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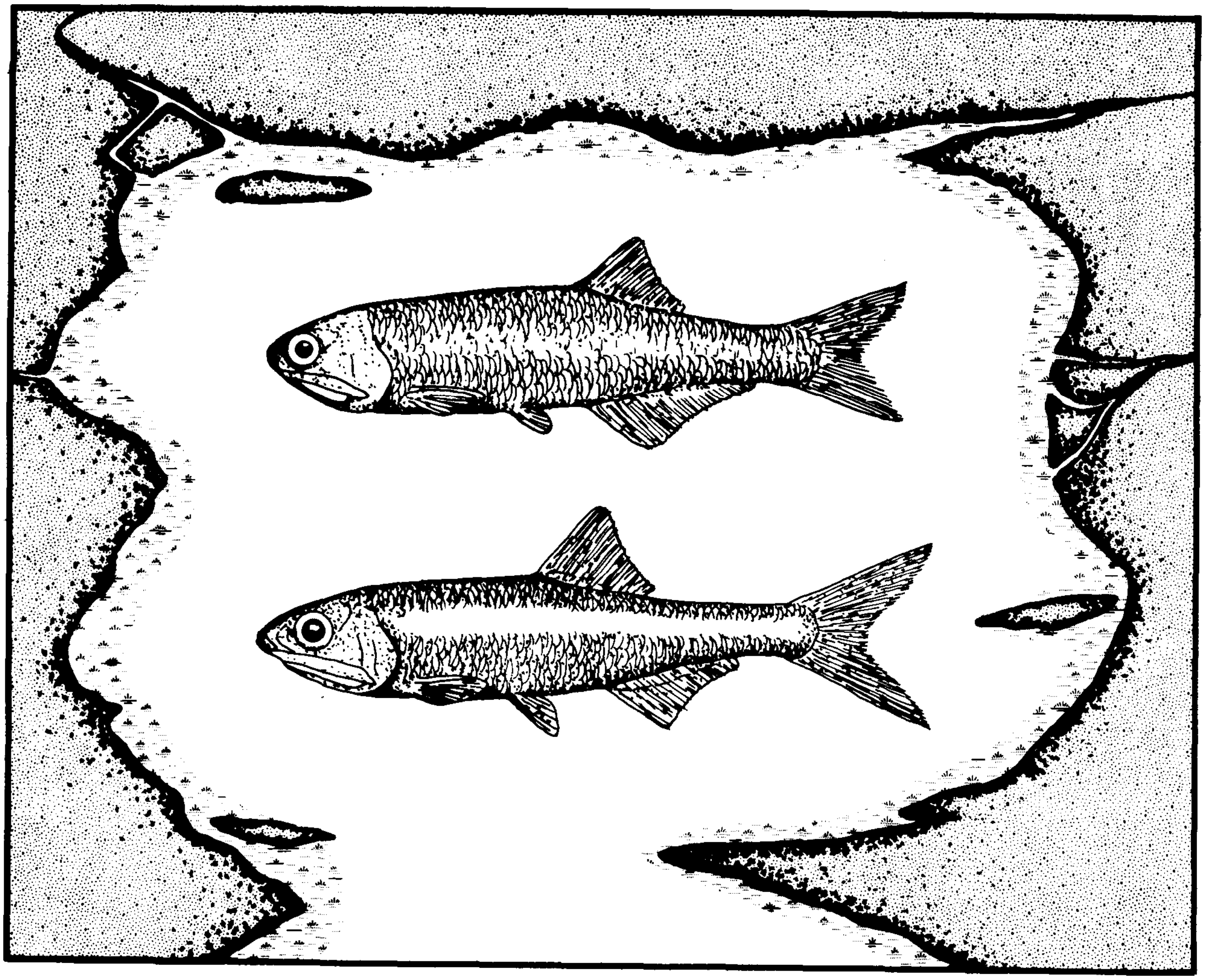

Fish and Wildlife Service
U.S. Department of the Interior

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

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BAY ANCHOVY
AND
STRIPED ANCHOVY

by

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in cooperation with
Coastal Ecology Group
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Waterways Experiment Station

