

BAITFISH TYPES USED BY SPORT-BOAT ANGLERS  
IN TEXAS MARINE WATERS, MAY 1995 – MAY 1996

by

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## ABSTRACT

Texas Parks and Wildlife Department has conducted an ongoing survey of marine sport-boat anglers along the Texas coast since 1974. On-site interviews were used to obtain survey information on completed fishing trips. A one-year component was added to the survey in May 1995 to gather information on types of baitfish used.

From May 1995 to May 1996, 12,078 trip interviews were completed that included information on types of bait used. Of these, 3,263 trip interviews had information on types of baitfish used. Type of sport-boat fishing (private or party), location of fishing (bay-pass or gulf), and number of fish landed by species (if any) were recorded for each trip. Private boats included privately-owned and rental boats; party boats included boats with a paid fishing guide and ten or fewer people onboard.

Fish were used as bait on 21% of bay-pass private-boat trips, 44% of bay-pass party-boat trips, 68% of gulf private-boat trips, and 72% of gulf party-boat trips.

Most often used baitfish types included mullet (Mugil sp.), Atlantic croaker (Micropogonias undulatus), and killifish (Fundulus sp.) on bay-pass private-boat trips; Atlantic croaker and mullet on bay-pass party-boat trips; round scad (Decapterus punctatus) and Atlantic cutlassfish (Trichiurus lepturus) on gulf private-boat trips; and herring (Family Clupeidae) and Atlantic cutlassfish on gulf party-boat trips.

Spotted seatrout (Cynoscion nebulosus) and red drum (Sciaenops ocellatus) were the species most often caught when live or dead baitfish was used on bay-pass private-boat and party-boat trips. Spotted seatrout was the species most often caught when live baitfish was used on gulf private-boat and party-boat trips. King mackerel (Scomberomorus cavalla) and red snapper (Lutjanus campechanus) were the species most often caught when dead baitfish was used on gulf private-boat and party-boat trips.

## INTRODUCTION

Texas Parks and Wildlife Department (TPWD) has conducted an ongoing survey of marine sport-boat anglers along the Texas coast since 1974 (Green and Campbell 2005). On-site trip-ending interviews were conducted at boat-access sites to estimate annual fishing effort, landings, catch rates, and mean sizes of selected species. Information on bait types used by anglers was collected. Based on these interviews, bait use in Texas bays was summarized by Heffernan et al. (1976), Breuer et al. (1977), and Heffernan and Green (1977) for 1974-76; McEachron et al. (1981) for 1979-80; Weixelman and Chai (1991) for 1983-87; and Morris et al. (1999) for 1987-97. Additional information on bait types used was obtained from short-term TPWD surveys of anglers involved in species-specific seasonal fisheries (Campbell-Hostettler 1982, Spiller 1982, Weixelman 1982).

Live baitfish use emerged as a possible fisheries-management issue in the early 1990's when juvenile Atlantic croaker (*Micropogonias undulatus*) were increasingly used as bait to catch spotted seatrout (*Cynoscion nebulosus*) along portions of the Texas coast. Questions arose on possible impacts of this trend on populations of both spotted seatrout and Atlantic croaker. The on-going survey did not capture information on types of baitfish used other than whether they were live or dead. A one-year component was added to the ongoing survey in May 1995 to gather information on types of baitfish used.

The objectives of this report were to determine the following: extent of use of fish as bait in relation to other bait types, extent of use of various baitfish types, and extent of use of live and dead baitfish types to catch selected fish species.

## MATERIALS AND METHODS

Trip interviews were conducted from 15 May 1995 to 14 May 1996 at boat-access sites in each of the eight major bay systems along the Texas coast (Figure 1). Standard interview procedures included determination of the primary bait type or types used by each angling party (Green and Campbell 2005). For parties with landings, interviewers recorded a single bait type if it was used to catch greater than 85% of the landings; otherwise, multiple bait types were recorded. For parties with no landings, interviewers recorded a single bait type if it was used greater than 85% of the trip; otherwise, multiple bait types were recorded. Bait types are listed and described in Table 1.

Nine baitfish categories were created. For parties that used live or dead fish as bait, interviewers recorded up to six baitfish types. Baitfish types are listed and described in Table 2.

Type of sport-boat fishing (private or party), location of fishing (bay-pass or gulf), and number of fish landed by species (if any) were recorded for each interview. Private boats included privately-owned and rental boats; party boats included boats with a paid fishing guide and ten or fewer people onboard.



## RESULTS

### Bait Types

Trip interviews with bait-type information totaled 12,078. Of these, 10,361 were from bay-pass private boats, 574 were from bay-pass party boats, 1,118 were from gulf private boats, and 25 were from gulf party boats (Tables 3-6).

Live shrimp (Family Penaeidae) (35.1% of trips), artificial baits (26.3% of trips), and live fish (12.0% of trips) were the most used bait types on bay-pass private-boat trips (Figure 2). Live shrimp use ranged from 58.7% of trips in the upper Laguna Madre to 3.6% of trips in Sabine Lake; artificial bait use ranged from 40.0% of trips in the lower Laguna Madre to 17.0% of trips in Galveston Bay; and live fish use ranged from 37.1% of trips in Sabine Lake to 0.9% of trips in the lower Laguna Madre (Table 3).

Live fish (36.9% of trips), live shrimp (30.5% of trips), and artificial baits (18.1% of trips) were the most used bait types on bay-pass party-boat trips (Figure 2). Live fish use ranged from 75.8% of trips in Corpus Christi Bay to 0% of trips in Matagorda Bay and the lower Laguna Madre; live shrimp use ranged from 76.6% of trips in the upper Laguna Madre to 0% of trips in Sabine Lake; and artificial bait use ranged from 58.5% of trips in the lower Laguna Madre to 6.5% of trips in Corpus Christi Bay (Table 4).

Dead fish (50.1% of trips) and artificial baits (16.8% of trips) were the most used bait types on gulf private-boat trips (Figure 2). Dead fish use ranged from 70.4% of trips in the gulf off Corpus Christi Bay to 24.1% of trips in the gulf off Matagorda Bay; and artificial bait use ranged from 23.8% of trips in the gulf off Matagorda Bay to 8.5% of trips in the gulf off Corpus Christi Bay (Table 5).

Dead fish (56.0% of trips) and artificial baits (20.0% of trips) were the most used bait types on gulf party-boat trips (Figure 2). Dead fish use ranged from 100% of trips in the gulf off Sabine Lake and Galveston Bay to 25.0% of trips in the gulf off Matagorda Bay and the lower Laguna Madre; and artificial bait use ranged from 62.5% of trips in the gulf off the lower Laguna Madre to 0% of trips in the other gulf areas (Table 6).

### Baitfish Types

Trip interviews with baitfish-type information totaled 3,263. Of these, 2,227 were from bay-pass private boats, 250 were from bay-pass party boats, 768 were from gulf private boats, and 18 were from gulf party boats (Tables 7-10).

Mullet (*Mugil* sp.) (36.2% of trips), Atlantic croaker (18.5% of trips), and killifish (*Fundulus* sp.) (16.1% of trips) were the most used baitfish types on bay-pass private-boat trips (Figure 3). Mullet use ranged from 47.5% of trips in Matagorda Bay to 17.4% of trips in Sabine Lake; Atlantic croaker use ranged from 43.9% of trips in San Antonio Bay to 0.5% of trips in the lower Laguna Madre; and killifish use ranged from 55.2% of trips in Sabine Lake to 0% of trips in the lower Laguna Madre (Table 7).

Atlantic croaker (59.2% of trips) and mullet (18.0% of trips) were the most used baitfish types on bay-pass party-boat trips (Figure 3). Atlantic croaker use ranged from 100% of trips in Galveston Bay, Matagorda Bay, and San Antonio Bay to 0% of trips in Sabine Lake and the lower Laguna Madre; and mullet use ranged from 100% of trips in the lower Laguna Madre to 0% of trips in Sabine Lake, Galveston Bay, Matagorda Bay, and San Antonio Bay (Table 8).

Round scad (Decapterus punctatus) (35.9% of trips) and Atlantic cutlassfish (Trichiurus lepturus) (31.1% of trips) were the most used baitfish types on gulf private-boat trips (Figure 3). Round scad use ranged from 78.0% of trips in the gulf off Galveston Bay to 4.5% of trips in the gulf off Corpus Christi Bay; and Atlantic cutlassfish use ranged from 77.8% of trips in the gulf off Corpus Christi Bay to 1.5% of trips in the gulf off Sabine Lake (Table 9).

Herring (Family Clupeidae) (33.3% of trips), Atlantic cutlassfish (22.2% of trips), and Atlantic croaker (16.7% of trips) were the most used baitfish types on gulf party-boat trips (Figure 3). Herring use ranged from 100% of trips in the gulf off Sabine Lake to 0% of trips in the gulf off Matagorda Bay, Corpus Christi Bay, and the lower Laguna Madre; Atlantic cutlassfish use ranged from 60.0% of trips in the gulf off Corpus Christi Bay to 0% of trips in the gulf off Sabine Lake, Galveston Bay, and the lower Laguna Madre; and Atlantic croaker use ranged from 75.0% of trips in the gulf off Matagorda Bay to 0% of trips in the other gulf areas (Table 10).

### Baitfish Types and Landings

#### Live Baitfish

Trip interviews with at least one fish landed and a bait type of live fish totaled 937. Of these, 711 were from bay-pass private boats, 187 were from bay-pass party boats, 36 were from gulf private boats, and 3 were from gulf party boats (Tables 11-14).

