	Striped mullet	17	
Atlantic spadefish		2	Gulf kingfish	1													
1993	Common carp	2		1988										Atlantic croaker	10		
	Tripletail	1			Spot									11			
1993	Common snook	2			1990									Sand seatrout	7		
	Gray snapper	2												Florida pompano	2		
1993	Florida pompano	3												1990	Southern kingfish	1	
	Bull shark	1															
1993	Southern kingfish	2															
	Atlantic sharpnose shark	1															
1993	Gulf flounder	4															
	Spinner shark	1															
1993	Gag	1															
Upper Laguna Madre	1976	Atlantic croaker							29								

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Table 3. (Cont'd)

Release location	Year	Common name	Number
<b>Gulf of Mexico off Galveston Bay (cont'd)</b>	1991	Sand seatrout	1
		Atlantic spadefish	2
		Atlantic stingray	1
		Florida pompano	1
	1992	Southern kingfish	1
1993	Gulf kingfish	1	
		Southern kingfish	1
<b>Gulf of Mexico off Matagorda Bay</b>	1987	Gulf kingfish	3
	1988	Gulf kingfish	6
		Southern kingfish	1
	1989	Gulf kingfish	2
		Southern kingfish	1
	1990	Gulf kingfish	8
		Southern kingfish	2
		Blacktip shark	1
	1991	Atlantic croaker	1
		Sand seatrout	1
		Gulf kingfish	3
		Tarpon	1
		Florida pompano	2
		Bull shark	1
		Southern kingfish	1
	1992	Palometa	1
		Atlantic spadefish	4
		Ladyfish	1
		Lane snapper	1
		Gulf kingfish	1
		Southern stargazer	3
		Florida pompano	2
		Southern kingfish	1
		Red snapper	1
		1993	Striped mullet
		Silver seatrout	1
		Gulf kingfish	8
	Florida pompano	4	
	Southern kingfish	1	
<b>Gulf of Mexico off Corpus Christi Bay</b>	1979	Lane snapper	2
		Red snapper	265
		Greater amberjack	3
	1988	Gulf kingfish	9
	1989	Palometa	4
		Spot	1
		Gulf kingfish	8
		Florida pompano	2
	1990	Spot	1
		Southern stingray	1
		Gulf kingfish	2
		Southern kingfish	3
		Red snapper	24
	1991	Atlantic croaker	1
		Gulf kingfish	2
		Florida pompano	1
		Red snapper	18
	1992	Hybrid bass	5
		Gulf kingfish	1
		Southern kingfish	1
Atlantic sharpnose shark		1	
King mackerel		3	
Spinner shark		1	
Great hammerhead		1	
Red snapper		5	
Remora		1	
1993		Gulf kingfish	2
<b>Gulf of Mexico off Laguna Madre</b>	1988	Fat snook	1
		Spot	1
		Florida pompano	1
	1990	Common snook	1

Table 4. Number of tagged fishes recaptured, by release and recapture locations from November 1975-December 1993.

