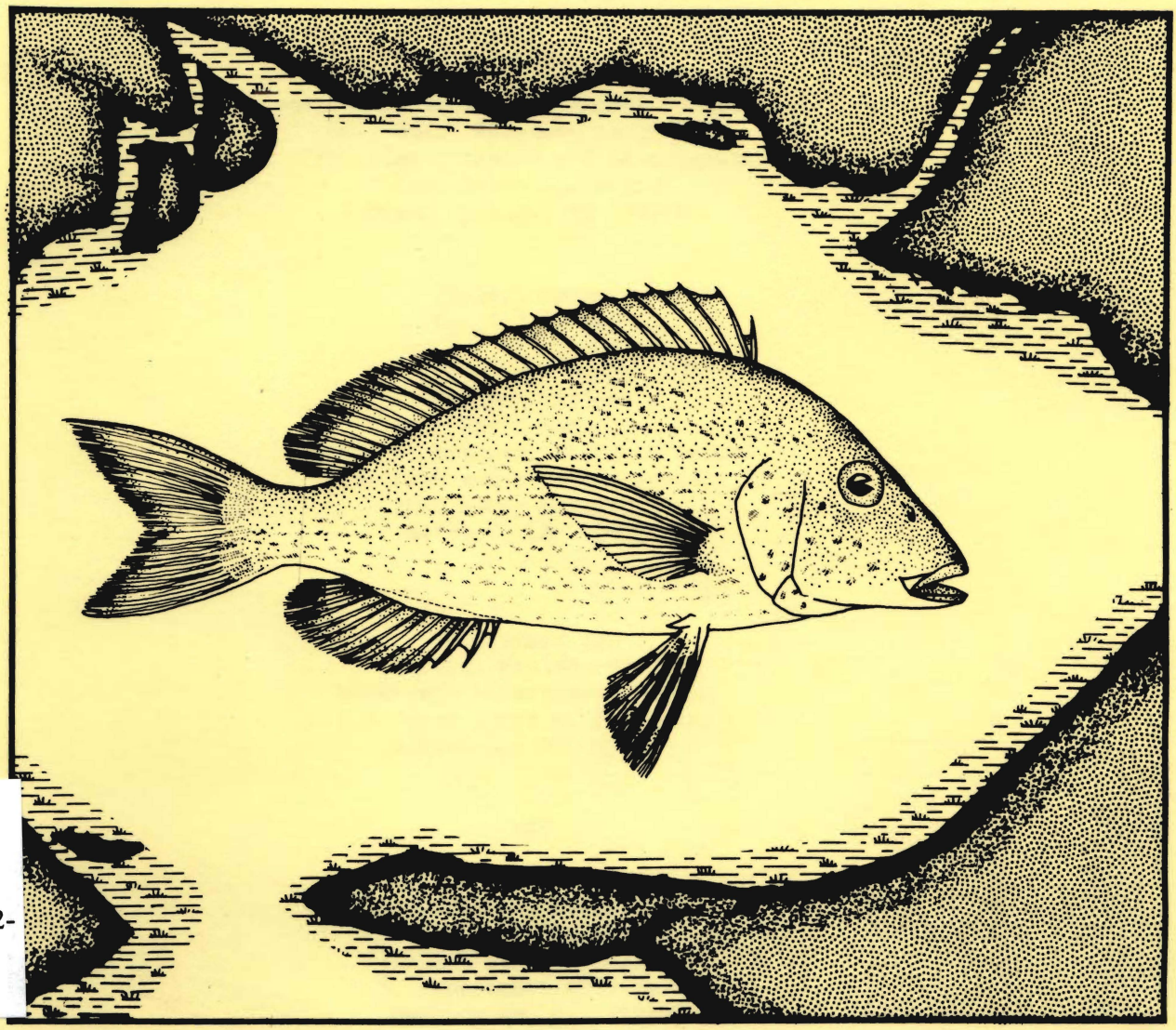
Biological Report 82(11.71)
March 1987

TR EL-82-4

Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Gulf of Mexico)

