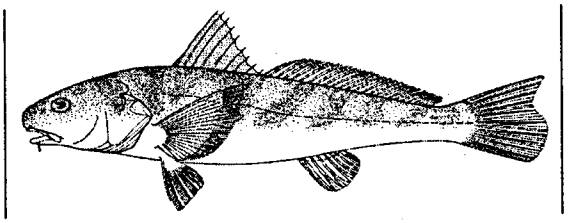
A Summary of Biological Information for Southern Kingfish (*Menticirrhus americanus*), Gulf Kingfish (*M. littoralis*), and Northern Kingfish (*M. saxatilis*) in Florida Waters.



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Executive summary

Three species of kingfish (whiting) occur in Florida waters, northern kingfish (*Menticirrhus americanus*), southern kingfish (*M. saxatilis*), and Gulf kingfish (*M. littoralis*). This report provides a summary of the available biological information for these three species and a brief characterization of the commercial and recreational kingfish landings within Florida.

All three species grow rapidly as juveniles, reaching about 120-180 mm total length (TL) by their first winter. They appear to be relatively short-lived, having been aged to only four years. Maximum size is about 450-500 mm TL. There is no information on growth specific to Florida waters for any of the species. Southern and northern kingfish mature at age-1 at about 180-200 mm TL. Little information exists concerning maturation in Gulf kingfish but it is assumed that they are similar to the other species in this regard. All three species spawn in late spring, summer, and early fall, with the time of peak spawning varying with geographic location. Kingfish are benthic feeders and eat a variety of prey including amphipods, isopods, crabs, bivalves, and polychaete worms. Southern kingfish are the most abundant of the three species in the estuaries of Florida. Gulf kingfish are restricted primarily to the surf zone along open beaches. Northern kingfish are the least common of the kingfishes in Florida and occur principally in shallow coastal waters.

Commercial landings were comprised primarily of age-1 southern kingfish in the size range 150-280 mm TL. Most of the landings came from northeast Florida. State-wide commercial landings varied between 500,000 and 1,200,000 lbs. per year during 1986-1995, with the lowest landings coming in recent years. Kingfish were landed primarily by trawls and gill nets. About 600-800 Saltwater Product License holders landed kingfish each year, of which most landed less than 5,000 pounds. Standardized catch per unit effort (CPUE) averaged about 25 pounds per trip on the Atlantic coast and 6 pounds per trip on the Gulf coast. No consistent trends in commercial CPUE were seen during the period examined (1986-1995).

State-wide recreational landings varied between 350,000 and 3,000,000 lbs. per year during 1986-1995. About 75% of the landings were southern kingfish and most of the remainder were Gulf kingfish. The length (TL) of recreationally-caught kingfish ranges from 200 to 400 mm. No consistent trends in recreational CPUE were seen during the period examined (1982-1995) except for a recent increasing trend in CPUE of Gulf kingfish on the Atlantic coast.

Introduction

The *Menticirrhus* complex in Florida waters consists of three species, *M. americanus* (southern kingfish), *M. saxatilis* (northern kingfish), and *M. littoralis* (Gulf kingfish). Although kingfish (or whiting as they are locally known) are generally not the target of directed fisheries, they occur significantly as bycatch in other fisheries. The kingfishes are abundant in nearshore and estuarine waters of Florida. The three species differ in their habitat requirements and their distribution within Florida waters reflects these differences. This report summarizes the available biological information for the three kingfish species and briefly characterizes the commercial and recreational fisheries for these species within Florida.

General Biology

Southern kingfish, *Menticirrhus americanus*

Southern kingfish range from southern New England to the southern tip of Florida, around the Gulf of Mexico, and down the east coast of South America to Argentina (Chao 1978). They have been reported from water temperatures of 8.0°C. (Bearden 1963) to 33.0°C. (Irwin 1970). They appear to be the most euryhaline of the Florida kingfish species, having been collecting in salinities ranging from 0.2‰ (DEP/FMRI Fisheries Independent Monitoring Program (FIM) unpublished data) to 41.0‰ (Irwin 1970).

Southern kingfish are primarily an inshore and bay species. Juveniles are found in a variety of shallow water habitats including open outer beaches (McMichael and Ross 1987), estuaries, tidal rivers and passes, and the mouths of rivers (Irwin 1970). They recruit to depths generally <5 m and expand their bathymetric range with age (Harding and Chittenden 1987) . Within Florida estuaries, southern kingfish are the most abundant of the three kingfish species (FIM 1995). Adults are commonly found in nearshore areas at depths of 5 to 20 m (Irwin 1970) and the deepest record of their occurrence is 37 m (Springer and Bullis 1956). They have been collected over all types of bottoms including sand, mud, seagrasses, and shell (Reid 1954; Bearden 1963; FIM unpublished data) but appear to prefer sand bottom (Bearden 1963).

Southern kingfish reach a size of about 125-135 mm total length (TL) by the end of their first summer, 185-200 mm TL by their second summer, and 260-280 mm TL by their third summer (Welsh and Breder 1923; Hildebrand and Cable 1934; Springer and Woodburn 1960; Bearden 1963; Smith and Wenner 1985). Music and Pafford (1984) reported the following back-calculated lengths (TL) at age: age-1: 152 mm; age-2: 277 mm; age-3: 320 mm; age-4: 361 mm. The following relationships have been provided for southern kingfish (from Georgia - Music and Pafford 1984; South Atlantic Bight - Smith and Wenner 1985; northwest Gulf of Mexico - Harding and Chittenden 1987):

Exponential Growth Model (Music and Pafford 1984)

combined sexes: $\text{Age (yr)} = 0.000431\ TL^{1.533}$

von Bertalanffy Growth Model (Smith and Wenner 1985)

males: L_t (in mm TL) = 292 $(1-e^{(-0.6369(t-0.0045))})$
females: L_t (in mm TL) = 477 $(1-e^{(-0.2742(t+0.2813))})$

Length Weight Relationship (combined sexes)

(Music and Pafford 1984): $\log_{10}Wt$ (in g) = -5.36 + 3.16 $\log_{10}TL$
(Smith and Wenner 1985): $\log_{10}Wt$ (in g) = -5.32 + 3.15 $\log_{10}TL$
(Harding and Chittenden 1987): $\log_{10}Wt$ (in g) = -5.79 + 3.33 $\log_{10}TL$

Length conversions (combined sexes)

(Smith and Wenner 1985): SL = -11.2 + 0.87 TL
(Harding and Chittenden 1987): SL = -6.19 +0.85 TL
(Harding and Chittenden 1987): TL = 7.40 + 1.18 SL

Southern kingfish in the South Atlantic Bight mature at age-1 at a mean size of 135 mm (5.3") TL for males and 192 mm (7.6") TL for females (Smith and Wenner 1985). In the northwest Gulf of Mexico, females mature at 150-220 mm (5.9-8.7") TL, and males mature at a length about 10-40 mm less than females (Harding and Chittenden 1987). Southern kingfish have a protracted spawning season, with spawning occurring later with increasing latitude. Most authors report the spawning season as late spring through mid autumn (Sikora and Sikora 1982), but year-long spawning has been reported from the Everglades region in south Florida (Jannke 1971). Peak spawning occurred in the South Atlantic Bight in June (Smith and Wenner 1985), while southern kingfish exhibited two spawning peaks in the northwest Gulf of Mexico, one in January-April and another in August-November (Harding and Chittenden 1987). In Florida waters, spawning took place during May-June in Tampa Bay (Springer and Woodburn 1960) and during April-August near Cedar Key (Reid 1954). Spawning occurs largely or entirely offshore in 9-36 m (Irwin 1970). Harding and Chittenden (1987) estimated the sex ratio (females/males) to be 1.2 and Smith and Wenner (1985) gave an estimate of 1.5.