Release location	Recapture location	Red drum	Spotted seatrout	Black drum	Sheeps-head	Southern flounder	Striped bass	Other species	All species	
Sabine Lake	Unknown	0	0	1	0	0	0	0	1	
	Sabine Lake	40	0	9	0	1	0	0	50	
	Gulf of Mexico off Sabine Lake	2	0	1	0	1	0	0	4	
Galveston Bay	Unknown	2	3	1	0	0	0	0	6	
	Galveston Bay	612	350	51	3	31	80	3 <sup>a</sup>	1,130	
	Matagorda Bay	2	1	0	0	0	0	0	3	
	Lower Laguna Madre	0	0	1	0	0	0	0	1	
	East Matagorda Bay	1	1	0	0	0	0	0	2	
	Cedar Lakes Area	0	1	0	0	0	0	0	1	
	Louisiana Waters	2	0	0	0	1	0	0	3	
	Gulf of Mexico off Sabine Lake	5	5	1	0	0	0	0	11	
	Gulf of Mexico off Galveston Bay	54	39	1	0	1	0	0	95	
	Gulf of Mexico off Matagorda Bay	1	0	0	0	0	0	0	1	
	Gulf of Mexico off Corpus Christi Bay	0	0	1	0	0	0	0	1	
Cedar Lakes Area	Galveston Bay	0	2	0	0	0	0	0	2	
	Matagorda Bay	1	2	0	0	0	0	0	3	
	San Antonio Bay	0	1	0	0	0	0	0	1	
	East Matagorda Bay	0	3	0	0	0	0	0	3	
	Cedar Lakes Area	8	7	0	0	0	2	0	17	
	Gulf of Mexico off Galveston Bay	1	1	0	0	0	0	0	2	
	Gulf of Mexico off Matagorda Bay	0	1	0	0	0	0	0	1	
East Matagorda Bay	Unknown	0	1	1	0	0	0	0	2	
	Galveston Bay	2	1	0	0	0	0	0	3	
	Matagorda Bay	6	7	11	0	2	0	0	26	
	San Antonio Bay	2	0	0	0	0	0	0	2	
	Upper Laguna Madre	1	0	0	0	0	0	0	1	
	East Matagorda Bay	136	75	69	5	17	0	0	302	
	Cedar Lakes Area	3	5	0	2	3	0	0	13	
	Gulf of Mexico off Galveston Bay	9	5	4	1	0	0	0	19	
	Gulf of Mexico off Matgorda Bay	6	3	0	0	0	0	0	9	
	Matagorda Bay	Unknown	20	1	6	0	2	0	0	29
		Galveston Bay	0	1	1	0	0	0	0	2
Matagorda Bay		624	145	136	5	16	0	1 <sup>b</sup>	927	
San Antonio Bay		19	5	6	2	0	0	0	32	
Aransas Bay		2	0	0	0	0	0	0	2	
Corpus Christi Bay		1	1	1	0	0	0	0	3	
Lower Laguna Madre		1	0	1	0	0	0	0	2	
East Matagorda Bay		4	2	1	0	0	0	0	7	
Cedar Lakes Area		2	0	0	0	0	0	0	2	
Gulf of Mexico off Galveston Bay		2	3	2	0	0	0	0	7	
Gulf of Mexico off Matagorda Bay		27	5	3	2	0	0	0	37	
Gulf of Mexico off Corpus Christi Bay	0	1	4	0	0	0	0	5		

Table 4. (Cont'd)

Release Location	Recapture Location	Red drum	Spotted seatrout	Black drum	Sheeps-head	Southern flounder	Striped bass	Other species	All species	
San Antonio Bay	Unknown	27	0	10	1	1	0	0	39	
	Matagorda Bay	15	6	7	0	3	0	0	31	
	San Antonio Bay	447	51	59	7	26	0	5 <sup>c</sup>	595	
	Aransas Bay	15	13	11	2	1	0	0	42	
	Corpus Christi Bay	2	1	3	2	0	0	0	8	
	East Matagorda Bay	0	0	0	1	0	0	0	1	
	Cedar Lakes Area	1	0	2	0	0	0	0	3	
	Gulf of Mexico off Galveston Bay	4	0	0	1	0	0	0	5	
	Gulf of Mexico off Matagorda Bay	11	1	1	2	0	0	0	15	
	Gulf of Mexico off Corpus Christi Bay	3	1	0	2	0	0	0	6	
	Gulf of Mexico off Laguna Madre	0	0	1	0	0	0	0	1	
	Aransas Bay	Unknown	72	9	15	0	2	0	0	98
		Galveston Bay	0	0	2	0	0	0	0	2
Matagorda Bay		5	0	3	3	0	0	0	11	
San Antonio Bay		22	2	6	0	0	0	1 <sup>d</sup>	31	
Aransas Bay		1,002	171	181	33	15	0	2 <sup>e</sup>	1,404	
Corpus Christi Bay		13	11	8	5	3	0	0	40	
Upper Laguna Madre		0	1	2	0	0	0	0	3	
Lower Laguna Madre		1	0	0	0	0	0	0	1	
East Matagorda Bay		1	0	2	0	0	0	0	3	
Gulf of Mexico off Galveston Bay		1	0	1	0	0	0	0	2	
Gulf of Mexico off Matagorda Bay		15	1	3	1	0	0	0	20	
Gulf of Mexico off Corpus Christi Bay		15	2	3	8	2	0	0	30	
Gulf of Mexico off Laguna Madre		1	0	0	0	0	0	0	1	
Corpus Christi Bay	Unknown	63	6	4	1	5	0	1 <sup>h</sup>	80	
	Galveston Bay	1	0	0	0	0	0	0	1	
	Matagorda Bay	1	1	0	0	0	0	0	2	
	Aransas Bay	32	18	8	1	2	0	0	61	
	Corpus Christi Bay	474	133	63	21	35	0	4 <sup>i</sup>	730	
	Upper Laguna Madre	22	5	11	0	1	0	0	39	
	Lower Laguna Madre	2	0	1	0	0	0	0	3	
	Gulf of Mexico off Galveston Bay	0	0	1	0	0	0	0	1	
	Gulf of Mexico off Corpus Christi Bay	16	2	1	5	0	0	0	24	
	Upper Laguna Madre	Unknown	10	0	13	0	0	0	0	23
		Matagorda Bay	0	0	1	0	0	0	0	1
		San Antonio Bay	2	0	0	0	0	0	0	2
		Aransas Bay	2	0	3	0	0	0	0	5
Corpus Christi Bay		24	7	10	1	3	0	0	45	
Upper Laguna Madre		186	89	141	0	5	0	1 <sup>h</sup>	422	
Lower Laguna Madre		7	3	4	1	0	0	0	15	
Gulf of Mexico off Corpus Christi Bay		5	0	1	1	0	0	0	7	
Lower Laguna Madre		Unknown	7	2	8	0	0	0	0	17
		Aransas Bay	3	0	2	0	0	0	0	5