Spotted seatrout, red drum (Sciaenops ocellatus), and southern flounder (Paralichthys lethostigma) were the species most often caught when live baitfish was used on bay-pass private-boat trips (Table 11). Mullet (37.6% of trips) and Atlantic croaker (36.0% of trips) were used most often to catch spotted seatrout (Figure 4), mullet (59.2% of trips) was used most often to catch red drum (Figure 5), and killifish (55.4% of trips) was used most often to catch southern flounder (Table 11).

Spotted seatrout and red drum were the species most often caught when live baitfish was used on bay-pass party-boat trips (Table 12). Atlantic croaker was used most often to catch both spotted seatrout (77.1% of trips) (Figure 4) and red drum (52.4% of trips) (Figure 5).

Spotted seatrout was the species most often caught when live baitfish was used on gulf private-boat trips (Table 13). Atlantic croaker (78.6% of trips) was used most often to catch spotted seatrout.

Spotted seatrout and red drum were the only species caught when live baitfish was used on gulf party-boat trips (Table 14). All were caught using Atlantic croaker.

## Dead Baitfish

Trip interviews with at least one fish landed and a bait type of dead fish totaled 577. Of these, 173 were from bay-pass private boats, 12 were from bay-pass party boats, 386 were from gulf private boats, and 6 were from gulf party boats (Tables 15-18).

Red drum and spotted seatrout were the species most often caught when dead baitfish was used on bay-pass private-boat trips (Table 15). Mullet (74.4% of trips) was used most often to catch red drum (Figure 5). Mullet (55.9% of trips) and herring (27.9% of trips) were used most often to catch spotted seatrout (Figure 4).

Red drum and spotted seatrout were the species most often caught when dead baitfish was used on bay-pass party-boat trips (Table 16). Mullet (75.0% of trips) was used most often to catch red drum (Figure 5). Mullet (57.1% of trips) and Atlantic croaker (42.9% of trips) were used to catch spotted seatrout (Figure 4).

King mackerel (*Scomberomorus cavalla*) and red snapper (*Lutjanus campechanus*) were the species most often caught when dead baitfish was used on gulf private-boat trips (Table 17). Atlantic cutlassfish (48.2% of trips) and round scad (46.7% of trips) were used most often to catch king mackerel; and round scad (66.5% of trips) was used most often to catch red snapper (Figure 6).

King mackerel and red snapper were the species most often caught when dead baitfish was used on gulf party-boat trips (Table 18). Only Atlantic cutlassfish (60.0% of trips) and herring (40.0% of trips) were used to catch king mackerel; and only herring (75.0% of trips) and Atlantic cutlassfish (25.0% of trips) were used to catch red snapper (Figure 6).

## DISCUSSION

Each of the eight major bay systems along the Texas coast has a unique combination of environmental factors and conditions (e.g., salinity, water clarity, water-depth profile, and presence of freshwater inflows, oyster reefs, seagrass beds, and bay-to-gulf passes) that influence fishing methodologies and population levels of forage and predator species. Along with local fishing traditions that have developed over time, this may explain the considerable differences observed among bay systems in bait types and baitfish types used on bay-pass private-boat trips.

Use of live baitfish along the Texas coast on bay-pass sport-boat trips increased from 2.6% of trips during 1983-87 (Weixelman and Chai 1991) to 11.3% of trips during 1987-97 (Morris et al. 1999); live baitfish was used on 13.3% of bay-pass sport-boat trips during this study. No other bait type exhibited this amount of change. Much of the increase in live baitfish use can be attributed the emergence of juvenile Atlantic croaker as an effective bait for catching spotted seatrout in the early 1990's. According to Bozka (1996), live Atlantic croaker were difficult to find, competition among bait camps for Atlantic croaker was intense, fishing guides had the market cornered at most bait camps, and the few leftover Atlantic croaker were claimed quickly by anglers who put down a \$4.50 per dozen deposit the day before.

Mail surveys sent to licensed saltwater anglers in Texas during 1996 (Ditton et al. 1998) and 2000 (Anderson and Ditton 2001) included questions on several aspects of live bait use. The proportion of responding anglers that used live fish for bait increased from 68% in 1996 to 73% in 2000. This increase in demand could have caused dealer supply shortages but apparently did not. When asked whether they could always find live baitfish to buy when needed, 37% of responding anglers in 1996 and 45% in 2000 indicated that they could. The ability of bait dealers to meet increased demand may have been facilitated by the relaxation of regulations associated with the commercial capture of baitfish from 1995 to 2000. For commercial shrimping vessels, the number of live baitfish that could be retained was increased and the season during which they could be taken was expanded (Texas Parks and Wildlife Department 1995, 1996, 1997, 1998, 2000).

Shifts in baitfish use could have biological, social, and economic implications. From a biological point of view, extensive use of a particular baitfish species could lead to reduced availability of that baitfish species, or widespread use of a particularly effective baitfish species could contribute to reduced availability of target fish species. From a social point of view, conflicts between anglers with differing angling philosophies have developed (e.g., natural versus artificial bait users or consumptive versus non-consumptive anglers). From an economic point of view, shifts towards a particular baitfish species could create supply, demand, and availability issues. Reasonably priced, high quality bait plays an important role in sustaining recreational fishing's popularity (Hanson et al. 2004). For these reasons, bait types used by sport-boat anglers should continue to be monitored along the Texas coast. In addition, this study should be repeated in the future to determine whether there have been changes in baitfish types used.

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Table 1. Bait types and descriptions, 15 May 1995 through 14 May 1996.

Bait type	Bait code <sup>a</sup>	Bait description
Dead shrimp	0	Non-living decapod crustaceans of the Family Penaeidae, either fresh dead or previously iced or frozen.
Live shrimp	1	Living decapod crustaceans of the Family Penaeidae.
Spoons	2	Curved or flatten, chrome plated or painted metal of different colors with one hook, either single or treble, attached.
Worm jigs	3	Soft, flexible and rubbery tails of various lengths, colors and shapes (worm-like, shrimp-like or fish-like) threaded onto a weighted or non-weighted hook.
Other jigs	4	Natural (e.g., feathers, horse hair, etc.) materials of various colors attached in a skirt-like manner to a weighted or non-weighted hook.
Plugs (fish type)	5	Artificial fish-like baits of various materials, shapes and colors that usually have multiple treble hooks attached.
Other	6	Any artificial (non-fish-like) or natural bait that does not fit into any other category.
Squid	7	Cephalopods of the Order Teuthoidea.
Live fish	8	Any living finfish.
Dead fish	9	Any non-living finfish, either salted, fresh dead, or previously iced or frozen.
Crabs	11	Crustaceans of the Order Decapoda that are non-shrimp-like (dead or alive).
Sea lice (mantis shrimp)	22	Crustaceans of the Order Stomatopoda.
Crabs and dead shrimp	33	See descriptions for bait codes 11 and 0.
Sea lice and dead shrimp	44	See descriptions for bait codes 22 and 0.
Crabs and sea lice	55	See descriptions for bait codes 11 and 22.
Combination	99	Any combination of bait codes requiring more than two digits.

<sup>a</sup> Coding of bait type was limited to two digits. Two-digit bait combinations, other than 33, 44, 55, and 99, were recorded with the highest numeral listed first (e.g., a combination of live shrimp and dead shrimp was coded as 10).

Table 2. Baitfish types and descriptions, 15 May 1995 through 14 May 1996.

Baitfish type	Baitfish code <sup>a</sup>	Baitfish description
Mullet	1	<u>Mugil</u> sp.; primarily striped mullet ( <u>M. cephalus</u> ) but also white mullet ( <u>M. curema</u> ).
Atlantic croaker	2	<u>Micropogonias undulatus</u> .
Killifish	3	<u>Fundulus</u> sp.; primarily gulf killifish ( <u>E. grandis</u> ) but also striped killifish ( <u>E. similis</u> ) and others.
Pinfish	4	<u>Lagodon rhomboids</u> (also known as pin perch).
Pigfish	5	<u>Orthopristis chrysoptera</u> (also known as piggy perch).
Herring	6	Family Clupeidae; primarily menhaden ( <u>Brevoortia</u> sp.) and shad ( <u>Dorosoma</u> sp.) but also Spanish sardine ( <u>Sardinella aurita</u> ) and Atlantic thread herring ( <u>Opisthonema oglinum</u> ).
Atlantic cutlassfish	7	<u>Trichiurus lepturus</u> (also known as ribbonfish).
Round scad	8	<u>Decapterus punctatus</u> (also known as cigarfish, cigar minnows, or ice fish).
Other or unknown	9	Includes a variety of non-listed species.

<sup>a</sup> Coding of baitfish type was limited to six digits. Multiple-digit baitfish combinations were recorded with the highest numerals listed first (e.g., a combination of pinfish, killifish, and mullet was coded as 431).



Table 3. Bait types used (% of trips) on private-boat trips in Texas bays and passes by bay system, 15 May 1995 through 14 May 1996.