Southern kingfish are reported to be "voracious bottom feeders" that eat a variety of organisms (Music and Pafford 1984). Juvenile southern kingfish feed on copepods, bivalve siphons, mysids, amphipods, polychaetes and cumaceans. Larger fish (> 70 mm TL) feed on various crab species, isopods, fishes, amphipods, and polychaetes (Bearden 1963; McMichael 1981).

Northern Kingfish, *Menticirrhus saxatilis*

Northern kingfish occur along the U.S. Atlantic coast from the Gulf of Maine to southern Florida, and along the Gulf of Mexico coast to the Yucatan, Mexico (Irwin 1970, Chao 1978). Their center of abundance is north of Cape Hatteras. They have been collected at water temperatures of 7.8°C. (Schaefer 1965) to 35.8°C. and at salinities of 8.0 to 35.1‰ but are

common only in water above 16‰ (Irwin 1970). In Tampa Bay, northern kingfish have only been collected in salinities greater than 16.7‰ (FIM, unpublished data).

Northern kingfish are much less abundant in Florida estuaries than southern kingfish (FIM 1995). Only 1 northern kingfish was collected in the Indian River lagoon by the Fisheries Independent Monitoring Program during 1990-1995. Northern kingfish occur at about 5% of the abundance of southern kingfish in Tampa Bay and Charlotte Harbor. They appear to be primarily a coastal species. Juveniles are collected from the open surf along outer sandy beaches (Irwin 1970; McMichael and Ross 1987). Larger individuals move to deeper water with increasing size, and all age groups move out of the shallows as temperatures fall in autumn (Irwin 1970). They have been collected down to a depth of at least 25 m.

The growth rate of northern kingfish is rapid. Hildebrand and Schroeder (1928) collected specimens up to 185 mm TL in Chesapeake Bay during October that they considered young-of-the-year. Welsh and Breder (1927) and Nichols and Breder (1927) collected juveniles in September that were 100-150 mm TL. Schaefer (1965) estimated back-calculated mean TL at age for females as follows: age-1: 266 mm; age-2: 343 mm; age-3:388 mm; age-4: 413 mm. Schaefer (1965) provided the following relationships:

<u>von Bertalanffy Growth Model</u>

males: $L_t = 386.6\ (1-e^{-0.7014(t+0.5505)})$
females: $L_t = 447.5\ (1-e^{-0.5558(t+0.6186)})$

<u>Length-Weight Relationship (combined sexes)</u>

$\log_{10}Wt = -5.1737 + 3.0747\ \log_{10}TL$

Welsh and Breder (1923) reported that northern kingfish along the U.S. east coast matured at age-2 and -3, but Schaefer (1965) reported that at least 50% of both males and females are mature at age-1. All young-of-the-year examined by Schaefer (1965) were immature. Irwin (1970) reported ripening females off North Carolina that were between 185-230 mm TL. This corresponds to age-1 fish based on Schaefer's (1965) growth model. Spawning occurs during the spring and summer (Welsh and Breder 1923; Hildebrand and Cable 1934; Bigelow and Schroeder 1953, Springer and Woodburn 1960) with a peak in June in New York waters (Schaefer 1965). Bigelow and Schroeder (1953) reported the spawning location as "bays and sounds".

McMichael and Ross (1987) found that northern kingfish in the northern Gulf of Mexico fed on isopods, crabs, fishes, polychaetes, amphipods, mysids, and cumaceans. The contribution of cumaceans and amphipods to the diet decreased with increasing size while the contribution of fishes and crabs increased with size. They found that dietary overlap among the northern, southern, and gulf kingfishes was relatively low.

Gulf kingfish, *Menticirrhus littoralis*

Gulf kingfish range along the U.S. Atlantic coast from about Chesapeake Bay to Florida, around the Gulf of Mexico, and to the coast of Brazil (Chao 1978). They have been collected in temperatures ranging from 10.8°C. to 31.0°C. (Springer and Woodburn 1960). This species is never found in low salinity. Gunter (1945) reported 17.9‰ as the lowest salinity at which gulf kingfish had been found. In Tampa Bay, they have not been collected in water below 30.7‰ (FIM, unpublished data). Simmons (1957) reported their occurrence in the upper Laguna Madre in Texas at salinities of 45‰.

Gulf kingfish are almost entirely a surf species although they also occur just offshore in shallow water. This restriction to shallow, sandy surf habitat has been noted by many authors (e.g. Gunter 1945, Reid 1945, Springer and Woodburn 1960). Northern and southern kingfish occur in surf zones primarily as juveniles only and migrate out of this habitat as they grow larger but gulf kingfish reside in the surf zone as both juveniles and adults. They are the most abundant kingfish in the surfzone, comprising 63% of the total number of *Menticirrhus* spp. present at a site in the northern Gulf of Mexico (McMichael and Ross 1987). Gulf kingfish are rarely collected within Tampa Bay, Charlotte Harbor, or the Indian River Lagoon (FIM 1995).

Less is known about the biology of Gulf kingfish than about the biology of northern and southern kingfish. Little is known of their growth rate but like the other two species, they appear to grow rapidly. Hildebrand and Cable (1934) found young-of-the-year gulf kingfish as large as 120 mm TL off North Carolina in September and Springer and Woodburn collected individuals of about 140-160 mm TL that were assumed to be young-of-the-year during October near Tampa Bay. Irwin (1970) estimated that age-2 fish were 252-271 mm TL which is similar to the other two species. Music and Pafford (1984) aged twenty-eight individuals and reported the following back-calculated lengths (TL) at age: age-1: 120 mm; age-2: 266 mm. Maximum size of Gulf kingfish is 457 mm TL (Breder 1948) and this is similar to the other two species. Music and Pafford provided the following length-weight relationship based on twenty-eight individuals:

$\log_{10}$ Wt (in g) = -4.675 + 2.872 $\log_{10}$TL

Spawning occurs during May to August (Darovec 1983). Little is known about the size and age of maturity of Gulf kingfish but it is likely that they are similar in this respect to northern and southern kingfish (Bearden 1963). Irwin (1970) and Gunter (1945) reported ripe females at 210 mm TL.

McMichael and Ross (1987) reported that small Gulf kingfish fed on bivalve siphons, cumaceans, mysids, copepods, amphipods, and polychaetes. Larger individuals (>100 mm TL) fed primarily on bivalves (whole and siphons), mole crabs, brachyuran crabs, and polychaetes.

Fishery Characteristics

Commercial

Southern kingfish are the most important commercially of the three species of *Menticirrhus* that occur in Florida waters. They occur regularly as a bycatch of the white shrimp fishery in northeast Florida. Coleman *et al.* (1993) found that southern kingfish was the only species of the genus *Menticirrhus* found in the bycatch of this fishery. Landings of kingfish in Florida are not reported by species in the Florida Marine Fisheries Information System, but port sampling indicates that most of the landings are southern kingfish. During 1986-1995 state-wide commercial landings varied between 503,250 and 1,230,433 lbs. per year with lower landings occurring in recent years (Table 1, Figure 1). Most of the landings come from the central and northern parts of the Florida Atlantic coast, with about 50% coming from Duval county alone. Commercially-landed kingfish range from 150 to 280 mm TL (Figure 2). Within this size range southern kingfish are primarily age-1.

Kingfish were landed primarily by trawls and gill nets (Table 2). About 600-800 Saltwater Product License holders landed kingfish each year, of which most landed less than 5,000 pounds (Table 3). Standardized catch per unit of effort (pounds per trip) averaged about 25 pounds on the Atlantic coast and 6 pounds on the Gulf coast (Figures 3 and 4). Catch per unit of effort was significantly different (Atlantic: F=43.72, d.f=9, 69230; Gulf: F=27.58, d.f.=9, 17520) among years on both coasts but no consistent trends were evident for the years examined (1986-1995).