Table 4. (Cont'd)

Release location	Recapture location	Red drum	Spotted seatrout	Black drum	Sheeps-head	Southern flounder	Striped bass	Other species	All species
Lower Laguna Madre (cont'd)	Corpus Christi Bay	3	1	3	0	0	0	0	7
	Upper Laguna Madre	4	11	6	1	0	0	0	22
	Lower Laguna Madre	434	126	72	4	4	0	2 <sup>a</sup>	642
	East Matagorda Bay	0	0	0	1	0	0	0	1
	Gulf of Mexico off Corpus Christi Bay	3	0	0	0	0	0	1 <sup>b</sup>	4
Gulf of Mexico off Sabine Lake	Gulf of Mexico off Laguna Madre	5	0	1	1	0	0	0	7
	Mexican waters	2	1	2	0	0	0	0	5
Gulf of Mexico off Sabine Lake	Gulf of Mexico off Sabine Lake	0	1	2	0	0	0	0	3
Gulf of Mexico off Galveston	Sabine Lake	0	1	0	0	0	0	0	1
	Gulf of Mexico off Sabine Lake	0	0	0	0	0	0	1	1
	Gulf of Mexico off Galveston Bay	4	9	2	0	1	0	0	16
Gulf of Mexico off Matagorda Bay	Unknown	0	0	1	0	0	0	0	1
	East Matagorda Bay	0	1	0	0	0	0	0	1
	Gulf of Mexico off Matagorda Bay	9	1	2	0	0	0	0	12
Gulf of Mexico off Corpus Christi Bay	Aransas Bay	0	0	1	0	0	0	0	1
	Gulf of Mexico off Corpus Christi Bay	2	1	1	0	0	0	22 <sup>c</sup>	26
Gulf of Mexico off Laguna Madre	Gulf of Mexico off Laguna Madre	1	0	0	0	0	0	0	1

<sup>a</sup>2 Atlantic croaker, 1 blue catfish.

<sup>b</sup>1 Gulf flounder.

<sup>c</sup>3 Gulf flounder, 1 alligator gar, 1 bull shark.

<sup>d</sup>1 Tarpon.

<sup>e</sup>2 Gulf flounder.

<sup>f</sup>4 Gulf flounder.

<sup>g</sup>1 Hardhead catfish.

<sup>h</sup>1 Atlantic croaker.

<sup>i</sup>1 Gulf flounder.

<sup>j</sup>1 Gulf kingfish, 21 red snapper.

Table 5. Percent of recaptured tagged fish grouped into intervals of distances traveled (km) from release to recapture location.