Bait type <sup>a</sup>	Bay system								
	Sabine Lake	Galveston	Matagorda	San Antonio	Aransas	Corpus Christi	Upper Laguna Madre	Lower Laguna Madre	Coastwide
Live fish	37.1	10.0	8.3	12.3	20.9	12.1	3.1	0.9	12.0
Dead fish	2.8	3.1	3.1	1.8	1.1	1.9	1.3	9.2	2.9
Live and dead fish	0.1	0.1	0.1	0.8	0.1	0.1	0	0.1	0.1
Live shrimp	3.6	48.5	28.9	24.1	34.7	37.5	58.7	26.9	35.1
Dead shrimp	27.9	10.7	9.7	6.7	5.5	10.3	9.1	5.5	9.8
Live and dead shrimp	0.2	1.6	1.0	0.4	0.7	2.3	1.0	0.5	1.0
Other natural <sup>b</sup>	0.7	0.9	2.9	1.5	0.4	1.8	0.3	0.6	1.2
Artificial <sup>c</sup>	18.6	17.0	33.8	37.4	25.7	19.1	19.9	40.0	26.3
Live fish combination <sup>d</sup>	5.2	4.4	5.8	7.5	6.0	5.6	1.2	0.6	4.4
Dead fish combination <sup>e</sup>	0.6	0.6	1.6	1.2	0.6	2.2	0.8	5.7	1.6
Miscellaneous <sup>f</sup>	3.1	3.2	4.8	6.3	4.2	7.2	4.7	10.1	5.5
Number of trip interviews	828	1,263	1,561	954	1,586	1,395	1,568	1,206	10,361

<sup>a</sup> See Table 1 for description of bait types.

<sup>b</sup> Includes squid, crab, and the following combinations: dead shrimp and squid; live shrimp and squid; and dead shrimp and crab.

<sup>c</sup> Includes worm jigs, plugs (fish type), spoons, other jigs, and all possible two-item combinations of these baits.

<sup>d</sup> Includes live fish combined with any other single bait except dead fish.

<sup>e</sup> Includes dead fish combined with any other single bait except live fish.

<sup>f</sup> Includes odd bait types; non-fish, two-item combinations of natural and artificial baits; and bait combinations not recordable with two digits (a portion of these may have included live or dead fish).

Table 4. Bait types used (% of trips) on party-boat trips in Texas bays and passes by bay system, 15 May 1995 through 14 May 1996.

Bait type <sup>a</sup>	Bay system								Coastwide
	Sabine Lake	Galveston	Matagorda	San Antonio	Aransas	Corpus Christi	Upper Laguna Madre	Lower Laguna Madre	
Live fish	50.0	11.1	0	52.0	59.6	75.8	5.5	0	36.9
Dead fish	0	0	0	2.0	3.7	1.6	0	6.1	2.6
Live and dead fish	0	0	0	0	0.5	0	0	0	0.2
Live shrimp	0	33.3	34.8	22.0	14.7	3.2	76.6	25.6	30.5
Dead shrimp	0	0	0	0	4.1	3.2	0	0	1.9
Live and dead shrimp	0	0	0	0	0.5	0	0	0	0.2
Other natural <sup>b</sup>	0	0	0	0	0.5	0	0	0	0.2
Artificial <sup>c</sup>	50.0	44.4	43.5	16.0	7.3	6.5	10.2	58.5	18.1
Live fish combination <sup>d</sup>	0	11.1	13.0	2.0	4.1	6.5	3.1	0	3.8
Dead fish combination <sup>e</sup>	0	0	0	0	0	0	0	1.2	0.2
Miscellaneous <sup>f</sup>	0	0	8.7	6.0	5.0	3.2	4.7	8.5	5.4
Number of trip interviews	2	9	23	50	218	62	128	82	574

<sup>a</sup> See Table 1 for description of bait types.

<sup>b</sup> Includes crab.

<sup>c</sup> Includes worm jigs, plugs (fish type), spoons, other jigs, and the following combinations: worm jigs and spoons; worm jigs and plugs (fish type); and plugs (fish type) and spoons.

<sup>d</sup> Includes live fish combined with live shrimp, dead shrimp, worm jigs, plugs (fish type), or spoons.

<sup>e</sup> Includes dead fish combined with worm jigs.

<sup>f</sup> Includes odd bait types; non-fish, two-item combinations of natural and artificial baits; and bait combinations not recordable with two digits (a portion of these may have included live or dead fish).

Table 5. Bait types used (% of trips) on private-boat trips in the gulf off Texas by gulf area, 15 May 1995 through 14 May 1996.

Bait type <sup>a</sup>	Gulf area					
	Sabine Lake	Galveston	Matagorda	Corpus Christi	Lower Laguna Madre	Coastwide
Live fish	6.2	2.1	11.2	1.2	0	5.2
Dead fish	45.5	67.3	24.1	70.4	40.7	50.1
Live and dead fish	0.5	0.4	0.6	1.6	0	0.7
Live shrimp	0.9	3.6	6.9	1.2	0	3.3
Dead shrimp	4.3	1.4	0.9	0	0	1.4
Live and dead shrimp	0	0.4	0	0	0	0.1
Other natural <sup>b</sup>	11.4	4.3	9.1	3.6	13.6	7.3
Artificial <sup>c</sup>	19.9	12.5	23.8	8.5	23.7	16.8
Live fish combination <sup>d</sup>	2.8	0	6.9	0.8	1.7	2.8
Dead fish combination <sup>e</sup>	5.7	7.5	14.4	9.7	15.3	10.0
Miscellaneous <sup>f</sup>	2.8	0.7	2.2	2.8	5.1	2.2
Number of trip interviews	211	281	320	247	59	1,118

<sup>a</sup> See Table 1 for description of bait types.

<sup>b</sup> Includes primarily squid, as well as squid combined with dead shrimp or live shrimp; also includes crab and mantis shrimp (*Squilla* sp.).

<sup>c</sup> Includes worm jigs, plugs (fish type), spoons, other jigs, and the following combinations: worm jigs and spoons; and plugs (fish type) combined with worm jigs, spoons, or other jigs.

<sup>d</sup> Includes live fish combined with live shrimp, worm jigs, spoons, squid, dead shrimp, or plugs (fish type).

<sup>e</sup> Includes dead fish combined with squid, other jigs, plugs (fish type), dead shrimp, live shrimp, spoons, or worm jigs.

<sup>f</sup> Includes odd bait types; non-fish, two-item combinations of natural and artificial baits; and bait combinations not recordable with two digits (a portion of these may have included live or dead fish).

Table 6. Bait types used (% of trips) on party-boat trips in the gulf off Texas by gulf area, 15 May 1995 through 14 May 1996.

Bait type <sup>a</sup>	Gulf area					
	Sabine Lake	Galveston	Matagorda	Corpus Christi	Lower Laguna Madre	Coastwide
Live fish	0	0	75.0	0	0	12.0
Dead fish	100.0	100.0	25.0	66.7	25.0	56.0
Live and dead fish	0	0	0	0	0	0
Live shrimp	0	0	0	0	0	0
Dead shrimp	0	0	0	0	0	0
Live and dead shrimp	0	0	0	0	0	0
Other natural <sup>b</sup>	0	0	0	16.7	12.5	8.0
Artificial <sup>c</sup>	0	0	0	0	62.5	20.0
Live fish combination <sup>d</sup>	0	0	0	0	0	0
Dead fish combination <sup>e</sup>	0	0	0	16.7	0	4.0
Miscellaneous <sup>f</sup>	0	0	0	0	0	0
Number of trip interviews	3	4	4	6	8	25

<sup>a</sup> See Table 1 for description of bait types.

<sup>b</sup> Includes squid.

<sup>c</sup> Includes plugs (fish type).

<sup>d</sup> Includes live fish combined with any other single bait except dead fish.

<sup>e</sup> Includes dead fish combined with other jigs.

<sup>f</sup> Includes odd bait types; non-fish, two-item combinations of natural and artificial baits; and bait combinations not recordable with two digits.

Table 7. Baitfish types used (% of trips) on private-boat trips in Texas bays and passes by bay system, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Bay system								
	Sabine Lake	Galveston	Matagorda	San Antonio	Aransas	Corpus Christi	Upper Laguna Madre	Lower Laguna Madre	Coastwide
Mullet	17.4	30.5	47.5	40.4	41.3	35.9	33.3	46.8	36.2
Atlantic croaker	2.3	16.1	27.1	43.9	22.5	21.3	15.2	0.5	18.5
Killifish	55.2	21.2	4.0	3.5	11.9	4.7	7.1	0	16.1
Pinfish	0	3.8	3.7	3.0	13.6	18.3	11.1	4.2	7.4
Herring	10.4	14.8	2.7	0.4	0.2	0	0	25.5	6.3
Pigfish	0	0.4	2.0	1.3	1.1	5.3	7.1	1.9	1.9
Atlantic cutlassfish	0	0	1.0	0	0.2	1.0	0	0.5	0.4
Round scad	0.3	2.5	0.3	0	0	0	0	0	0.4
Other	1.3	1.7	1.0	0	0.2	1.7	14.1	5.1	1.9
Mullet combination	9.1	6.4	8.7	5.7	6.5	7.0	5.1	14.8	7.9
Atlantic croaker combination	5.2	3.0	5.0	4.8	3.2	5.0	7.1	1.4	4.2
Killifish combination	6.8	5.1	1.3	1.3	1.9	1.0	3.0	0	2.7
Pinfish combination	0	0.8	2.0	2.2	6.3	8.3	5.1	2.3	3.5
Herring combination	6.5	3.8	2.0	0.9	0.4	0	0	8.3	2.8
Pigfish combination	0	0	2.0	1.7	0.6	3.0	1.0	1.4	1.2
Atlantic cutlassfish combination	0	0.8	0.3	0	0	0.3	0	0.5	0.2
Round scad combination	0	0	0	0	0	0	0	0	0
Other combination	1.0	0.8	1.0	0	0	0.3	4.0	3.7	1.0
Number of trip interviews	384	236	299	230	462	301	99	216	2,227

<sup>a</sup> See Table 2 for description of baitfish types. Combinations include the listed species along with one (211 interviews), two (27 interviews), or three (5 interviews) other listed species. Due to inclusion of multiple combination categories, column-percentage sums are greater than 100.