Recreational

Information on recreational landings was obtained from the NMFS's Marine Recreational Fisheries Statistical Survey (MRFSS). Statewide landings for all three kingfish species pooled ranged between 355,865 and 3,393,676 lbs. per year during 1986-1995 (Table 4, Figure 1). About 75% of the landings were southern kingfish, with Gulf kingfish making up most of the rest of the landings. Only a few thousand pounds of northern kingfish were landed annually. Landings of southern kingfish on the Atlantic coast were about double those from the Gulf coast. Gulf landings of Gulf kingfish were generally much greater than Atlantic landings although this trend was reversed in 1994 and 1995. The length of recreationally-caught southern kingfish ranges from about 200 to 400 mm TL (Figure 2).

The mode of fishing (shore, private boat, charter boat) was examined for southern and Gulf kingfish. On the Atlantic coast, most kingfish were caught from shore (Figure 5). This was especially true for Gulf kingfish. On the Gulf coast, generally 60-80% of southern kingfish were landed by boat fishermen. For Gulf kingfish, shore landings dominated some years while boat landings dominated others. Landings of southern and Gulf kingfish from charter boats were never important on either coast.

Catch per unit effort (number of fish caught per hour) in the recreational fishery is presented in Figure 6 for southern and Gulf kingfish. In general, catch rates have varied around 0.5 fish per hour with no consistent trends in 1982-1995. Gulf kingfish on the Atlantic coast

historically had a lower CPUE than Gulf kingfish on the Gulf coast and showed an increasing trend in recent years.

Fisheries Independent

The DEP/FMRI Fisheries Independent Monitoring Program catch significant numbers of southern kingfish during their sampling of Tampa Bay, Charlotte Harbor, and the Indian River Lagoon. An index of recruitment was generated using GLM techniques for this species for the years 1989-1995. The index was not significantly different among years for Charlotte Harbor ($F=0.50$, d.f=6, 523; $p=0.81$) or the Indian River Lagoon ($F=0.79$, d.f=5, 528; $p=0.56$). The index was significantly different among years in Tampa Bay ($F=2.46$, d.f.=6, 734; $p=.02$) but no trend was apparent in the time series (Figure 7).

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List of Tables

List of Figures

Table 1. Commercial landings (lbs.) of kingfish (Me. .irrhus spp.) in Florida, 1995, by county.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Out-of -State	0	0	0	1121	0	0	0	0	0	279
ATLANTIC COAST										
Nassau	206,599	157,710	139,217	161,057	157,519	112,441	101,359	36,772	37,353	33,783
Duval	276,517	395,700	411,905	486,096	501,758	504,495	439,713	221,169	453,783	262,517
Clay	0	0	0	0	0	0	0	0	0	0
St. Johns	86,882	92,997	116,226	170,762	135,381	100,491	86,915	37,363	57,388	60,672
Putnam	0	0	0	0	15	228	0	0	0	0
Flagler	0	0	0	0	7	176	0	0	0	0
Volusia	102,773	93,222	94,145	104,026	99,966	60,554	53,349	44,085	51,249	35,747
Brevard	91,610	155,611	86,486	91,912	127,924	63,182	48,219	53,522	49,393	74,922
Indian River	19,736	14,310	7,839	10,197	27,284	14,824	5,207	11,204	3,318	2,210
St. Lucie	35,235	30,752	12,508	31,851	35,789	13,044	7,620	15,858	17,148	7,580
Martin	101,511	68,720	47,426	50,966	69,241	32,351	32,778	53,631	66,008	46,094
Palm Beach	148	1,000	584	4,443	2,653	791	634	5,053	1,875	2,225
Broward	0	0	32	81	22	44	49	46	206	1,794
Dade	224	0	0	0	0	0	12	66	4,192	7,652
Atlantic county totals	921,235	1,010,022	916,368	1,111,391	1,157,559	902,621	775,855	478,769	741,913	535,196
GULF COAST										
Escambia	1,402	2,352	972	1,080	90	910	1,687	2,717	1,055	1,297
Santa Rosa	36	14	5	383	319	97	83	22	73	30
Okaloosa	328	212	106	2,353	200	1,493	2,913	478	85	853
Bay	1,617	903	1,426	979	2,286	1,157	811	891	1,332	152
Walton	0	0	0	0	0	0	0	0	0	0
Washington	0	0	0	0	0	0	0	0	0	0
Gulf	260	497	30	0	505	1,089	0	210	0	0
Franklin	136	993	1,600	2,250	1,210	1,518	6,184	870	4,391	8,960
Wakulla	829	1,949	164	734	4,958	1,199	18,349	1,907	414	3,985
Jefferson	0	0	0	0	0	0	0	0	0	0
Taylor	145	1,163	865	588	911	1,332	2,435	362	6,856	4,446
Dixie	4,985	4,694	3,406	9,707	18,355	6,373	11,365	1,210	7,712	4,147
Levy	450	1,180	258	176	213	258	227	305	509	72
Citrus	82	14	35	85	146	90	67	51	69	202
Hernanado	0	0	0	3	0	3	0	0	0	0
Pasco	44	210	20	4	271	4	448	10	59	178
Pinellas	2,957	6,091	1,136	9,792	29,582	10,362	2,245	1,640	3,562	1,162
Hillsboro	7,809	10,683	8,293	3,439	5,238	2,161	2,307	2,824	1,657	1,949
Manatee	1,602	607	1,336	1,749	3,549	457	10,299	4,053	21,259	539
Sarasota	262	1	3	27	1	4	5	37	47	140
Charlotte	4,846	1,175	1,656	2,503	1,232	3,481	3,361	2,014	1,284	480
Lee	8,879	2,440	3,669	4,537	3,228	2,320	7,554	3,641	2,135	3,183
Adjusted Lee	0	0	0	0	0	0	0	0	0	0
Collier	4,972	934	111	616	332	225	260	461	1,219	1,546
Monroe	139	30	273	180	242	13	974	778	7,958	4,990
In-land counties	195	69	207	87	6	2	57	0	0	0
Gulf County totals	41,975	36,211	25,571	41,272	72,874	34,548	71,631	24,481	61,676	38,311
Statewide Totals	963,210	1,046,233	941,939	1,153,784	1,230,433	937,169	847,486	503,250	803,589	573,786

Table 4. Recreational landings (in #'s except as noted) of kingfish (Menticirrhus spp.) in Florida, by coast.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Southern Kingfish										
Atlantic	549,728	623,013	797,856	707,232	656,631	933,389	635,318	330,564	735,721	482,311
Gulf	188,253	200,617	328,175	260,568	327,299	597,354	215,436	55,077	190,162	374,926
State Total	737,981	823,630	1,126,031	967,800	983,930	1,530,743	850,754	385,641	925,883	857,237
Gulf Kingfish										
Atlantic	33,704	1,781	134,390	72,307	187,973	65,284	62,625	65,740	237,743	233,310
Gulf	3,262,490	116,573	252,010	301,052	92,220	542,765	294,223	80,691	120,074	43,105
State Total	3,296,194	118,354	386,400	373,359	280,193	608,049	356,848	146,431	357,817	276,415
Northern kingfish										
Atlantic	207,676	970	0	0	0	0	0	0	1,934	965
Gulf	2,106	0	2,770	0	0	0	0	5,993	0	4,459
State Total	209,782	970	2,770	0	0	0	0	5,993	1,934	5,424
All Species Pooled										
Atlantic Total (all spp.)	791,108	625,764	932,246	779,539	844,604	998,673	697,943	396,304	975,398	716,586
Avg. Wt. (lbs.)	0.44	0.66	0.66	0.66	0.44	0.44	0.44	0.66	0.66	0.66
Atlantic Total (lbs.)	348,815	413,868	616,569	515,572	372,403	440,335	307,737	262,108	645,109	473,936
Gulf Total (all spp.)	3,452,849	317,190	582,955	561,620	419,519	1,140,119	509,659	141,761	310,236	422,490
Avg. Wt. (lbs.)	0.88	0.66	0.66	0.66	0.66	0.44	0.66	0.66	0.66	0.55
Gulf Total (lbs.)	3,044,860	209,783	385,555	371,444	277,461	502,701	337,078	93,758	205,184	232,855
Statewide Totals (#'s)	4,243,957	942,954	1,515,201	1,341,159	1,264,123	2,138,792	1,207,602	538,065	1,285,634	1,139,076
Statewide Totals (lbs.)	3,393,676	623,651	1,002,124	887,016	649,864	943,036	644,815	355,865	850,293	706,791