Distance traveled	Red drum	Spotted seatrout	Black drum	Sheeps-head	Southern flounder	Striped bass	Other species	All species
0-10	69.9	54.8	50.3	44.5	66.1	71.6	75.6	61.8
11-20	12.4	17.9	18.1	21.8	7.9	0.0	12.2	12.9
21-30	6.9	10.3	11.0	5.9	10.3	1.2	4.9	7.2
31-40	3.2	6.7	6.1	6.7	5.5	1.2	0.0	4.2
41-50	2.7	5.2	3.7	4.2	4.8	0.0	0.0	2.9
51-60	1.5	1.9	1.7	3.4	1.8	0.0	2.4	1.8
61-70	0.9	0.8	1.9	2.5	0.6	2.5	0.0	1.3
71-80	0.5	0.4	0.9	1.7	0.6	0.0	0.0	0.6
81-90	0.4	0.3	1.8	2.5	1.2	9.9	2.4	2.6
91-100	0.4	0.5	0.5	0.8	0.0	0.0	0.0	0.4
>100	1.3	1.2	4.0	5.9	1.2	13.6	2.4	4.2

Table 6. Percentage of recaptured tagged fish grouped into intervals of days free from release to recapture date.

Days free	Red drum	Spotted seatrout	Black drum	Sheeps-head	Southern flounder	Striped bass	Other species	All species
0-90	34.3	30.6	36.4	51.8	41.1	39.5	75.0	44.1
91-180	23.6	29.5	19.7	16.7	20.2	14.8	18.2	20.4
181-270	15.8	12.4	13.1	8.8	14.3	21.0	2.3	12.5
271-360	12.0	8.6	10.3	6.1	13.1	8.6	0.0	8.4
361-450	6.5	7.3	7.0	7.0	6.5	4.9	2.3	5.9
451-540	3.5	3.2	4.1	3.5	1.2	0.0	0.0	2.2
541-630	1.7	2.4	3.5	3.5	1.8	2.5	2.3	2.5
630-720	1.3	1.7	2.5	0.0	0.6	3.7	0.0	1.4
>720	1.3	4.4	3.4	2.6	1.2	4.9	0.0	2.5

Table 7. Summary of recapture rates (%) reported for tagged fish from this study and from previous studies. NT=none tagged. DNA=data not available.

Reference	Area and dates of study		Recapture rates							
	State	Years	Red drum	Spotted seatrout	Black drum	Sheeps-head	Southern flounder	Striped bass	Other species	All species
Bowling (present study)	Texas	1975-93	11.9	6.5	3.7	2.7	5.3	0.7	2.0	6.9
Bowling (1991)	Texas	1975-90	14.7	6.8	4.5	2.9	6.0	0.5	2.5	7.9
Marwitz (1989)	Texas	1975-88	15.2	7.0	5.2	3.0	6.2	0.2	2.8	8.0
Matlock and Weaver (1979)	Texas	1975-76	11.6	2.3	3.4	2.9	4.5	NT	4.5	6.4
Green (1986)	Texas	1950-75	11.9	4.0	3.0	1.7	2.5	NT	1.6	4.6
Beaumariage (1969)	Florida	1961-65	47.5	13.6	37.0	34.7	DNA	DNA	DNA	17.4