PIGFISH



Fish and Wildlife Service
U.S. Department of the Interior

Coastal Ecology Group
Waterways Experiment Station
U.S. Army Corps of Engineers

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Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Gulf of Mexico)

PIGFISH

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PREFACE

This species profile is one of a series on coastal aquatic organisms, principally fish, of sport, commercial, or ecological importance. The profiles are designed to provide coastal managers, engineers, and biologists with a brief comprehensive sketch of the biological characteristics and environmental requirements of the species and to describe how populations of the species may be expected to react to environmental changes caused by coastal development. Each profile has sections on taxonomy, life history, ecological role, environmental requirements, and economic importance, if applicable. A three-ring binder is used for this series so that new profiles can be added as they are prepared. This project is jointly planned and financed by the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service.

Suggestions or questions regarding this report should be directed to one of the following addresses.

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U.S. Army Engineer Waterways Experiment Station
Attention: WESER-C
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CONVERSION TABLE

Metric to U.S. Customary

Multiply	By	To Obtain
millimeters (mm)	0.03937	inches
centimeters (cm)	0.3937	inches
meters (m)	3.281	feet
meters (m)	0.5468	fathoms
kilometers (km)	0.6214	statute miles
kilometers (km)	0.5396	nautical miles
square meters (m^2)	10.76	square feet
square kilometers (km^2)	0.3861	square miles
hectares (ha)	2.471	acres
liters (l)	0.2642	gallons
cubic meters (m^3)	35.31	cubic feet
cubic meters (m^3)	0.0008110	acre-feet
milligrams (mg)	0.00003527	ounces
grams (g)	0.03527	ounces
kilograms (kg)	2.205	pounds
metric tons (t)	2205.0	pounds
metric tons (t)	1.102	short tons
kilocalories (kcal)	3.968	British thermal units
Celsius degrees (°C)	1.8(°C) + 32	Fahrenheit degrees

U.S. Customary to Metric

inches	25.40	millimeters
inches	2.54	centimeters
feet (ft)	0.3048	meters
fathoms	1.829	meters
statute miles (mi)	1.609	kilometers
nautical miles (nmi)	1.852	kilometers
square feet (ft^2)	0.0929	square meters
square miles (mi^2)	2.590	square kilometers
acres	0.4047	hectares
gallons (gal)	3.785	liters
cubic feet (ft^3)	0.02831	cubic meters
acre-feet	1233.0	cubic meters
ounces (oz)	283.5	milligrams
ounces (oz)	28.35	grams
pounds (lb)	0.4536	kilograms
pounds (lb)	.00045	metric tons
short tons (ton)	0.9072	metric tons
British thermal units (Btu)	0.2520	kilocalories
Fahrenheit degrees (°F)	0.5556(°F - 32)	Celsius degrees

CONTENTS

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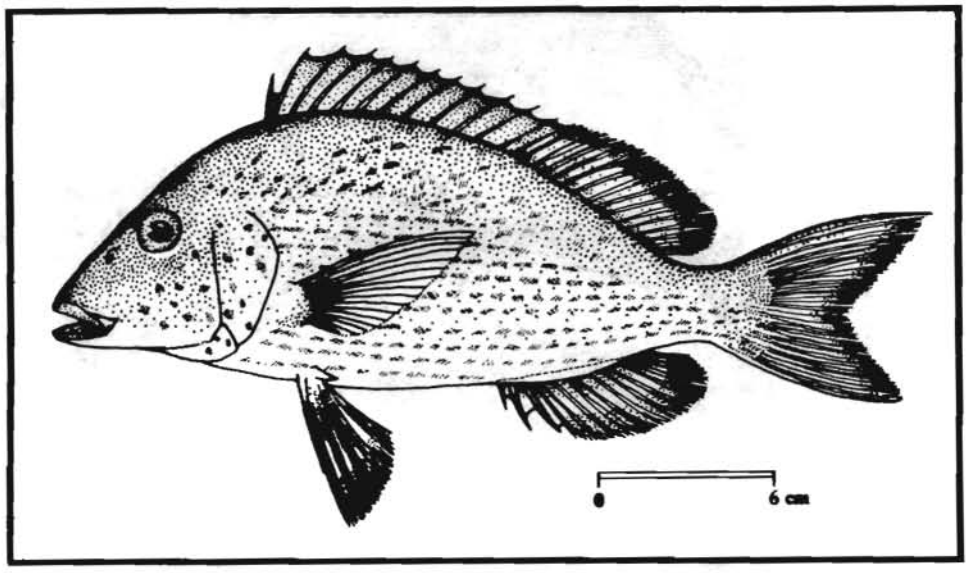