Table 2. KINGFISH LANDINGS BY COAST AND GEAR

PROGRAM: KFG SAS EDITED BATCHES 1 -426

		COAST					
		ATLANTIC		GULF		INLAND/OUT OF STATE	
		TRIPS	POUNDS	TRIPS	POUNDS	TRIPS	POUNDS
YEAR	GEAR USED						
92	UNKNOWN	567	26,091	223	10,857	.	.
	TRAWL	2,938	451,773	339	15,467	.	.
	GILL NET	2,878	193,168	1,651	35,310	.	.
	TRAMMEL	88	725	76	815	.	.
	GIG/SPEAR	14	97	.	.	.	.
	HOOK AND LINE	999	18,457	49	2,908	.	.
	OTHER	214	85,544	194	6,286	.	.
	TOTAL	7,698	775,855	2,532	71,643	.	.
93	GEAR USED						
	UNKNOWN	149	5,709	28	520	.	.
	TRAWL	2,379	269,914	100	5,044	.	.
	GILL NET	2,559	161,725	1,159	14,842	.	.
	TRAMMEL	57	1,398	62	952	.	.
	GIG/SPEAR	5	115	.	.	.	.
	HOOK AND LINE	957	13,964	64	1,829	.	.
	OTHER	188	25,944	73	1,294	.	.
	TOTAL	6,294	478,769	1,486	24,481	.	.
94	GEAR USED						
	UNKNOWN	29	2,011	93	10,609	.	.
	TRAWL	2,848	370,435	88	16,342	.	.
	GILL NET	2,627	296,805	1,125	20,464	.	.
	TRAMMEL	15	264	336	6,995	.	.
	GIG/SPEAR	8	73	.	.	.	.
	HOOK AND LINE	978	23,682	110	5,138	.	.
	OTHER	233	48,692	108	2,128	.	.
	TOTAL	6,738	741,962	1,860	61,676	.	.
95	GEAR USED						
	UNKNOWN	25	2,621	17	150	.	.
	TRAWL	2,377	321,037	144	10,933	1	279
	GILL NET	1,582	100,743	653	12,790	.	.

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
FLORIDA MARINE RESEARCH INSTITUTE

KINGFISH LANDINGS BY COAST AND GEAR

PROGRAM: KFG SAS EDITED BATCHES 1 -426

		COAST					
		ATLANTIC		GULF		INLAND/OUT OF STATE	
		TRIPS	POUNDS	TRIPS	POUNDS	TRIPS	POUNDS
YEAR	GEAR USED						
95	TRAMMEL	11	33	347	5,077	.	.
	GIG/SPEAR	4	116	.	.	.	.
	HOOK AND LINE	1,019	30,634	134	8,763	.	.
	OTHER	213	80,012	40	598	.	.
	TOTAL	5,231	535,196	1,335	38,311	1	279

Table 3. KINGFISH SPL LICENSES AND ANNUAL PRODUCTION SUMMARY

PROGRAM: KFSPL SAS DATA: EDITED BATCHES 1 - 426

		COAST								
		ATLANTIC			GULF			INLAND/OUT OF STATE		
YEAR	POUND CATEGORY	NUMBER OF LICENSES	TRIPS	POUNDS	NUMBER OF LICENSES	TRIPS	POUNDS	NUMBER OF LICENSES	TRIPS	POUNDS
87	LESS THAN 100 LBS	406	1,338	9,301	293	797	5,635	2	3	14
	100 - 999 LBS	191	1,796	69,879	48	451	12,519	.	.	.
	1000 - 4,999 LBS	85	1,508	210,943	8	112	12,723	.	.	.
	5,000 - 9,999 LBS	28	876	205,981	1	111	5,320	.	.	.
	10,000 LBS OR MORE	18	1,818	513,918	.	.	.	.	.	.
	TOTAL	728	7,336	1,010,022	350	1,471	36,197	2	3	14
88	POUND CATEGORY									
	LESS THAN 100 LBS	451	1,510	10,306	354	1,100	5,667	7	12	130
	100 - 999 LBS	178	2,023	62,332	37	463	7,121	.	.	.
	1000 - 4,999 LBS	90	1,759	194,715	7	213	12,653	.	.	.
	5,000 - 9,999 LBS	34	917	237,512	.	.	.	.	.	.
	10,000 LBS OR MORE	19	1,489	411,503	.	.	.	.	.	.
	TOTAL	772	7,698	916,368	398	1,776	25,441	7	12	130
89	POUND CATEGORY									
	LESS THAN 100 LBS	457	1,509	10,891	427	1,355	7,433	4	5	146
	100 - 999 LBS	192	1,704	66,089	64	532	18,823	3	6	1,022
	1000 - 4,999 LBS	83	1,417	197,886	8	171	14,969	.	.	.
	5,000 - 9,999 LBS	30	940	213,935	.	.	.	.	.	.
	10,000 LBS OR MORE	32	1,637	622,590	.	.	.	.	.	.

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
FLORIDA MARINE RESEARCH INSTITUTE
MARINE FISHERIES INFORMATION SYSTEM

KINGFISH SPL LICENSES AND ANNUAL PRODUCTION SUMMARY

PROGRAM: KFSPL SAS DATA: EDITED BATCHES 1 - 426

		COAST								
		ATLANTIC			GULF			INLAND/OUT OF STATE		
YEAR	TOTAL	NUMBER OF LICENSES	TRIPS	POUNDS	NUMBER OF LICENSES	TRIPS	POUNDS	NUMBER OF LICENSES	TRIPS	POUNDS
89		794	7,207	1,111,391	499	2,058	41,225	7	11	1,168
90	POUND CATEGORY									
	LESS THAN 100 LBS	482	1,577	10,741	397	1,312	6,366	.	.	.
	100 - 999 LBS	234	2,988	83,205	62	618	18,692	.	.	.
	1000 - 4,999 LBS	106	2,494	262,906	15	171	31,404	.	.	.
	5,000 - 9,999 LBS	36	1,102	242,441	2	43	16,412	.	.	.
	10,000 LBS OR MORE	35	1,830	558,266	.	.	.	.	.	.
	TOTAL	893	9,991	1,157,559	476	2,144	72,874	.	.	.
	POUND CATEGORY									
	LESS THAN 100 LBS	414	1,469	9,388	386	1,077	6,012	1	2	2
	100 - 999 LBS	206	3,312	79,451	57	785	15,192	.	.	.
	1000 - 4,999 LBS	97	1,635	226,475	4	64	7,115	.	.	.
	5,000 - 9,999 LBS	24	1,177	182,042	1	3	6,249	.	.	.
	10,000 LBS OR MORE	26	1,565	405,265	.	.	.	.	.	.
	TOTAL	767	9,158	902,621	448	1,929	34,568	1	2	2
92	POUND CATEGORY									
	LESS THAN 100 LBS	429	1,813	9,842	453	1,318	8,137	.	.	.
	100 - 999 LBS	198	2,275	68,987	92	910	27,518	.	.	.
	1000 - 4,999 LBS	79	1,356	193,506	14	280	30,125	.	.	.
	5,000 - 9,999 LBS	27	1,156	191,381	1	24	5,863	.	.	.