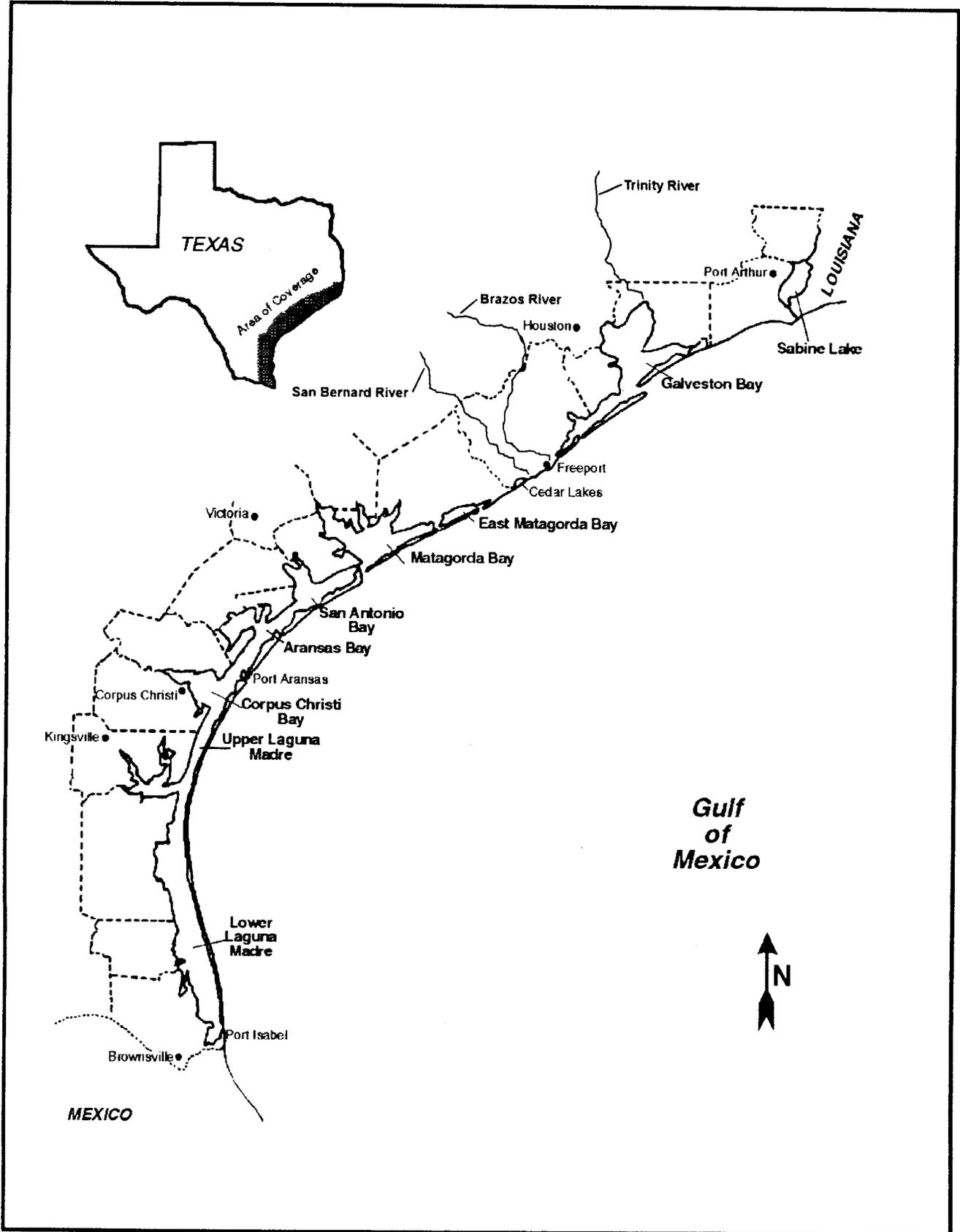


Figure 1. Texas bay systems.