Figure 1. Pigfish (adult).

PIGFISH

NOMENCLATURE/TAXONOMY/RANGE

Scientific name . . . . . Orthopristis chrysoptera (Linnaeus)
Preferred common name . . . . Pigfish (Figure 1)
Class . . . . . Osteichthyes
Order . . . . . Perciformes
Family . . . . . Haemulidae

Geographical range: Pigfish are distributed along the Atlantic coast from Massachusetts (Hoese and Moore 1977) to the tip of Florida, but are uncommon north of Virginia (Breder 1948). They are found throughout the Gulf of Mexico (Figure 2; Briggs 1958) and in coastal waters around Bermuda.

MORPHOLOGY/IDENTIFICATION AIDS

The following descriptive characteristics for pigfish were taken from Courtenay and Sahlman (1978): Body ovate-elliptical, considerably compressed, its depth contained 2.6 to 3.0 times in standard length (SL). Posterior edge of upper jaw not reaching to below eye; two pores and a median groove on chin; jaws with a narrow band of slender teeth; preopercular margin very slightly serrate; gill rakers short and slender, about 12 on lower limb of first arch. Dorsal fin with 12 or 13 spines and 15 or 16 soft rays; anal fin with 3 spines and 12 or 13 soft rays; dorsal and anal fin spines enclosed in a deep scaly sheath, the soft rays naked. Scales ctenoid; pored lateral-line scales 55 to 58; 10 longitudinal rows of scales above the lateral line and 19 rows below.

Color of body: light blue-gray above, shading gradually into silver below; each scale of body with a blue center, the edge with a bronze spot; these spots form distinct orange-brown stripes extending obliquely upward