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
FLORIDA MARINE RESEARCH INSTITUTE
MARINE FISHERIES INFORMATION SYSTEM

KINGFISH SPL LICENSES AND ANNUAL PRODUCTION SUMMARY

PROGRAM: KFSPL SAS DATA: EDITED BATCHES 1 - 426

		COAST								
		ATLANTIC			GULF			INLAND/OUT OF STATE		
YEAR	POUND CATEGORY	NUMBER OF LICENSES	TRIPS	POUNDS	NUMBER OF LICENSES	TRIPS	POUNDS	NUMBER OF LICENSES	TRIPS	POUNDS
92	10,000 LBS OR MORE	18	1,098	312,139	.	.	.	.	.	.
	TOTAL	751	7,698	775,855	560	2,532	71,643	.	.	.
93	LESS THAN 100 LBS	385	1,449	9,058	400	1,007	7,026	.	.	.
	100 - 999 LBS	198	2,294	74,672	48	443	13,166	.	.	.
	1000 - 4,999 LBS	69	1,491	162,691	3	36	4,289	.	.	.
	5,000 - 9,999 LBS	18	670	126,387	.	.	.	.	.	.
	10,000 LBS OR MORE	6	390	105,961	.	.	.	.	.	.
	TOTAL	676	6,294	478,769	451	1,486	24,481	.	.	.
94	LESS THAN 100 LBS	441	1,490	10,712	377	924	6,848	.	.	.
	100 - 999 LBS	182	1,799	71,169	77	680	23,351	.	.	.
	1000 - 4,999 LBS	66	1,469	158,135	10	231	12,327	.	.	.
	5,000 - 9,999 LBS	26	1,112	198,576	1	8	6,507	.	.	.
	10,000 LBS OR MORE	18	868	303,370	1	17	12,643	.	.	.
	TOTAL	733	6,738	741,962	466	1,860	61,676	.	.	.
95	LESS THAN 100 LBS	358	1,126	8,462	274	602	5,745	.	.	.
	100 - 999 LBS	184	1,500	65,273	77	658	19,951	1	1	279

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
FLORIDA MARINE RESEARCH INSTITUTE
MARINE FISHERIES INFORMATION SYSTEM

KINGFISH SPL LICENSES AND ANNUAL PRODUCTION SUMMARY

PROGRAM: KFSPL SAS DATA: EDITED BATCHES 1 - 426

		COAST								
		ATLANTIC			GULF			INLAND/OUT OF STATE		
YEAR	POUND CATEGORY	NUMBER OF LICENSES	TRIPS	POUNDS	NUMBER OF LICENSES	TRIPS	POUNDS	NUMBER OF LICENSES	TRIPS	POUNDS
95	1000 - 4,999 LBS	81	1,511	182,368	7	75	12,615	.	.	.
	5,000 - 9,999 LBS	20	668	143,786	.	.	.	.	.	.
	10,000 LBS OR MORE	9	426	135,307	.	.	.	.	.	.
	TOTAL	652	5,231	535,196	358	1,335	38,311	1	1	279
96	POUND CATEGORY									
	LESS THAN 100 LBS	153	317	5,701	78	109	1,481	.	.	.
	100 - 999 LBS	124	542	40,998	20	54	4,414	.	.	.
	1000 - 4,999 LBS	35	420	72,585	4	9	8,513	.	.	.
	5,000 - 9,999 LBS	4	86	25,788	1	10	5,456	.	.	.
	TOTAL	316	1,365	145,072	103	182	19,864	.	.	.

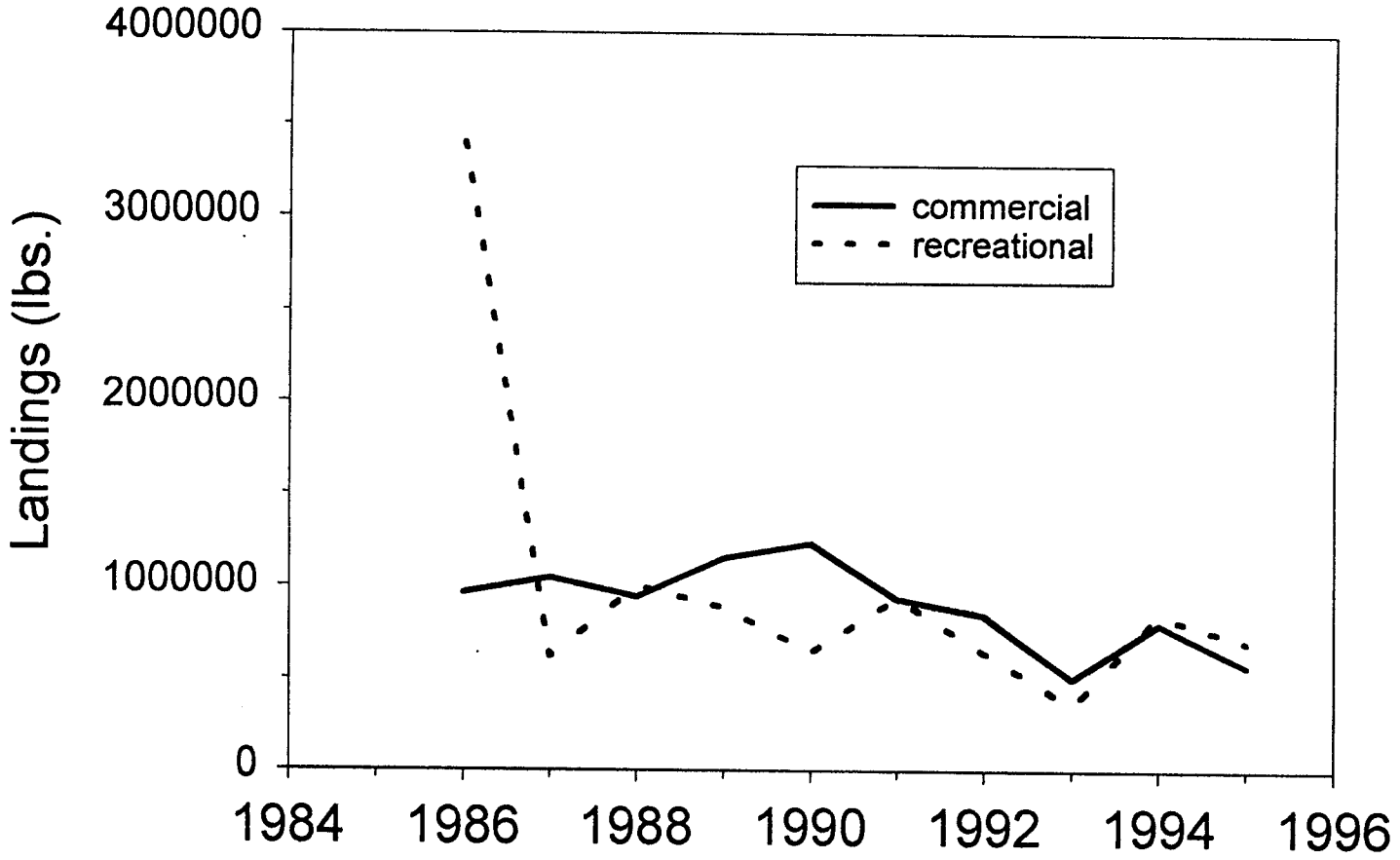


Figure 1. Landings of kingfish (*Menticirrhus* spp.) in Florida.