Table 8. Baitfish types used (% of trips) on party-boat trips in Texas bays and passes by bay system, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Bay system								
	Sabine Lake	Galveston	Matagorda	San Antonio	Aransas	Corpus Christi	Upper Laguna Madre	Lower Laguna Madre	Coastwide
Mullet	0	0	0	0	20.4	13.5	18.2	100.0	18.0
Atlantic croaker	0	100.0	100.0	100.0	61.9	42.3	18.2	0	59.2
Killifish	100.0	0	0	0	1.4	1.9	0	0	1.6
Pinfish	0	0	0	0	4.1	5.8	18.2	0	4.4
Herring	0	0	0	0	0	0	0	0	0
Pigfish	0	0	0	0	4.1	23.1	9.1	0	7.6
Atlantic cutlassfish	0	0	0	0	0	0	0	0	0
Round scad	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0
Mullet combination	0	0	0	0	2.7	3.8	9.1	0	2.8
Atlantic croaker combination	0	0	0	0	6.1	11.5	27.3	0	7.2
Killifish combination	0	0	0	0	3.4	1.9	0	0	2.4
Pinfish combination	0	0	0	0	1.4	1.9	27.3	0	2.4
Herring combination	0	0	0	0	0	0	0	0	0
Pigfish combination	0	0	0	0	3.4	9.6	18.2	0	4.8
Atlantic cutlassfish combination	0	0	0	0	0	0	0	0	0
Round scad combination	0	0	0	0	0	0	0	0	0
Other combination	0	0	0	0	0	0	0	0	0
Number of trip interviews	1	2	3	28	147	52	11	6	250

<sup>a</sup> See Table 2 for description of baitfish types. Combinations include the listed species along with one (20 interviews) or two (3 interviews) other listed species. Due to inclusion of multiple combination categories, some column-percentage sums are greater than 100.

Table 9. Baitfish types used (% of trips) on private-boat trips in the gulf off Texas by gulf area, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Gulf area					
	Sabine Lake	Galveston	Matagorda	Corpus Christi	Lower Laguna Madre	Coastwide
Mullet	6.1	0.5	10.4	3.0	10.8	4.9
Atlantic croaker	5.3	1.4	19.1	0.5	2.7	6.1
Killifish	3.0	0.5	0	0	0	0.7
Pinfish	0	0.9	0.5	0	0	0.4
Herring	25.0	5.0	2.7	0	5.4	6.6
Pigfish	0	0	0.5	0	0	0.1
Atlantic cutlassfish	1.5	6.9	31.7	77.8	27.0	31.1
Round scad	45.5	78.0	18.0	4.5	10.8	35.9
Other	1.5	1.8	1.1	1.0	16.2	2.1
Mullet combination	4.5	0.5	3.8	2.5	10.8	3.0
Atlantic croaker combination	2.3	0.5	3.3	0.5	2.7	1.6
Killifish combination	3.0	0	1.1	0	0	0.8
Pinfish combination	0	0.9	2.2	2.0	0	1.3
Herring combination	8.3	1.4	2.7	0	8.1	2.9
Pigfish combination	0	0	0.5	0	0	0.1
Atlantic cutlassfish combination	1.5	2.8	10.9	12.1	18.9	7.7
Round scad combination	6.1	4.6	8.2	7.6	2.7	6.4
Other combination	0	0	0	1.5	10.8	0.9
Number of trip interviews	132	218	183	198	37	768

<sup>a</sup> See Table 2 for description of baitfish types. Combinations include the listed species along with one (87 interviews) or two (5 interviews) other listed species. Due to inclusion of multiple combination categories, column-percentage sums are greater than 100.

Table 10. Baitfish types used (% of trips) on party-boat trips in the gulf off Texas by gulf area, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Gulf area					
	Sabine Lake	Galveston	Matagorda	Corpus Christi	Lower Laguna Madre	Coastwide
Mullet	0	0	0	0	0	0
Atlantic croaker	0	0	75.0	0	0	16.7
Killifish	0	0	0	0	0	0
Pinfish	0	0	0	0	0	0
Herring	100.0	75.0	0	0	0	33.3
Pigfish	0	0	0	0	0	0
Atlantic cutlassfish	0	0	25.0	60.0	0	22.2
Round scad	0	25.0	0	0	0	5.6
Other	0	0	0	0	100.0	11.1
Mullet combination	0	0	0	0	0	0
Atlantic croaker combination	0	0	0	0	0	0
Killifish combination	0	0	0	0	0	0
Pinfish combination	0	0	0	0	0	0
Herring combination	0	0	0	0	0	0
Pigfish combination	0	0	0	0	0	0
Atlantic cutlassfish combination	0	0	0	40.0	0	11.1
Round scad combination	0	0	0	40.0	0	11.1
Other combination	0	0	0	0	0	0
Number of trip interviews	3	4	4	5	2	18

<sup>a</sup> See Table 2 for description of baitfish types. Combinations include the listed species along with one (2 interviews) other listed species. Due to inclusion of multiple combination categories, some column-percentage sums are greater than 100.



Table 11. Live baitfish used (% of trips) on private-boat trips in Texas bays and passes by species landed, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Spotted seatrout	Red drum	Black drum	Southern flounder	Atlantic croaker	Sand seatrout	Sheeps-head	Gafftop-sail catfish	Other species
Mullet	37.6	59.2	50.0	33.9	15.8	32.0	50.0	18.8	39.7
Atlantic croaker	36.0	13.8	0	1.1	10.5	20.0	0	56.2	20.5
Killifish	12.5	14.5	33.3	55.4	47.4	16.2	33.3	18.8	15.1
Pinfish	7.6	10.0	8.3	2.2	5.3	8.0	16.7	0	8.2
Herring	3.7	0.6	8.3	7.0	15.8	20.0	0	0	16.4
Pigfish	2.6	1.9	0	0.5	5.3	4.0	0	6.2	0
Atlantic cutlassfish	0	0	0	0	0	0	0	0	0
Round scad	0	0	0	0	0	0	0	0	0
Number of trip interviews <sup>b</sup>	383	311	12	186	19	25	6	16	73

<sup>a</sup> See Table 2 for description of baitfish types.

<sup>b</sup> In total, there were 711 private-boat angling parties that used live fish for bait and landed at least one fish. Of these, 451 parties landed one species, 205 parties landed two species, 50 parties landed three species, and 5 parties landed four species.

Table 12. Live baitfish used (% of trips) on party-boat trips in Texas bays and passes by species landed, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Spotted seatrout	Red drum	Black drum	Southern flounder	Atlantic croaker	Sand seatrout	Sheeps-head	Gafftop-sail catfish	Other species
Mullet	11.2	29.1	0	35.7	0	20.0	100.0	11.1	25.0
Atlantic croaker	77.1	52.4	0	50.0	0	40.0	0	77.8	50.0
Killifish	1.2	1.9	0	0	0	0	0	0	0
Pinfish	1.8	4.9	0	14.3	0	20.0	0	0	0
Herring	0	0	0	0	0	0	0	0	0
Pigfish	8.8	11.7	100.0	0	0	20.0	0	11.1	25.0
Atlantic cutlassfish	0	0	0	0	0	0	0	0	0
Round scad	0	0	0	0	0	0	0	0	0
Number of trip interviews <sup>b</sup>	170	103	1	14	0	5	1	9	8

<sup>a</sup> See Table 2 for description of baitfish types.

<sup>b</sup> In total, there were 187 party-boat angling parties that used live fish for bait and landed at least one fish. Of these, 85 parties landed one species, 86 parties landed two species, 10 parties landed three species, and 6 parties landed four species.

Table 13. Live baitfish used (% of trips) on private-boat trips in the gulf off Texas by species landed, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Red snapper	King mackerel	Dolphin-fish	Gray triggerfish	Spanish mackerel	Spotted seatrout	Red drum	Sand seatrout	Other species
Mullet	100.0	0	0	0	33.3	7.1	16.7	100.0	25.0
Atlantic croaker	0	0	0	0	66.7	78.6	50.0	0	50.0
Killifish	0	0	0	0	0	0	0	0	0
Pinfish	0	100.0	0	0	0	7.1	16.7	0	16.7
Herring	0	0	0	0	0	3.6	16.7	0	8.3
Pigfish	0	0	0	0	0	3.6	0	0	0
Atlantic cutlassfish	0	0	0	0	0	0	0	0	0
Round scad	0	0	0	0	0	0	0	0	0
Number of trip interviews <sup>b</sup>	2	2	0	0	3	28	6	1	12

<sup>a</sup> See Table 2 for description of baitfish types.

<sup>b</sup> In total, there were 36 private-boat angling parties that used live fish for bait and landed at least one fish. Of these, 21 parties landed one species, 12 parties landed two species, and 3 parties landed three species.

Table 14. Live baitfish used (% of trips) on party-boat trips in the gulf off Texas by species landed, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Red snapper	King mackerel	Dolphin-fish	Gray triggerfish	Spanish mackerel	Spotted seatrout	Red drum	Sand seatrout	Other species
Mullet	0	0	0	0	0	0	0	0	0
Atlantic croaker	0	0	0	0	0	100.0	100.0	0	0
Killifish	0	0	0	0	0	0	0	0	0
Pinfish	0	0	0	0	0	0	0	0	0
Herring	0	0	0	0	0	0	0	0	0
Pigfish	0	0	0	0	0	0	0	0	0
Atlantic cutlassfish	0	0	0	0	0	0	0	0	0
Round scad	0	0	0	0	0	0	0	0	0
Number of trip interviews <sup>b</sup>	0	0	0	0	0	3	2	0	0

<sup>a</sup> See Table 2 for description of baitfish types.