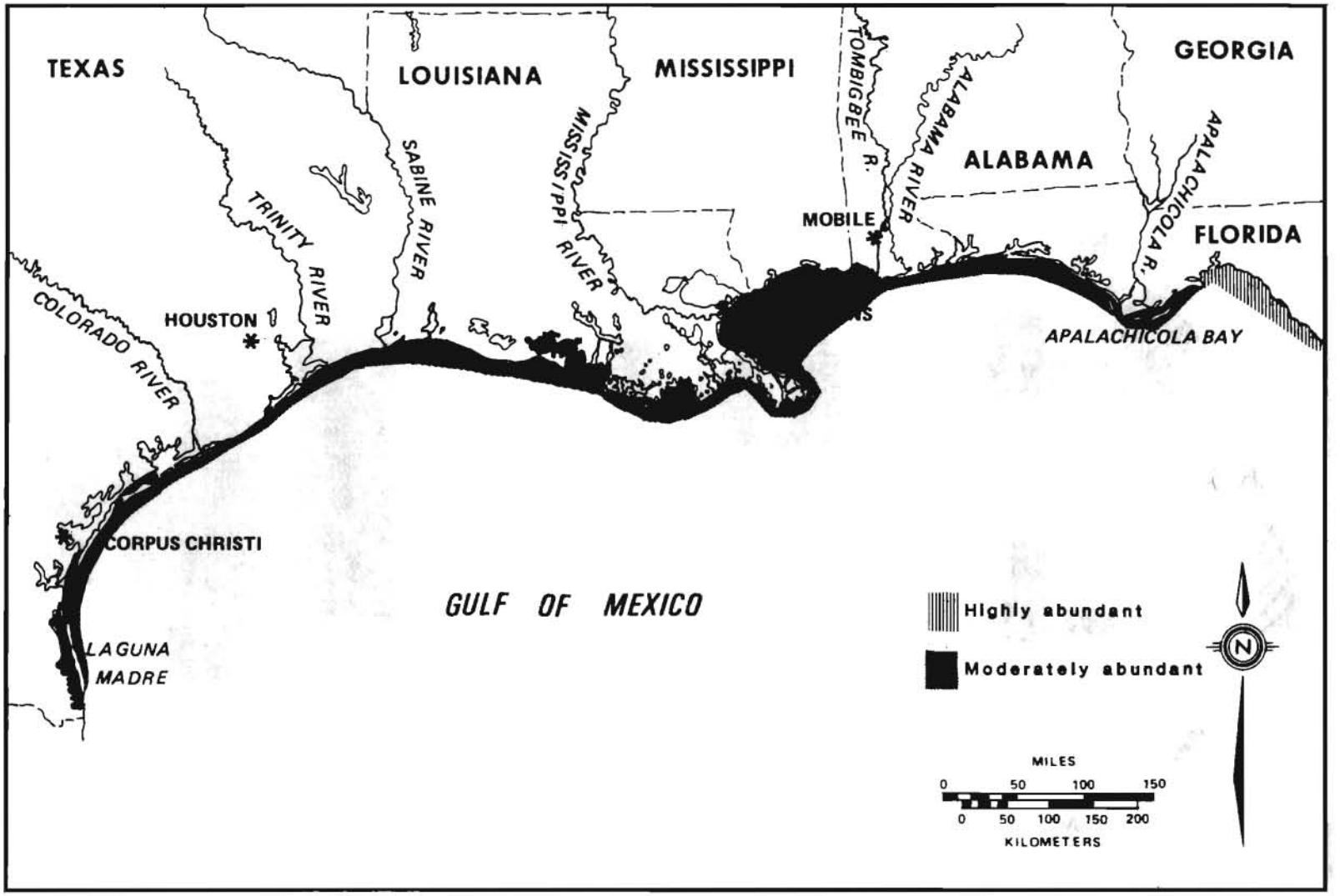

Figure 2. Distribution of the pigfish.

and backward on back and sides, those below being nearly horizontal; head with bronze spots; fins yellow-bronze with dusky margins.

REASON FOR INCLUSION IN THE SERIES

Pigfish are common inhabitants of warm gulf waters (Reid 1954). They are frequently taken by sport anglers, especially in Florida waters, and are considered to be a good quality food fish (Darcy 1983); however, they have only limited economic importance (Joseph and Yerger 1956). Pigfish are often trapped and used for live bait (Carr 1976). They are also used as a source of food by other predatory species (Smith 1907).

LIFE HISTORY

Spawning

Pigfish mature by their second year of life (Taylor 1916; Hildebrand and Cable 1930). Reid (1954) concluded that spawning in gulf waters near Cedar Key, Florida, was probably in spring, since small young-of-the-year (23 to 28 mm SL) first appeared in May. He also noted a bimodal length-frequency curve for that month, suggesting that pigfish in this area of the gulf may have two breeding peaks or "growth spurts." Adult females taken during July from the Cedar Key area showed some signs of maturing gonads; however, they were far from ripe. After comparing average monthly lengths and seasonality of fish in other areas, Grimes and Mountain (1971) concluded that pigfish apparently spawn in about March in gulf waters near Crystal River, Florida. Gunter (1945) found ripe males in Texas gulf waters in March and April and suggested that the fish probably spawn there before June.