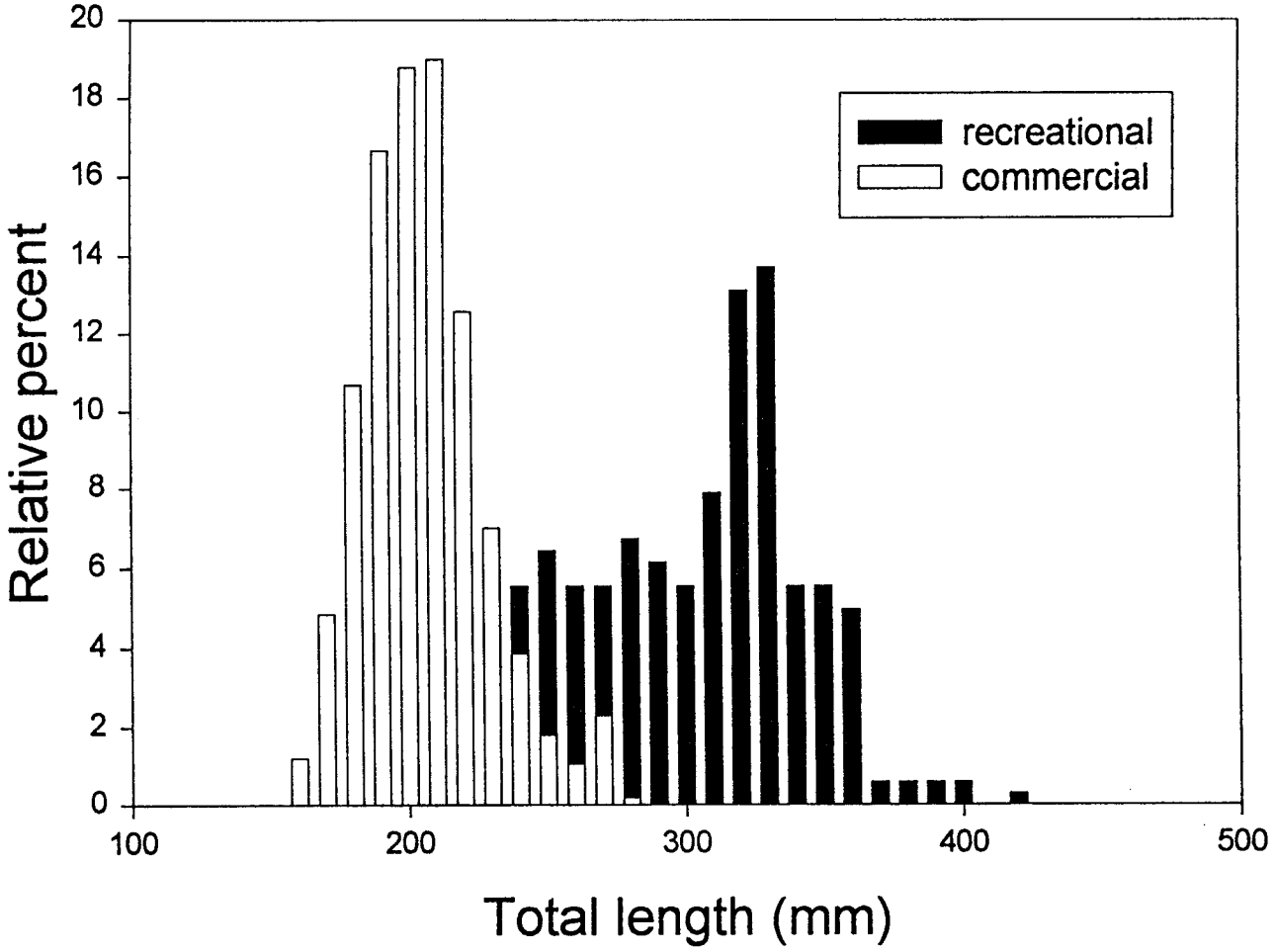
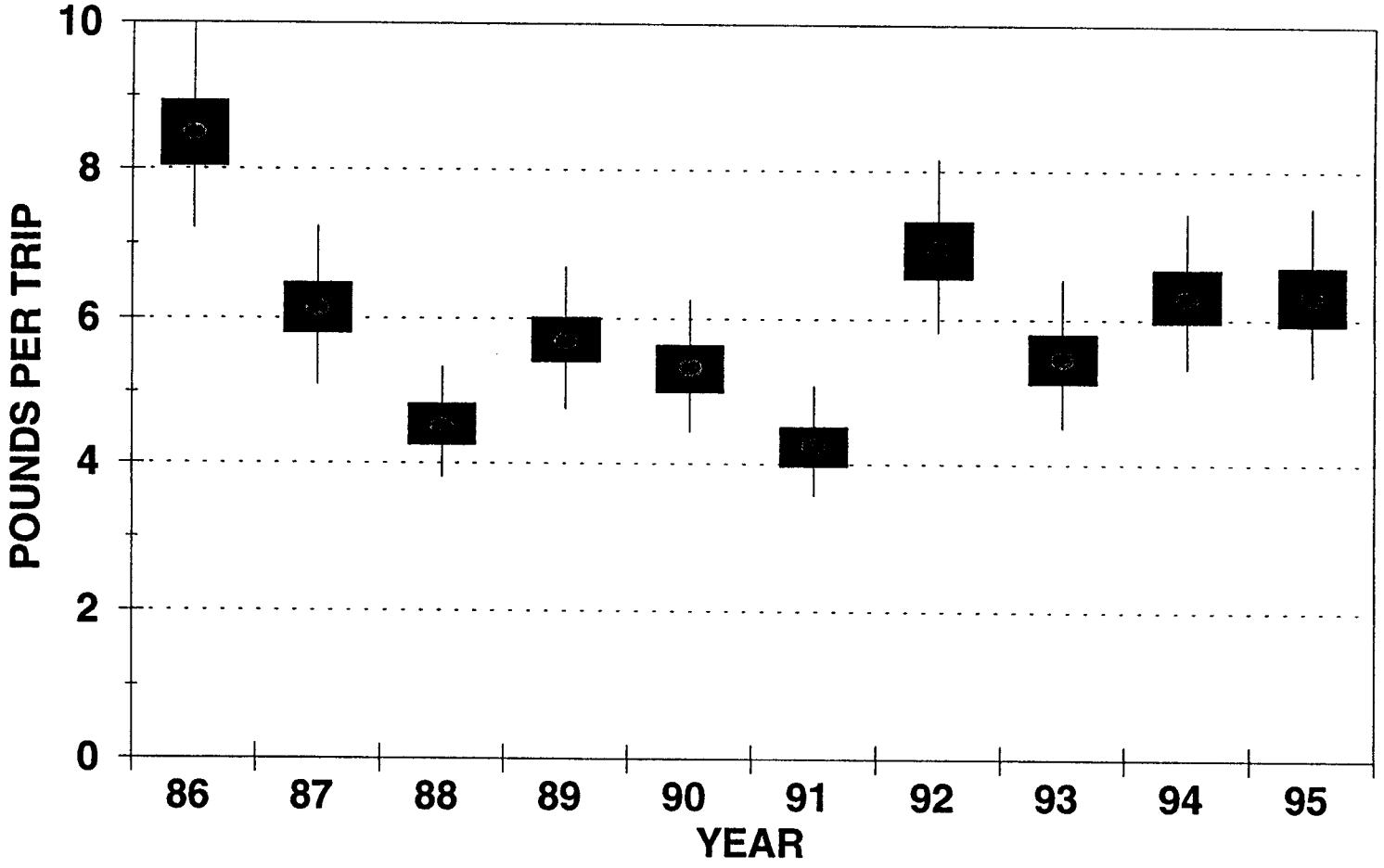