<sup>b</sup> In total, there were 3 party-boat angling parties that used live fish for bait and landed at least one fish. Of these, 1 party landed one species and 2 parties landed two species.

Table 15. Dead baitfish used (% of trips) on private-boat trips in Texas bays and passes by species landed, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Spotted seatrout	Red drum	Black drum	Southern flounder	Atlantic croaker	Sand seatrout	Sheeps-head	Gafftop-sail catfish	Other species
Mullet	55.9	74.4	66.7	83.3	27.3	30.4	100.0	14.3	40.0
Atlantic croaker	2.9	2.4	6.7	0	9.1	8.7	0	28.6	10.0
Killifish	1.5	0	0	8.3	0	0	0	0	1.7
Pinfish	5.9	4.9	0	0	18.2	30.4	0	14.3	6.7
Herring	27.9	15.9	26.7	8.3	45.5	30.4	0	28.6	30.0
Pigfish	4.4	2.4	0	0	0	0	0	14.3	3.3
Atlantic cutlassfish	0	0	0	0	0	0	0	0	3.3
Round scad	1.5	0	0	0	0	0	0	0	6.7
Number of trip interviews <sup>b</sup>	68	82	15	12	11	23	2	7	60

<sup>a</sup> See Table 2 for description of baitfish types.

<sup>b</sup> In total, there were 173 private-boat angling parties that used dead fish for bait and landed at least one fish. Of these, 98 parties landed one species, 47 parties landed two species, 24 parties landed three species, and 4 parties landed four species.

Table 16. Dead baitfish used (% of trips) on party-boat trips in Texas bays and passes by species landed, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Spotted seatrout	Red drum	Black drum	Southern flounder	Atlantic croaker	Sand seatrout	Sheeps-head	Gafftop-sail catfish	Other species
Mullet	57.1	75.0	0	50.0	0	0	0	0	0
Atlantic croaker	42.9	12.5	0	0	0	0	0	0	100.0
Killifish	0	0	0	0	0	0	0	0	0
Pinfish	0	12.5	0	50.0	0	0	0	0	0
Herring	0	0	0	0	0	0	0	0	0
Pigfish	0	0	0	0	0	0	0	0	0
Atlantic cutlassfish	0	0	0	0	0	0	0	0	0
Round scad	0	0	0	0	0	0	0	0	0
Number of trip interviews <sup>b</sup>	7	8	0	2	0	0	0	0	1

<sup>a</sup> See Table 2 for description of baitfish types.

<sup>b</sup> In total, there were 12 party-boat angling parties that used dead fish for bait and landed at least one fish. Of these, 7 parties landed one species, 4 parties landed two species, and 1 party landed three species.

Table 17. Dead baitfish used (% of trips) on private-boat trips in the gulf off Texas by species landed, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Red snapper	King mackerel	Dolphin-fish	Gray triggerfish	Spanish mackerel	Spotted seatrout	Red drum	Sand seatrout	Other species
Mullet	0.5	0.4	0	6.2	0	0	25.0	0	1.2
Atlantic croaker	2.1	0.8	0	6.2	0	33.3	0	0	2.4
Killifish	0	0	0	0	0	0	0	0	0
Pinfish	0	0	0	0	0	0	0	0	0
Herring	17.0	3.9	0	18.8	7.0	0	12.5	28.7	9.7
Pigfish	0	0	0	0	0	0	0	0	0
Atlantic cutlassfish	13.8	48.2	20.0	25.0	26.3	33.3	12.5	14.3	28.5
Round scad	66.5	46.7	80.0	43.8	66.7	33.3	50.0	57.1	58.2
Number of trip interviews <sup>b</sup>	188	255	15	16	57	3	8	7	165

<sup>a</sup> See Table 2 for description of baitfish types.

<sup>b</sup> In total, there were 386 private-boat angling parties that used dead fish for bait and landed at least one fish. Of these, 174 parties landed one species, 121 parties landed two species, 69 parties landed three species, 19 parties landed four species, and 3 parties landed five species.

Table 18. Dead baitfish used (% of trips) on party-boat trips in the gulf off Texas by species landed, 15 May 1995 through 14 May 1996.

Baitfish type <sup>a</sup>	Red snapper	King mackerel	Dolphin-fish	Gray triggerfish	Spanish mackerel	Spotted seatrout	Red drum	Sand seatrout	Other species
Mullet	0	0	0	0	0	0	0	0	0
Atlantic croaker	0	0	0	0	0	0	0	0	0
Killifish	0	0	0	0	0	0	0	0	0
Pinfish	0	0	0	0	0	0	0	0	0
Herring	75.0	40.0	0	0	100.0	0	0	0	50.0
Pigfish	0	0	0	0	0	0	0	0	0
Atlantic cutlassfish	25.0	60.0	0	0	0	0	0	0	50.0
Round scad	0	0	0	0	0	0	0	0	0
Number of trip interviews <sup>b</sup>	4	5	0	0	1	0	0	0	4

<sup>a</sup> See Table 2 for description of baitfish types.

<sup>b</sup> In total, there were 6 party-boat angling parties that used dead fish for bait and landed at least one fish. Of these, 1 party landed one species, 3 parties landed two species, 1 party landed three species, and 1 party landed four species.



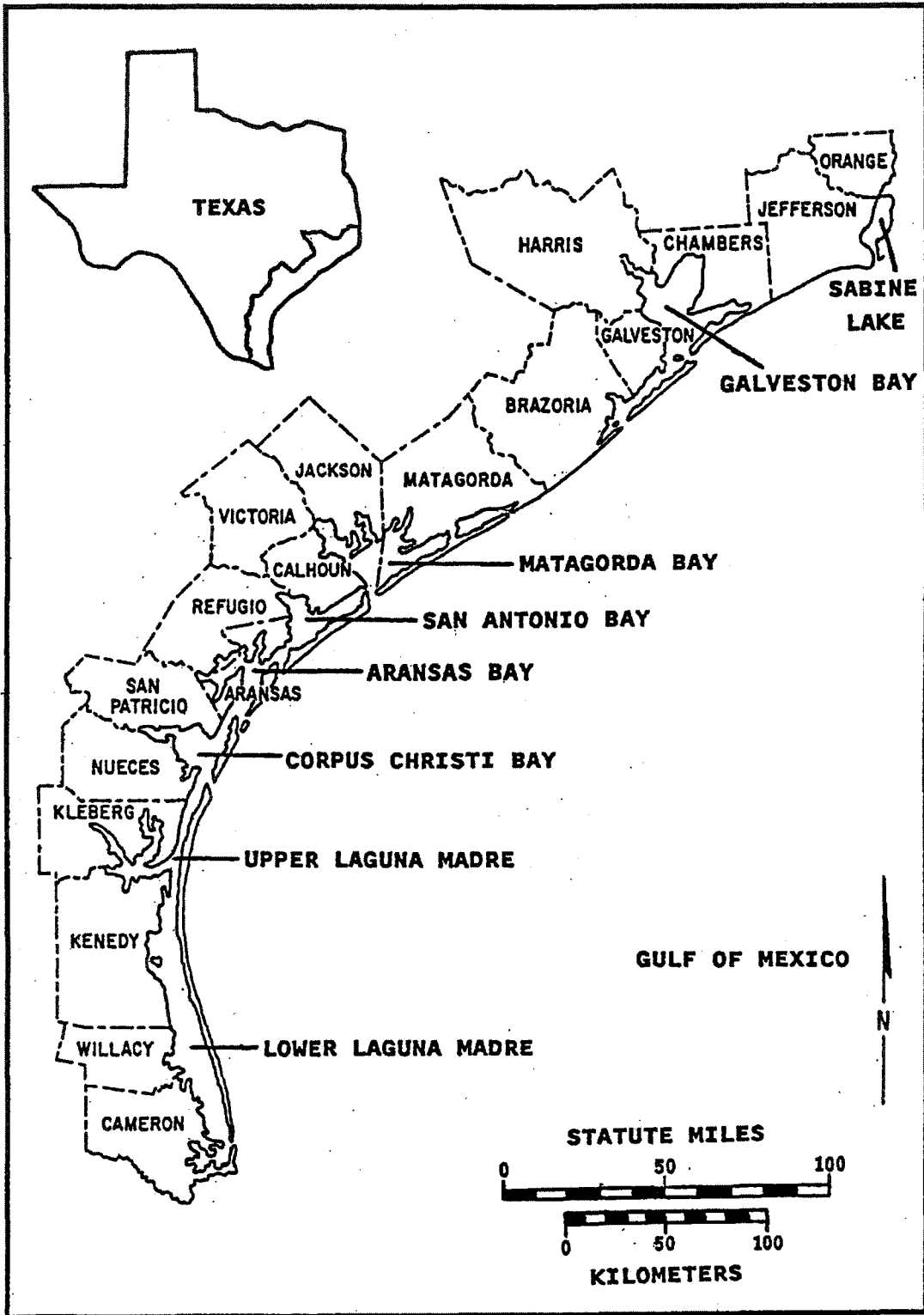


Figure 1. Bay systems and coastal counties of Texas.