Other studies from the Gulf of Mexico also indicate that spawning occurs in the late winter or spring: Tampa Bay, Florida, March-May (Springer and Woodburn 1960); Alligator Harbor, Florida, March (Joseph and Yerger 1956); eastern Gulf of Mexico, January-May (Darcy 1983); and Horn Island, Mississippi, March-April (Franks 1970). Hoese (1965) reported that pigfish larvae were found off Port Aransas from late February through June. Hastings (1972) noted that spawning may occur in open water prior to inshore migrations during March-April in St. Andrew Bay, Florida.

Pigfish spawn during March to June along the inside shores of Bogue and Shackleford Banks, North Carolina, and within the harbor and estuaries on the outer shores of these banks (Hildebrand and Cable 1930). Spawning apparently takes place during the early evening hours (Towers 1928; Hildebrand and Cable 1930).

Eggs

Johnson (1978) reported that pigfish eggs are buoyant, highly transparent, and spherical (0.7 to 0.8 mm in diameter). The eggs have a single oil globule (rarely two or three) that averages 0.16 mm in diameter. Pigfish eggs are easily confused with those of silver perch (Bairdiella chrysoura). This problem is magnified by the fact that the two species spawn at nearly the same time and in similar areas.

Larvae

Hildebrand and Cable (1930) provided descriptions of larval pigfish collected from North Carolina waters. Watson (1983) updated their descriptions using a series of larval pigfish specimens from lower Cape Fear Estuary, North Carolina, and from the gulf waters off Texas. Pigfish larvae can be separated from those of other haemulids (grunts) by the presence of 11 soft rays in the anal fin (Watson 1983). Darcy (1983)

cited a study by Houde et al. (1979) describing the distribution and abundance of pigfish larvae in the eastern gulf. They found one peak of abundance in late winter and spring, mainly inside a depth of 50 m.

Juveniles

Juvenile pigfish are fully scaled by 25 mm SL and achieve adult form by 70 mm SL (Figure 3; Hildebrand and Cable 1930). At 25 mm, they have a prominent dark midlateral band with an additional dark band from the nape to the base of the second dorsal fin. The mid-lateral bands often disappear at a length of approximately 40 mm SL, but the anterior position of the lower band may remain longer (Johnson 1978). Juvenile pigfish have yellow and green horizontal lines along their sides that are most prominent on the cheeks and opercles.

Grimes and Mountain (1971), working in an area of thermal effluent near Crystal River, Florida, first noted young-of-the-year pigfish in trawl samples taken during June. Juvenile pigfish (smallest, 12.5 mm SL) were first taken in April from Tampa Bay (Springer and Woodburn 1960) and St. Andrew Bay, Florida (Hastings 1972). Juveniles were most abundant during May in Cedar Key, Florida (Reid 1954). In Alligator Harbor, Florida, Joseph and Yerger (1956) reported that juveniles (41 mm SL) were present by June. Gunter (1945) and Hildebrand (1954) collected smallest pigfish in shallow bays along the Texas gulf coast.

Juvenile pigfish may associate with other species of fish. Darcy (1983) referenced a study by Wang and Raney (1971) from Charlotte Harbor, Florida, where young pigfish (16-25 mm SL) were found in mixed schools with small pinfish.