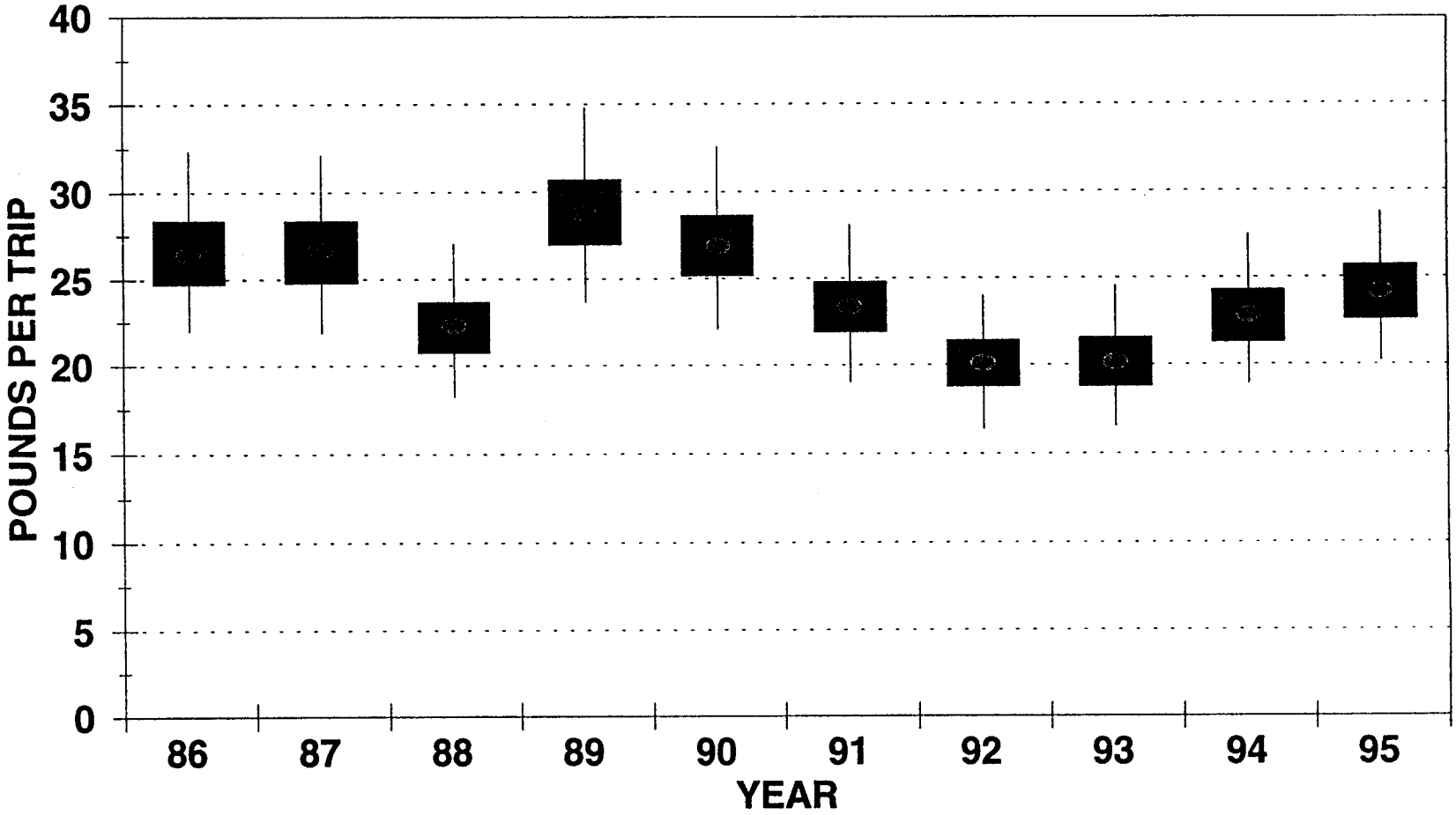
Figure 2. Length frequencies of southern kingfish, *Menticirrhus americanus*, landed in the commercial and recreational fisheries in Florida, 1995.

FIGURE 4. STANDARDIZED COMMERCIAL CPUE KINGFISH -- GULF



Vertical bar = 95% confidence limits, box = quartiles, circle = median

FIGURE 3. STANDARDIZED COMMERCIAL CPUE
KINGFISH -- ATLANTIC



Vertical bar = 95% confidence limits, box = quartiles, circle = median

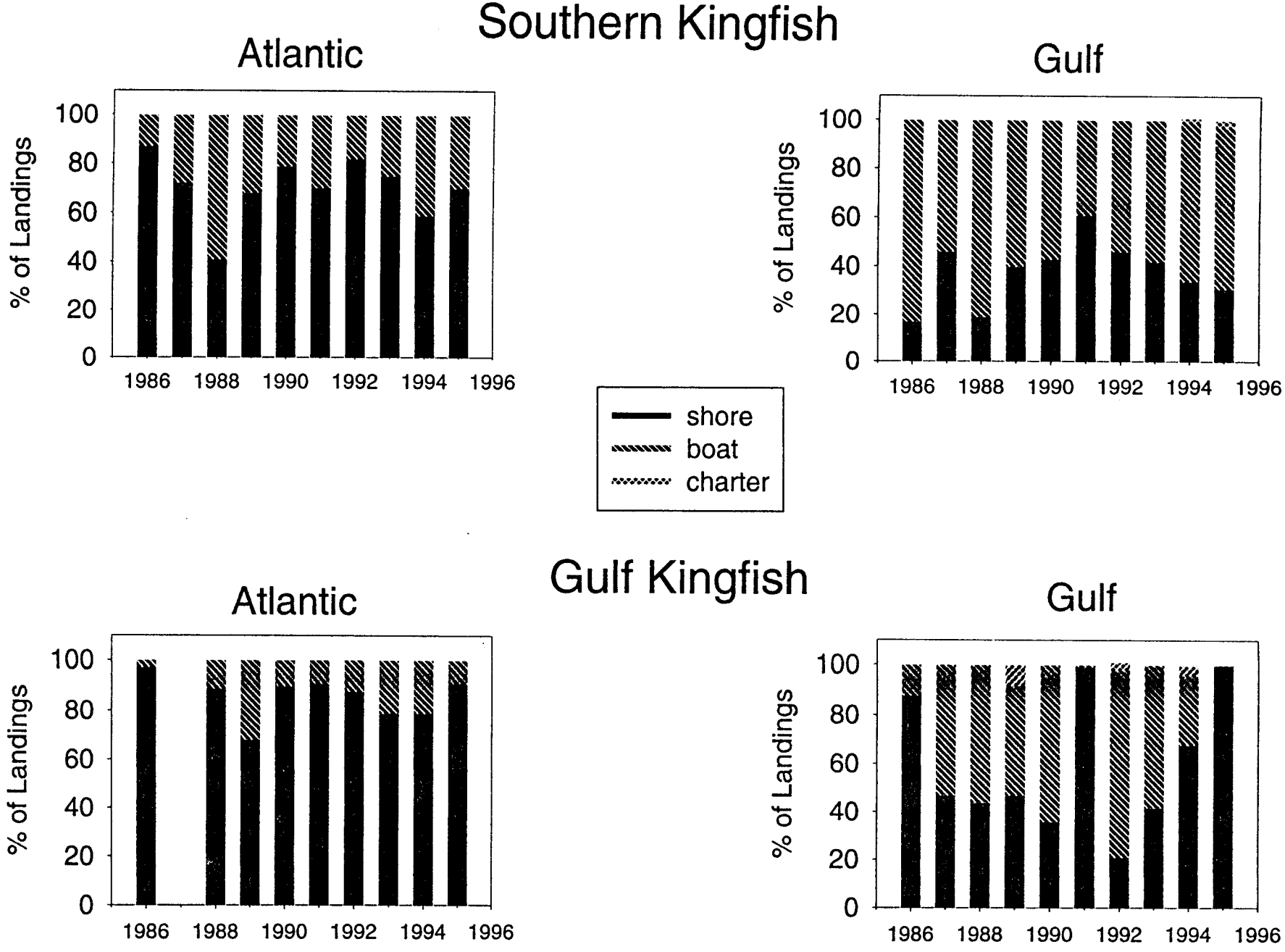


Figure 5. Relative percent of southern and Gulf kingfish recreational landings by mode of fishing (shore, private boat, charter boat).