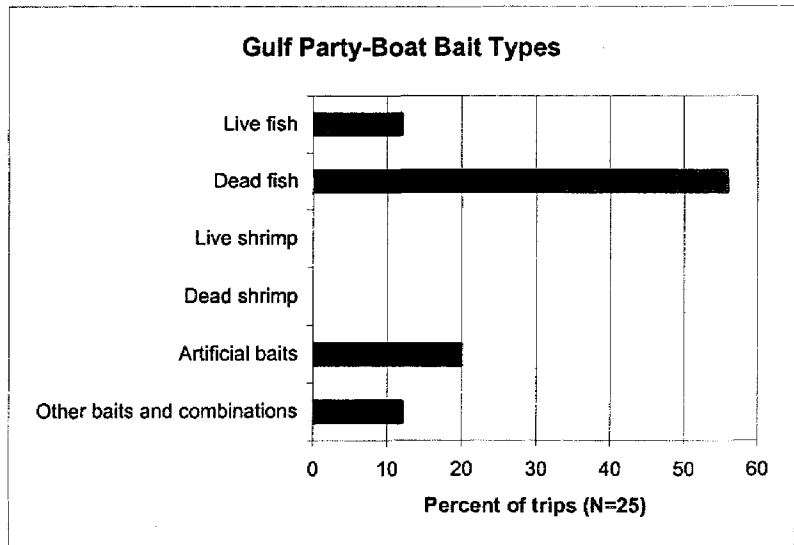
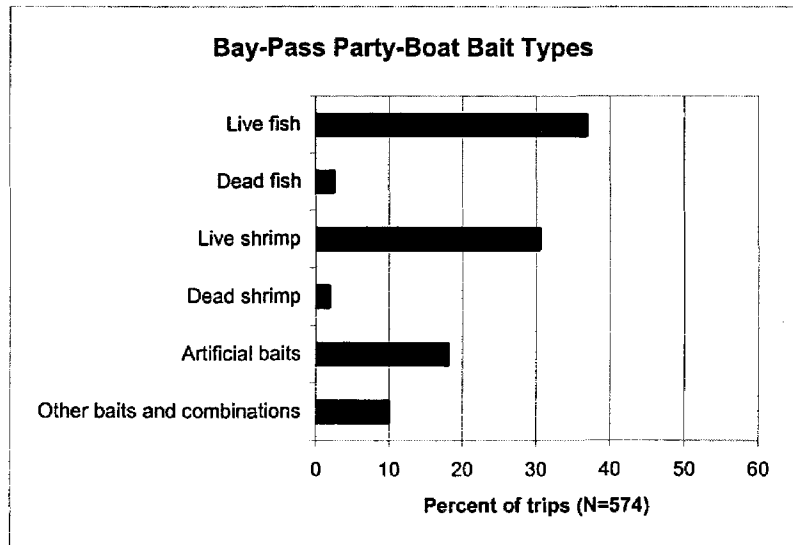
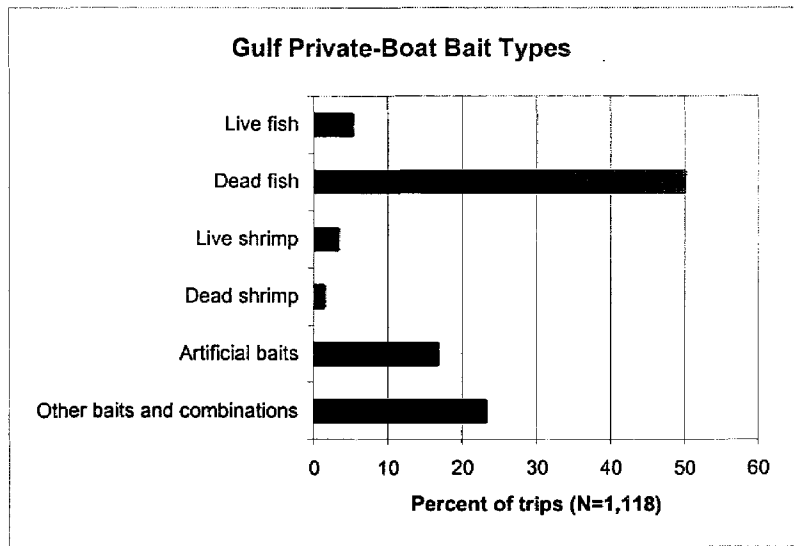
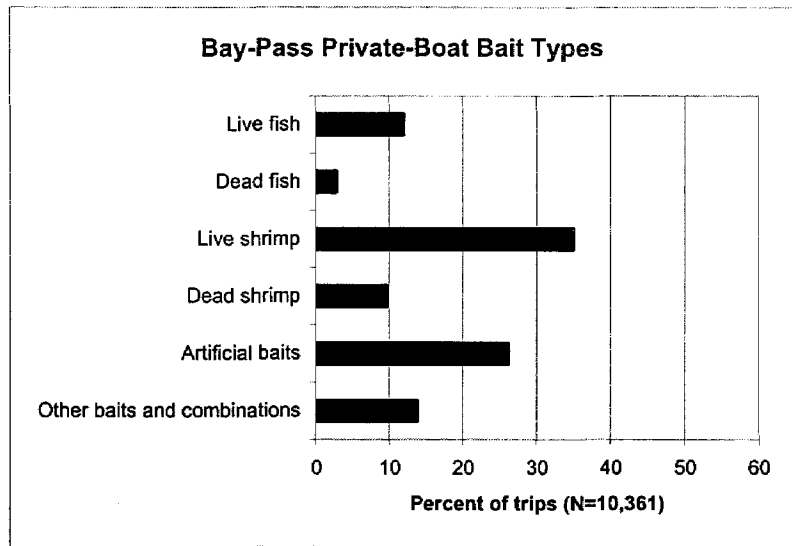


Figure 2. Bait types used on sport-boat trips along the Texas coast, May 1995 through May 1996.

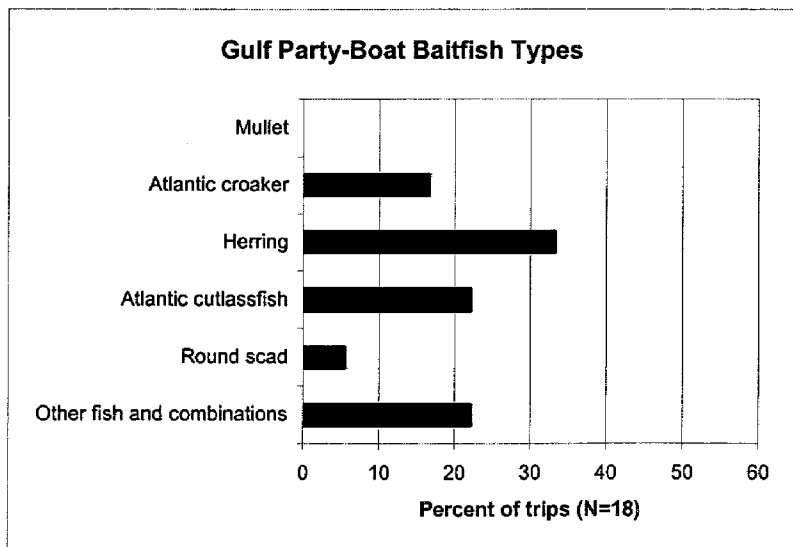
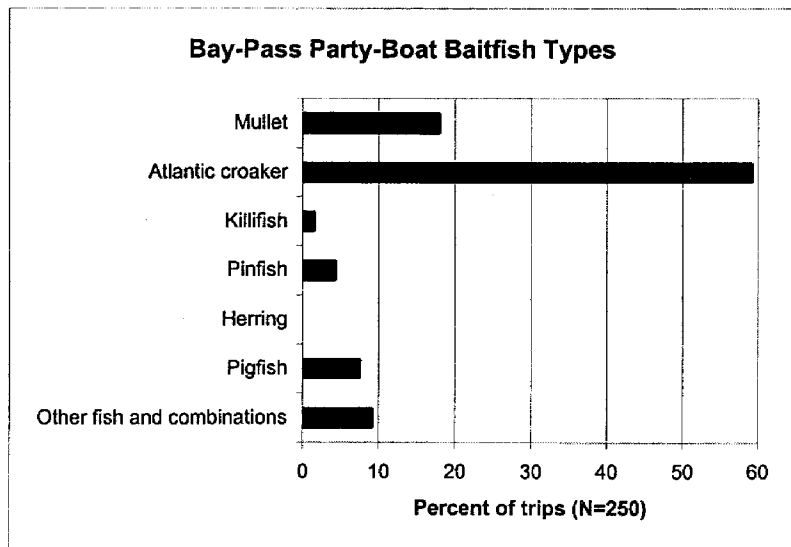
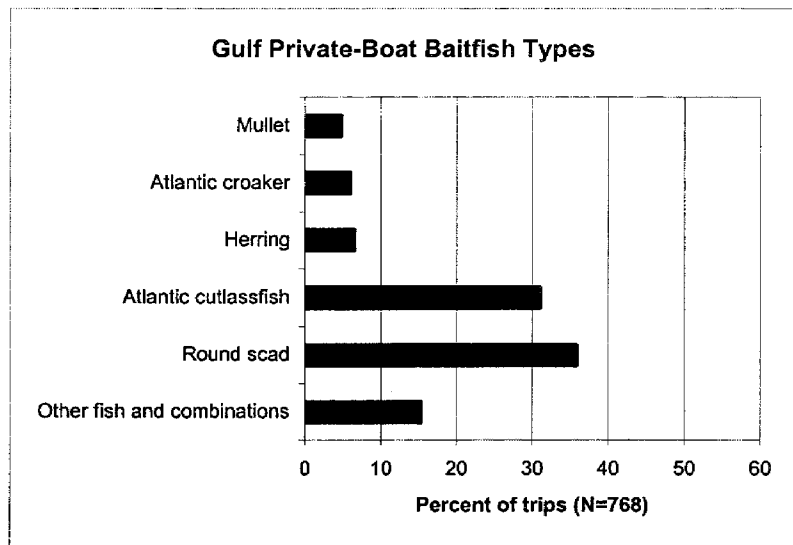
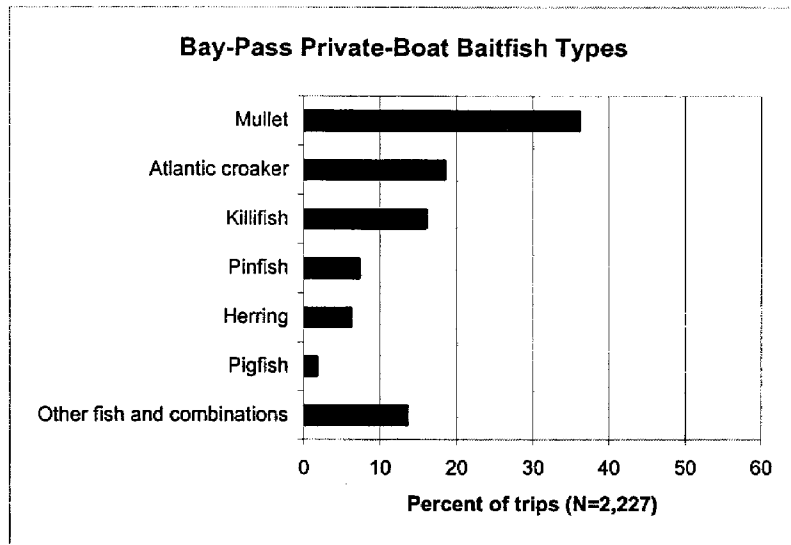