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National Coastal Ecosystems Team
Division of Biological Services
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U.S. Department of the Interior
Washington, DC 20240

CONVERSION FACTORS

Metric to U.S. Customary

Multiply	By	To Obtain
millimeters (mm)	0.03937	inches
centimeters (cm)	0.3937	inches
meters (m)	3.281	feet
kilometers (km)	0.6214	miles
square meters (m^2)	10.76	square feet
square kilometers (km^2)	0.3861	square miles
hectares (ha)	2.471	acres
liters (1)	0.2642	gallons
cubic meters (m^3)	35.31	cubic feet
cubic meters	0.0008110	acre-feet
milligrams (mg)	0.00003527	ounces
grams (gm)	0.03527	ounces
kilograms (kg)	2.205	pounds
metric tons (mt)	2205.0	pounds
metric tons (mt)	1.102	short tons
kilocalories (kcal)	3.968	BTU
Celsius degrees	1.8(C°) + 32	Fahrenheit degrees

U.S. Customary to Metric

Multiply	By	To Obtain
inches	25.40	millimeters
inches	2.54	centimeters
feet (ft)	0.3048	meters
fathoms	1.829	meters
miles (mi)	1.609	kilometers
nautical miles (nmi)	1.852	kilometers
square feet (ft.')	0.0929	square meters
acres	0.4047	hectares
square miles (mi')	2.590	square kilometers
gallons (gal)	3.785	liters
cubic feet (ft')	0.02831	cubic meters
acre-feet	1233.0	cubic meters
ounces (oz)	28.35	grams
pounds (lb)	0.4536	kilograms
short tons (ton)	0.9072	metric tons
BTU	0.2520	kilocalories
Fahrenheit degrees	0.5556(F° - 32)	Celsius degrees

CONTENTS

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:

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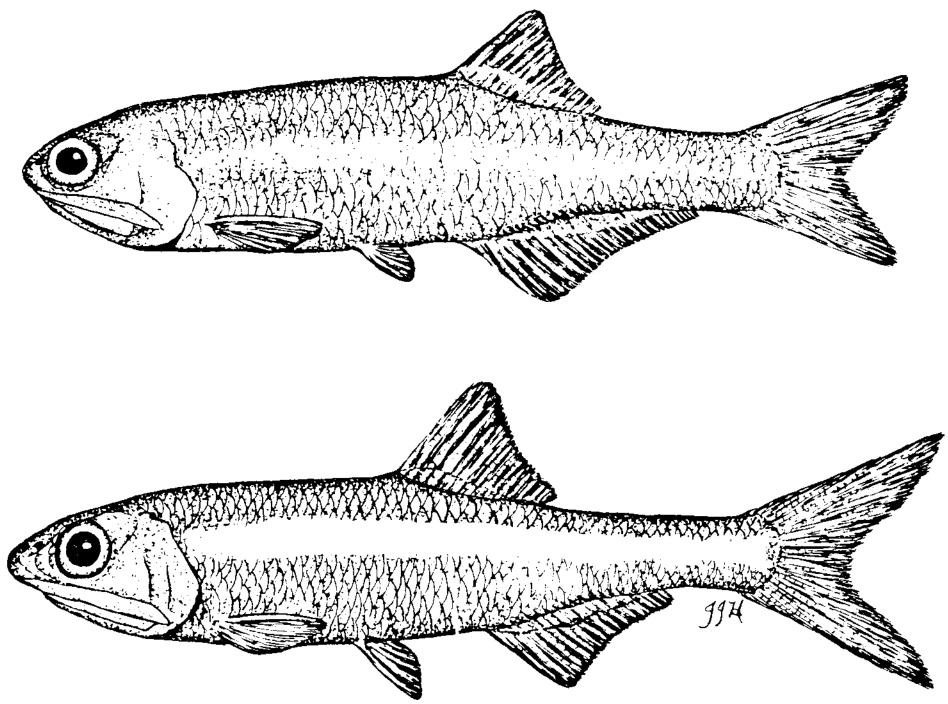

Figure 1. Bay anchovy (top) and striped anchovy (bottom).