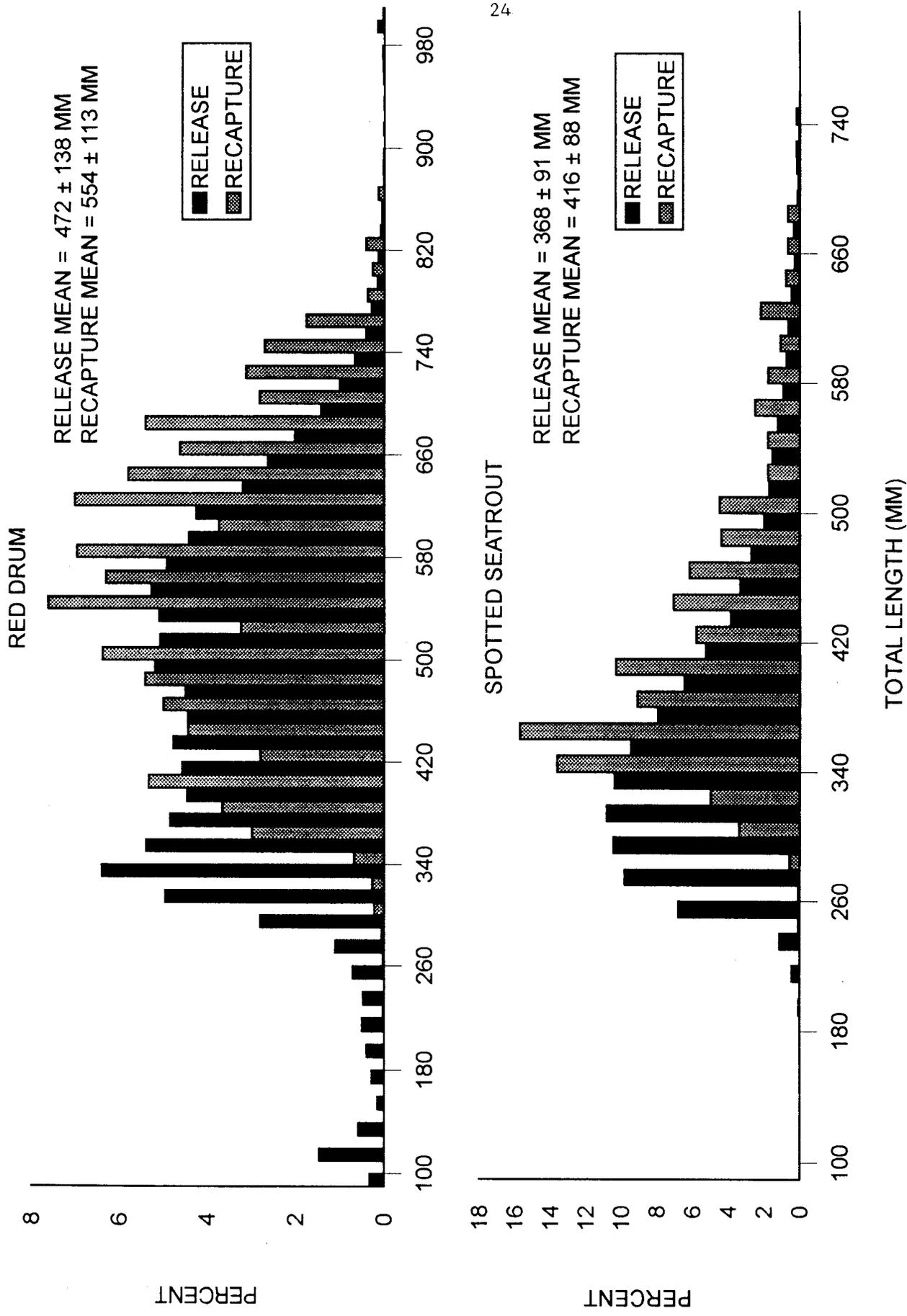


Figure 2. Percentages of release and recapture total lengths (midpoint of 20 mm intervals) of red drum, spotted seatrout, black drum, sheepshead, southern flounder, and striped bass for fish tagged and recaptured from November 1975-December 1993.