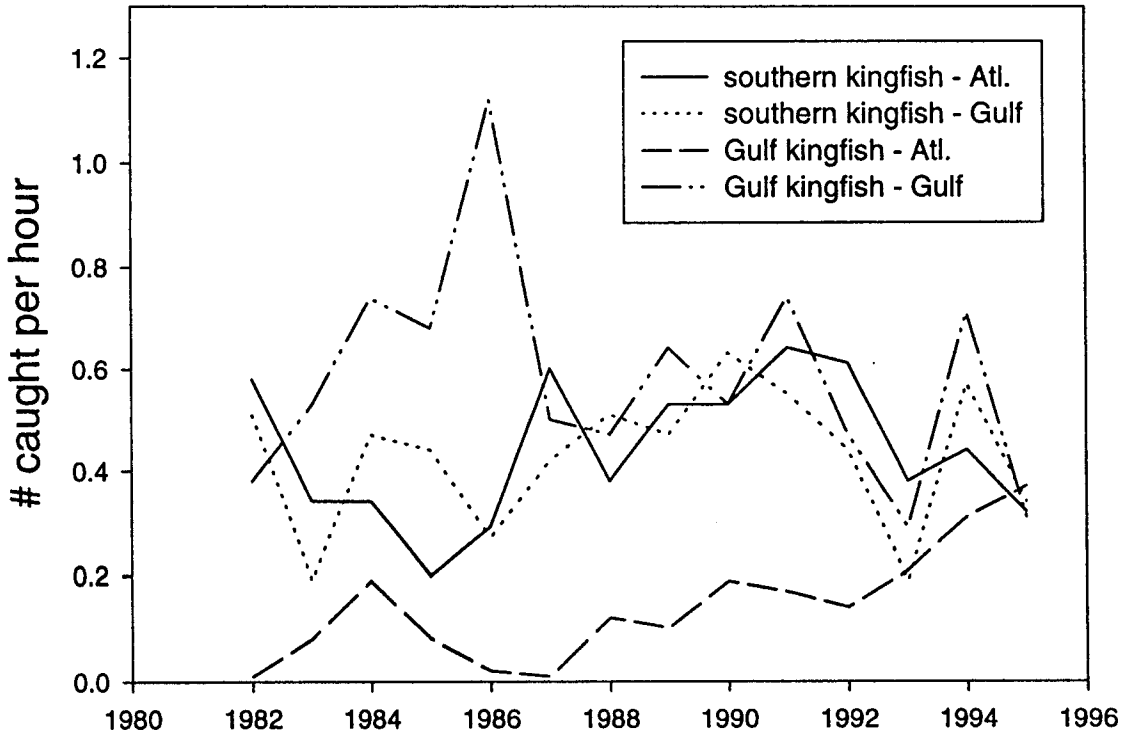


Figure 6. CPUE (# per hour) of southern and Gulf kingfish in the Florida recreational fishery.

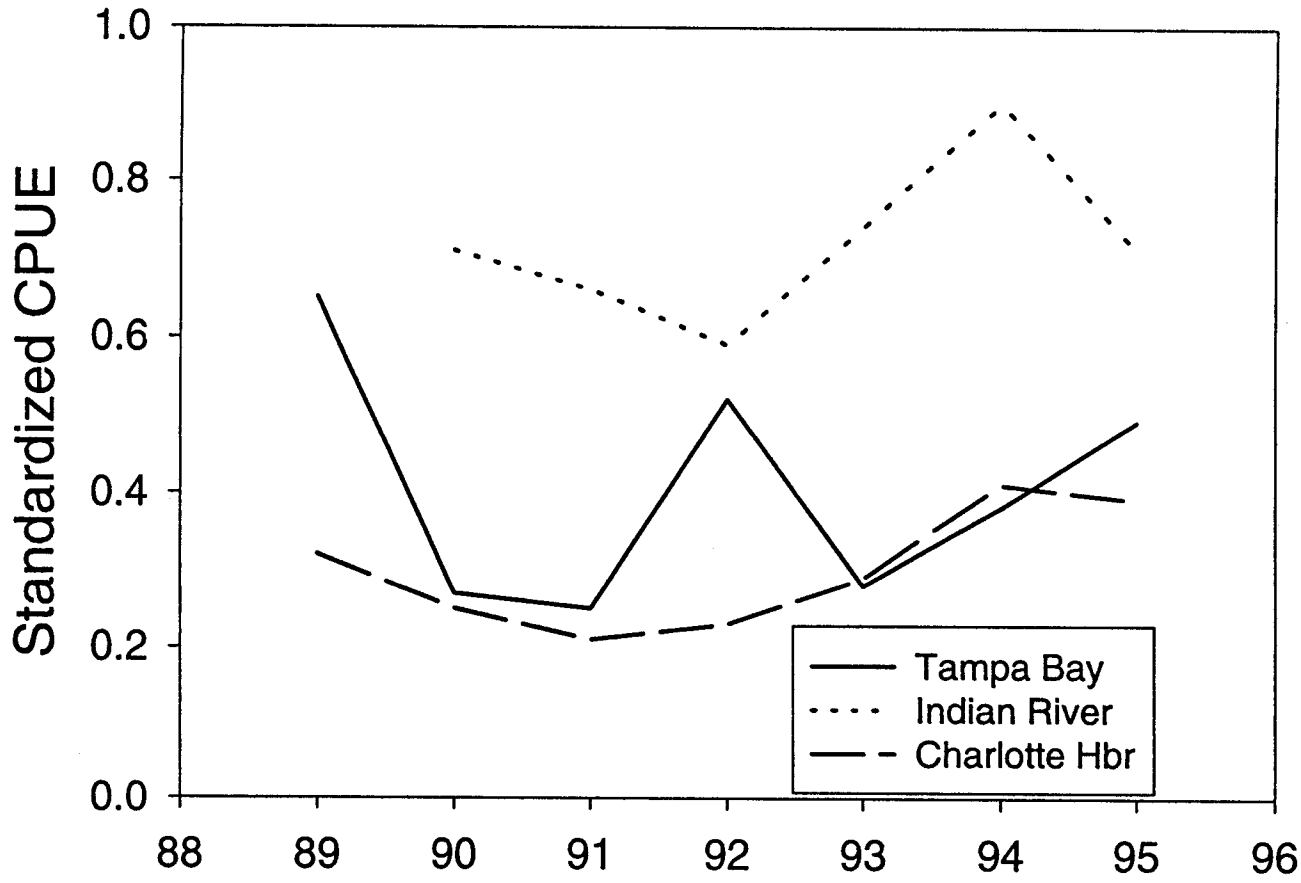


Figure 7. Index of recruitment for southern kingfish, Menticirrhus americanus, in three Florida estuaries.