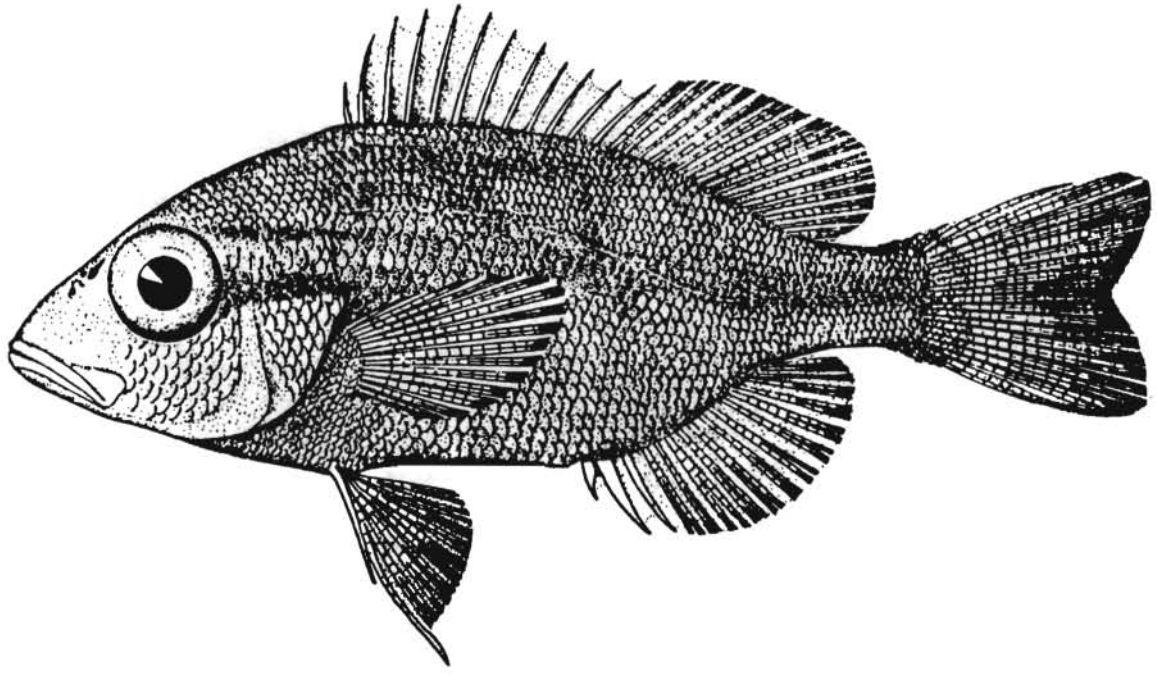

Figure 3. Juvenile pigfish, 38 mm TL (from Hildebrand and Cable 1930, Figure 37).

Adults

Adult pigfish are common in the northern and more saline coastal areas of the Gulf of Mexico (Springer and Woodburn 1960; Moe and Martin 1965; Hoese and Moore 1977). Reid (1954) reported that adult pigfish were found in Cedar Key, Florida, throughout the year (except January); however, pigfish were most abundant during summer months. Grimes and Mountain (1971) also noted that pigfish were more commonly taken during later summer and fall months in Crystal River, Florida. Along the coastal areas of north Florida, pigfish have been reported to be among the most abundant finfish collected (Joseph and Yerger 1956; Hastings et al. 1976; Ogren and Brusher 1977; Pristas and Trent 1978; Darcy 1983).

Adult pigfish also occur in the offshore and open-shelf areas of the Gulf of Mexico. Darcy (1983) noted a study by Cody et al. (1978) stating that pigfish occurred in 40%-43% of all trawl catches on the white shrimp grounds off the Texas gulf coast. Pigfish have also been taken from offshore reefs and platforms along the northern gulf (Hastings 1972; Hastings et al. 1976; Darcy 1983). Moe and Martin (1965) reported that pigfish may be more abundant in offshore waters than inshore in the southern regions of the Gulf of Mexico. Hildebrand (1954) noted that pigfish were abundant on the shell banks off Campeche, Mexico.

GROWTH CHARACTERISTICS

Pigfish reach a maximum length of 46 cm SL (Courtenay and Sahlman 1978) and a weight of 0.9 kg (2 lb) (Hildebrand and Cable 1930; Konchina 1977; Darcy 1983). Few pigfish older than 3 years old and very few age 4 fish have been taken along the Atlantic coast (Taylor 1916; Hildebrand and Cable 1930).

Information on growth of pigfish in gulf waters is limited to age 0 and age 1 fish (Table 1). Growth rates based on these data range from 7 mm SL/mo (Reid 1954) to 9.3 mm SL/mo from June to October. Growth during October to April slows to 3.1 mm SL/mo (Grimes and Mountain 1971) to 5.5 mm SL/mo (Reid 1954).