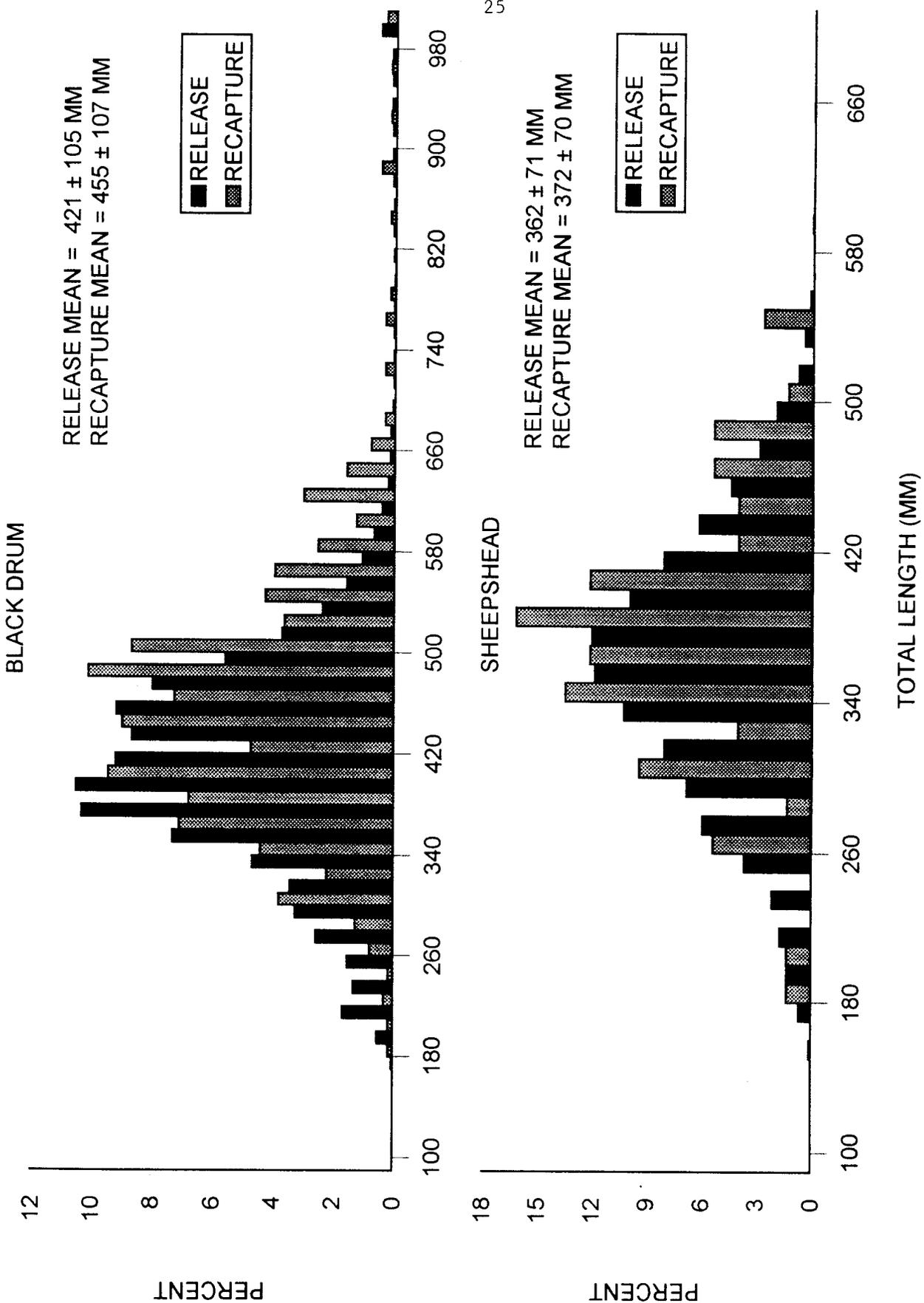
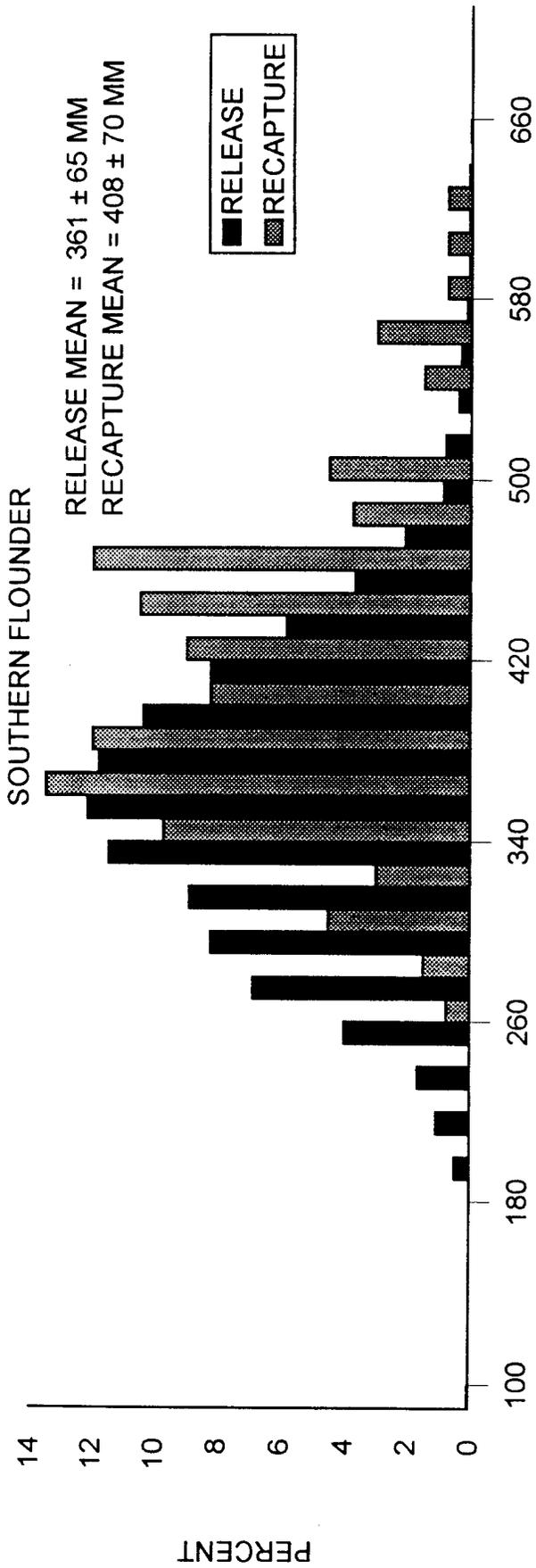