Figure 3. Baitfish types used on sport-boat trips along the Texas coast, May 1995 through May 1996.

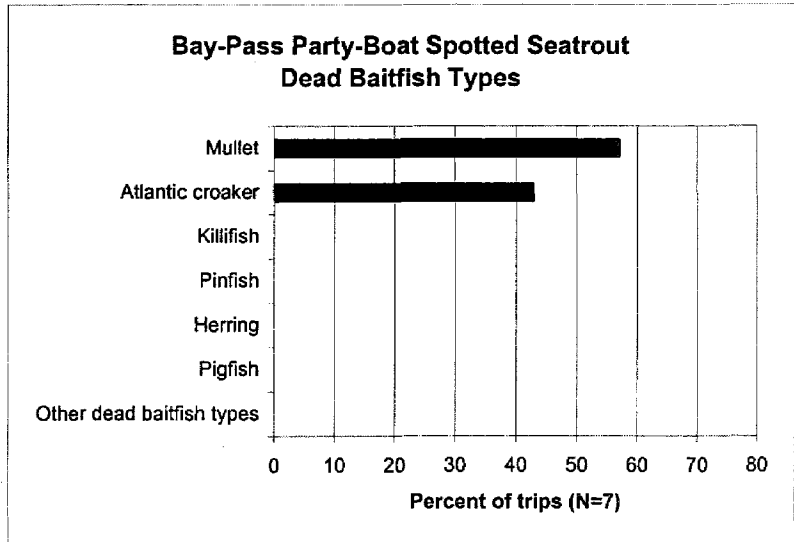
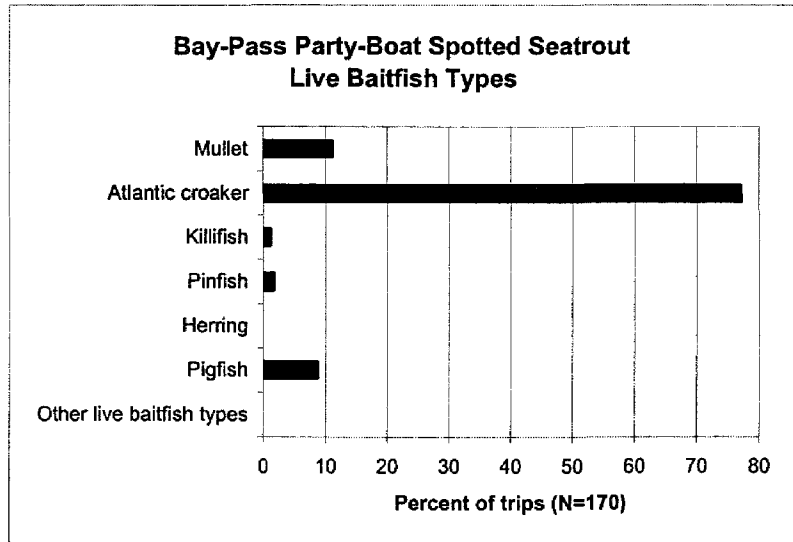
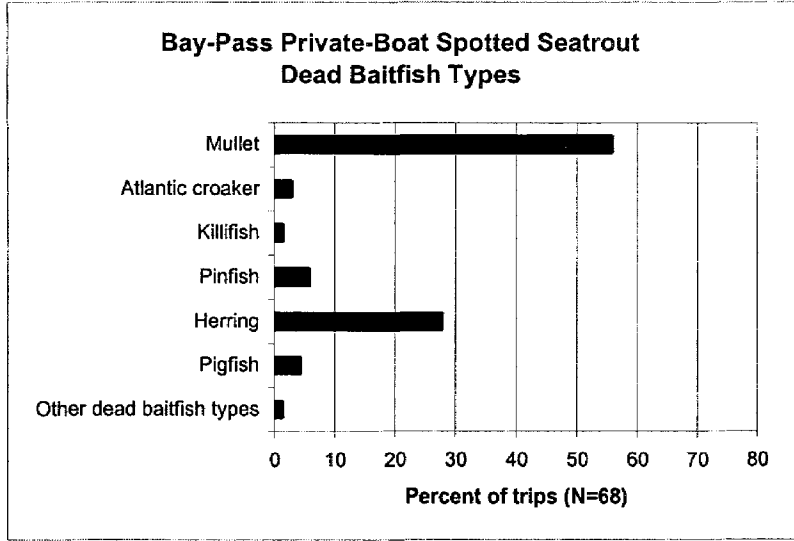
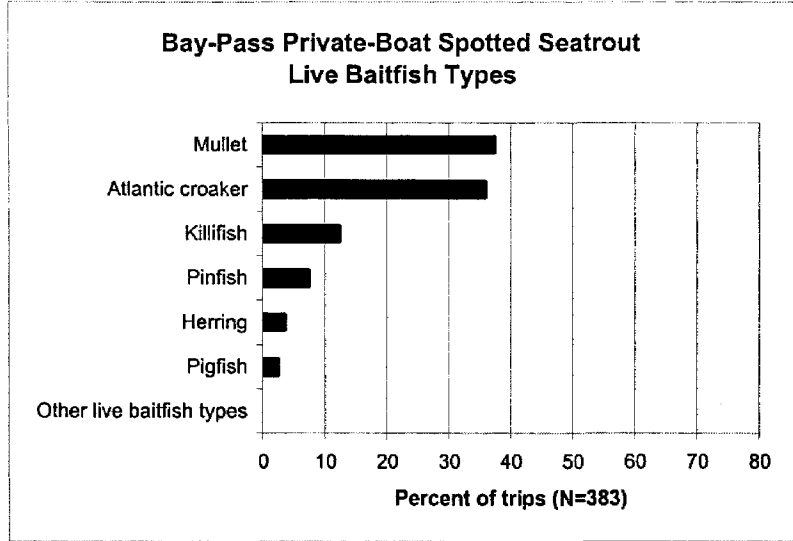


Figure 4. Live and dead baitfish types used on sport-boat trips in Texas bays and passes to catch spotted seatrout, May 1995 through May 1996.