THE FISHERY

Commercial statistics are not specifically reported for pigfish, but have been combined with those for the other grunts by the Bureau of Commercial Fisheries and National Marine Fisheries Service. Pigfish are taken in seines, traps, trawls, and by handlines (Courtenay and Sahlman 1978). Most are marketed as live bait (especially in Texas); they are also considered a good quality food fish (Darcy 1983) but have little economic value. Marine recreational landing statistics for pigfish in the Gulf of Mexico for 1979 and 1981-85 are summarized in Table 2; most are taken along Florida (gulf and Atlantic) and the Texas gulf coast waters.

ECOLOGICAL ROLE

Food Habits

Feeding habits of pigfish vary with growth stage; they are primarily benthic carnivores as adults, possibly feeding nocturnally (Hastings et al. 1976), while young fish are planktivorous (Carr and Adams 1973; Darcy 1983). Reid (1954) found a shift in diet relative to increasing length for pigfish taken from Crystal River, Florida (Table 3). Small fish (25-50 mm TL) ate mostly copepods, while larger fish shifted to a diet of amphipods, shrimps, and other benthic organisms. Carr and Adams (1973), who also studied juvenile pigfish (16-80 mm SL) in the Crystal River, found two distinct feeding phases. Smaller pigfish (16-30 mm) were planktivorous (eating copepods, mysids, and

Table 1. Comparative monthly mean standard lengths (mm) for age 0 pigfish (from Grimes and Mountain 1971).

Study	Year collected	June	Aug.	Oct.	Dec.	Feb.	April
Springer and Woodburn 1960 (Tampa Bay)	1957	40.0	62.1				17.5
Reid 1954 (Cedar Keys)[a]	1951	49.0	66.0	77.0		84.0	110.0
Grimes 1971[b]	1969						
Crystal River-Affected		44.0	66.0	70.0	79.0		98.0
Crystal River-Nonaffected		51.0	75.0				111.0
Grimes and Mountain 1971[b]	1970						
Crystal River-Affected			78.9	94.0	88.2		102.9
Crystal River-Nonaffected		50.0	68.9	87.2	90.8		105.8

[a]Lengths estimated from graph.
[b]Statistical comparison of annual growth (monthly mean standard length vs. time) of fish from thermally affected (warmed by the effluent from a steam electric station) vs. nonaffected areas revealed no significant difference.

postlarval shrimp), followed by a two-phase carnivorous stage in which benthic invertebrates were the major food items. The transition from planktivore to carnivore was gradual, beginning at about 26 mm SL, and was complete by 41-45 mm SL. Polychaetes were important in the diet of pigfish longer than 30 mm, but as fish grew larger than 55 mm, caridean and penaeid shrimp were consumed more frequently (Darcy 1983).

Predators

Pigfish are prey of Atlantic sharpnose sharks, spotted seatrout, and weakfish (Radcliffe 1916; Hastings 1972; Darcy 1983). Other large piscivores, such as snapper and grouper, probably also prey on pigfish (Darcy 1983).

Parasites and Diseases

Pigfish have been reported to be parasitized by a monogenetic trematode that infests the gill filaments (Suydam 1971). Springer and Woodburn (1960) report that pigfish were killed by red tides in Tampa Bay, Florida.

ENVIRONMENTAL REQUIREMENTS

Temperature and Salinity

Reid (1954) found mean water temperature and salinity values of 25.2 °C and 25.1 ppt in Crystal River, Florida, when pigfish were most abundant. During December to April, when pigfish were taken less frequently, values of 15.9 °C and

Table 2. Summary of recreational fishing statistics for pigfish in the Gulf of Mexico.