Figure 2. (Cont'd)



26

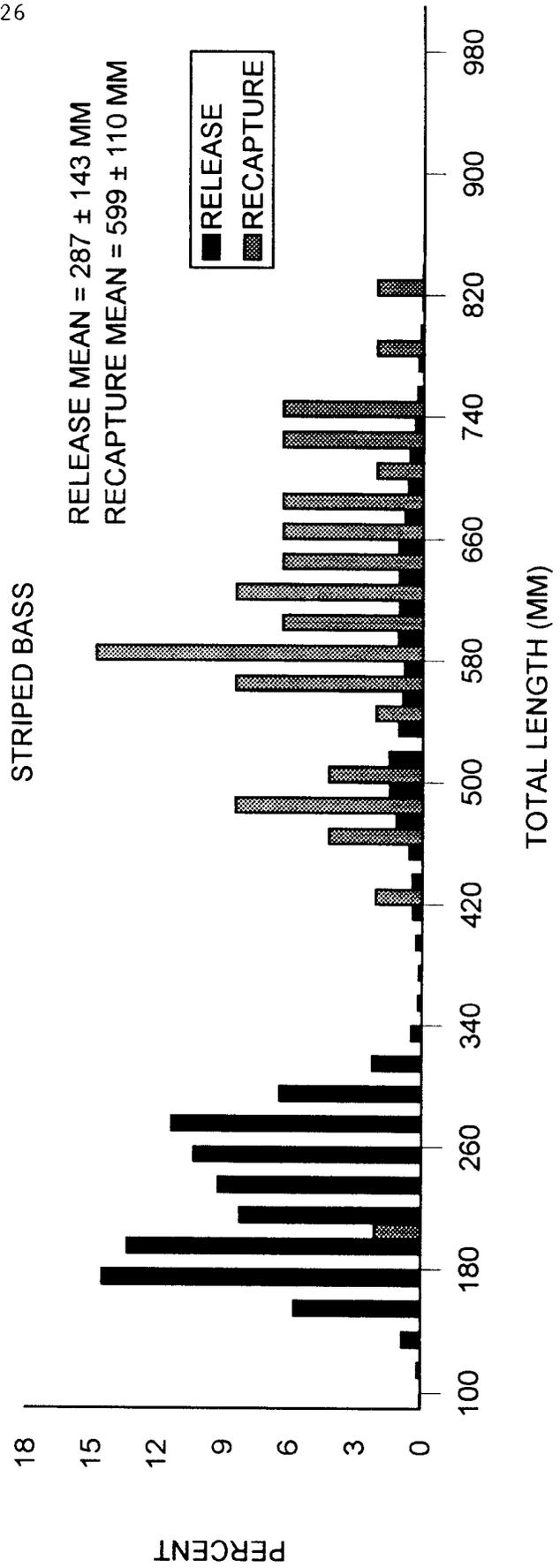


Figure 2. (Cont'd)

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