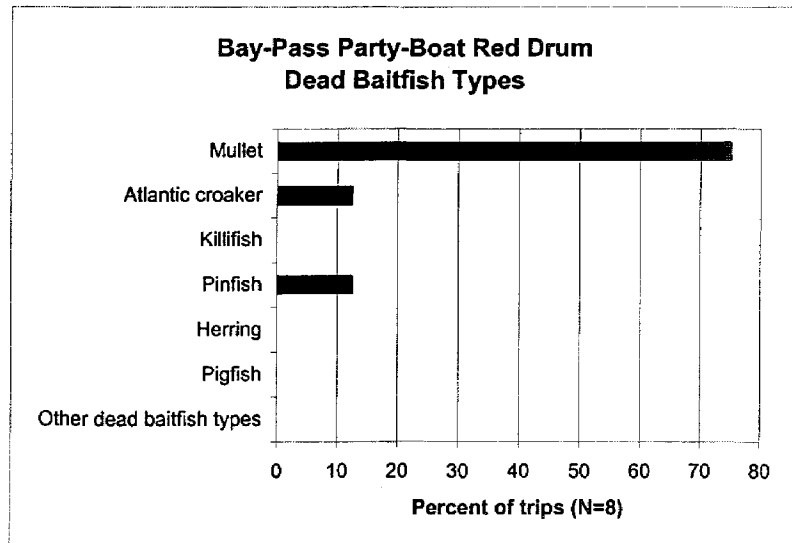
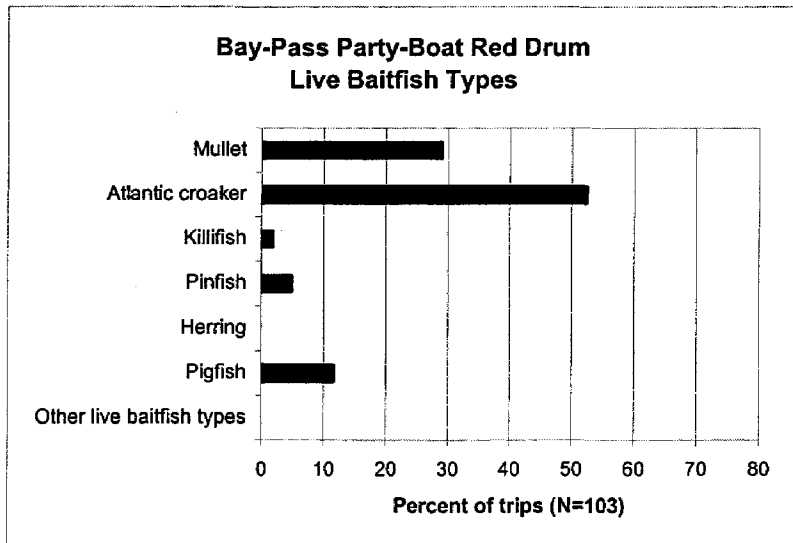
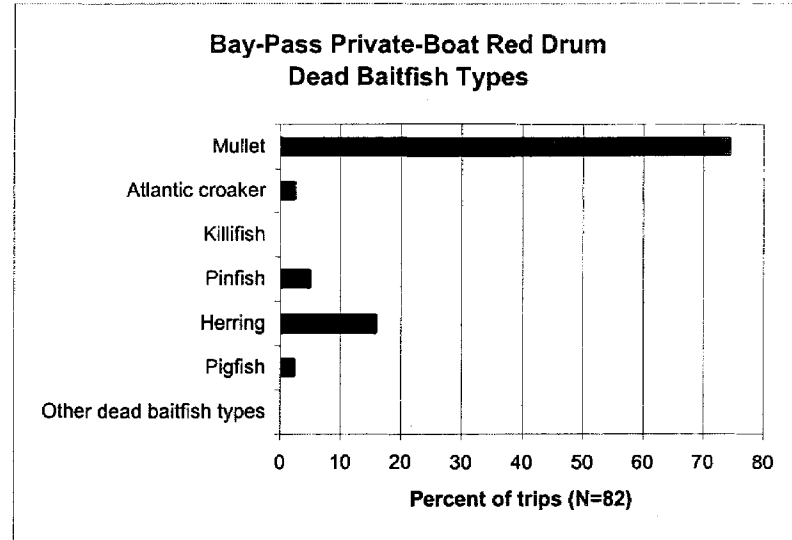
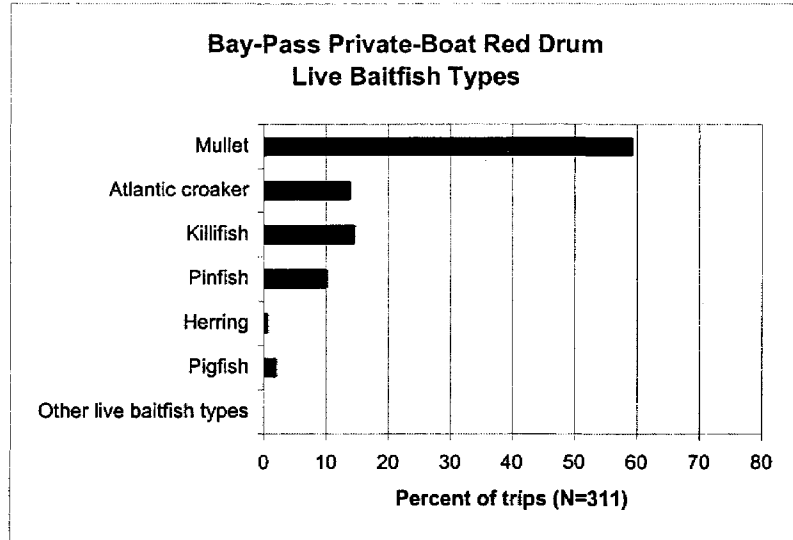


Figure 5. Live and dead baitfish types used on sport-boat trips in Texas bays and passes to catch red drum, May 1995 through May 1996.

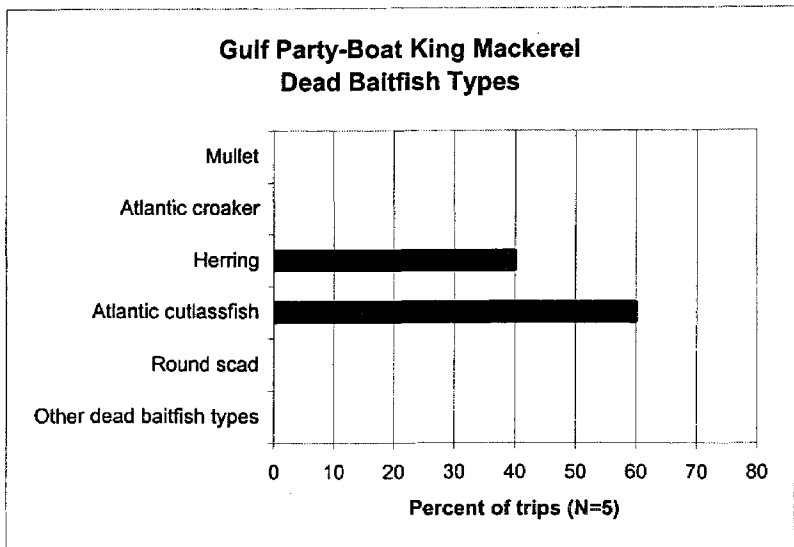
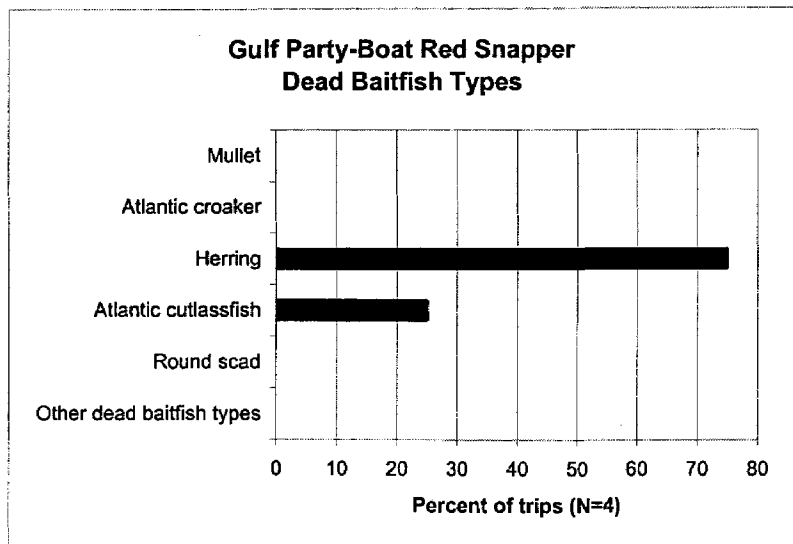
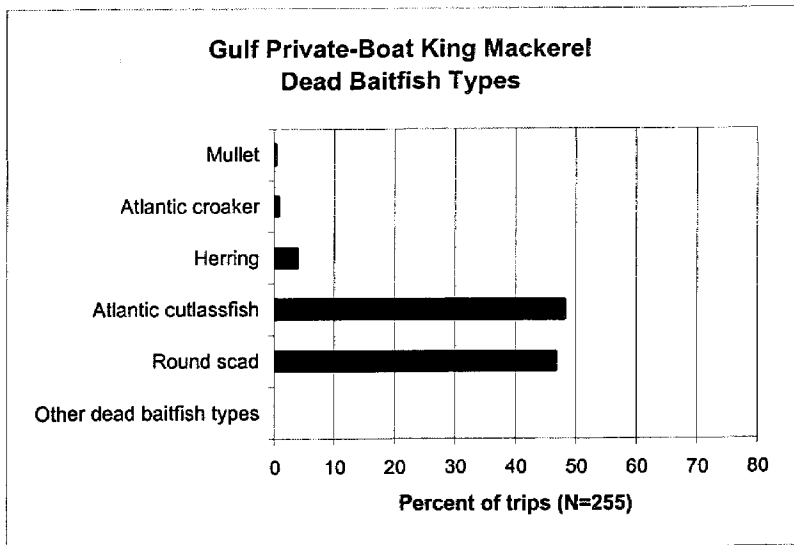
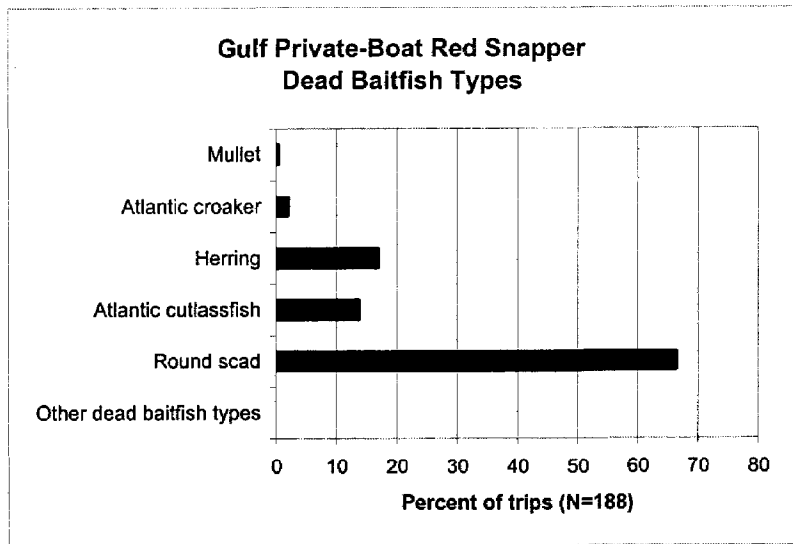


Figure 6. Dead baitfish types used on sport-boat trips in the gulf off Texas to catch red snapper and king mackerel, May 1995 through May 1996.

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