Time period	Total U.S. catch (thousands of fish)	Percent of catch taken in Gulf of Mexico	Catch by Gulf States (thousands of fish)				
			FL	AL	MS	LA	TX
Jan-Dec[a] 1979	1,992	76.4	700	--	34	--	770
Mar-Dec[b] 1981	2,281	67.0	1,071	--	--	--	428
Jan-Dec[b] 1982	2,643	76.2	1,769	--	--	72	169
Jan-Dec[c] 1983	2,386	49.2	1,001	39	*	--	115
Jan-Dec[c] 1984	1,731	66.8	741	--	--	*	413
Jan-Dec[d] 1985	2,770	47.4	587	*	*	*	726

[a]U.S. National Marine Fisheries Service (1980).
[b]U.S. National Marine Fisheries Service (1985a).
[c]U.S. National Marine Fisheries Service (1985b).
[d]U.S. National Marine Fisheries Service (1986).
*means none reported.
--means less than 30,000 reported; however, the figure is included in removed column totals.

26.5 ppt were recorded. Roessler (1970) collected pigfish from Florida waters at temperatures of 19.5 to 30.6 °C and salinities of 17.2 to 44.1 ppt. A temperature range of 13.7 to 36 °C and a salinity range of 0 to 38 ppt was also provided by Roessler (1970) on the basis of published values for pigfish throughout the gulf. Springer and Woodburn (1960) reported a tolerance range of 19.1 to 35 ppt (mean = 28.9 ppt) and 17.5 to 32.5 °C for pigfish collected in Tampa Bay, Florida. In Barataria Bay, Louisiana, pigfish were taken between 6.2 and 24.3 ppt and between 17.3 and 30.0 °C (Dunham 1972).

Pigfish apparently avoid low-temperature water, migrating to deeper water during the winter (Hildebrand and Cable 1930; Gunter 1945; Reid 1954; Wang and Raney 1971; Grimes 1971; Hastings 1972; Ogren and Brusher 1977; Naughton and Saloman 1978; Darcy 1983). Hastings (1972) noted that pigfish were absent in collections made at water temperatures of 12 to 14 °C; however adults were abundant when waters of St. Andrew Bay, Florida, warmed to 16.5 to 31.0 °C. Moe and Martin (1965) also noted that pigfish were not collected when water temperatures in Pinellas County, Florida, dropped

Table 3. Food of pigfish (percentage frequency of occurrence) from Crystal River, Florida (from Reid 1954).

Food item	Size of fish (mm)		
	25-50	51-150	151-170
Copepods	83	38	--
Ostracods	50	--	--
Amphipods	--	54	10
Shrimps	17	56	40
Crabs	--	5	20
Mollusks	--	--	20
Polychaetes	17	8	60
Fishes	--	5	--
Insects	--	--	10

below 12.5 °C. Moore (1976) reported that pigfish were killed during a cold wave that caused water temperatures to drop to 4.5 °C (Darcy 1983).

Low salinity areas also appear to be avoided by pigfish. In Charlotte Harbor, Florida, Wang and Raney (1971) reported that pigfish were not taken in waters with salinity values less than 15 ppt. Gunter (1945) found all pigfish less than 50 mm TL and greater than 200 mm TL in Texas gulf waters in salinities greater than 25 ppt; no specimens were taken in less than 10 ppt. Reid (1954) noted a mass mortality of pigfish, as well as other species, after a hurricane caused salinities to drop from 23.5 ppt to 9.7 ppt over a 4-day period in Goose Cove, Florida. However, it was probably the rapid drop rather than the low salinity that caused the mortality (Darcy 1983).

Dissolved Oxygen

Schwartz et al. (1982) collected pigfish from waters with dissolved oxygen concentrations of 2.1 to 11.8 ppm in Cape Fear Estuary, North Carolina.

Substrate

Juvenile pigfish in Crystal River were found on shallow flats with considerable plant growth during spring and early summer (Reid 1954). As the summer and fall progressed, juvenile pigfish moved to deep flats and the edges of channels. Adults were taken from deeper flats and channels with sparse vegetation. Adult pigfish occurred most frequently over mud bottoms and occasionally over sandy, vegetated areas (Hildebrand and Schroeder 1928; Tabb and Manning 1961), hard substrates such as reefs and jetties (Hastings 1972), and offshore platforms (Hastings et al. 1976).

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