SAY ANCHOVY AND STRIPED ANCHOVY

NOMENCLATURE/TAXONOMY/RANGE

Scientific name ... *Anchoa mitchilli* (Valenciennes)
Preferred common name .. Bay anchovy (Figure 1)
Other common names . Common anchovy, Mitchill's anchovy, whitebait, little anchovy

Scientific name .. *Anchoa hepsctus* (Linnaeus)
Preferred common name .... Striped anchovy (Figure 1)

Class . . . . Osteichthyes
Order . . . . Clupeiformes
Family . . . . Engraulidae

Geographic range: The range of the bay anchovy extends from Massachusetts to Yucatan, Mexico, excluding the West Indies (Hildebrand 1943, as cited by Daly 1970). The bay anchovy has not been found in the Florida Keys, but it is common on both coasts of Florida (Daly 1970). The striped anchovy ranges in the western Atlantic from Massachusetts, rarely to Nova Scotia, through the West Indies, and southward as far as Montevideo, Uruguay (Hildebrand 1943). This fish has rarely been collected from the Florida Keys, but is common along the entire west coast of Florida (Daly 1370) as well as throughout the Gulf of Mexico (Gunter and Hall 1965) (Figure 2). Both species have occasionally been taken from the Gulf of Maine (Bigelow and Schroeder 1953).

MORPHOLOGY/IDENTIFICATION AIDS

Meristic and morphometric characteristics (Table 1) of the bay anchovy and the striped anchovy overlap considerably, especially for counts of fin rays, lateral line scales, gill rakers, and vertebrae, and for percentage of standard length to body depth, head length, and eye diameter. Fortunately, the two species can be separated by gross examination. Both anchovies are rather cylindrical in cross-section with adults attaining lengths of 10 and 14 cm for the bay and striped anchovies, respectively. Both fishes have large subterminal mouths and large eyes, but the bay anchovy has a shorter snout. The most distinctive feature of the striped anchovy is its silvery lateral stripe, which is about 75% as wide as the eye (Hoese and Moore 1977); the bay anchovy also has a silvery lateral stripe, but it is somewhat indistinct. The best single character for separating the two species is the location of the anal fin (Figure 1). The anal fin originates under or slightly posterior to the dorsal fin origin (under fifth or sixth dorsal ray) in the bay anchovy. The anal fin origin is under the 12th to 14th dorsal ray in juveniles, but 1 or 2 mm posterior to the dorsal fin in adult striped anchovy (Daly 1970). Live bay anchovy are greenish with bluish reflections above, pale lower parts, and translucent abdominal walls (Bigelow et al. 1963). Striped anchovy have yellow and green iridescence above the lateral silvery stripe. Noniridescent yellow occurs around the head, lateral stripe, and cleithral area (Daly 1970).

REASON FOR INCLUSION IN SERIES

The bay anchovy is one of the most common fish inhabiting coastal areas, and the striped anchovy is commonly taken in coastal areas as well as in waters extending out to the Continental Shelf. Because of their abundance and their small size, both fish are important prey species. They are not currently used in North America as human food and thus are not of direct commercial importance, but many of the fish that feed on anchovies are important recreational and commercial species.

LIFE HISTORY

Spawning

The bay anchovy typically spawns in water less than 20 m deep, although, on the basis of egg collection, it is thought that they possibly spawn to the edge of the Continental Shelf (Jones et al. 1978). The striped anchovy also spawns in estuaries, but probably typically spawns in deeper waters than the bay anchovy. At Beaufort, North Carolina, they spawn along the outer banks not more than 16 km offshore and in water no deeper than 22 m (Mansueti and Hardy 1967). Jones et al. (1965) reported segregation of the two species; striped anchovy larvae occurred in offshore waters while the bay anchovy larvae predominated inshore.

Field collections of larval anchovies indicate time of spawning. Swingle (1971) concluded from fish collected in Alabama waters that the striped anchovy had two major spawning periods--the larger spawning period in late March or April and the smaller in

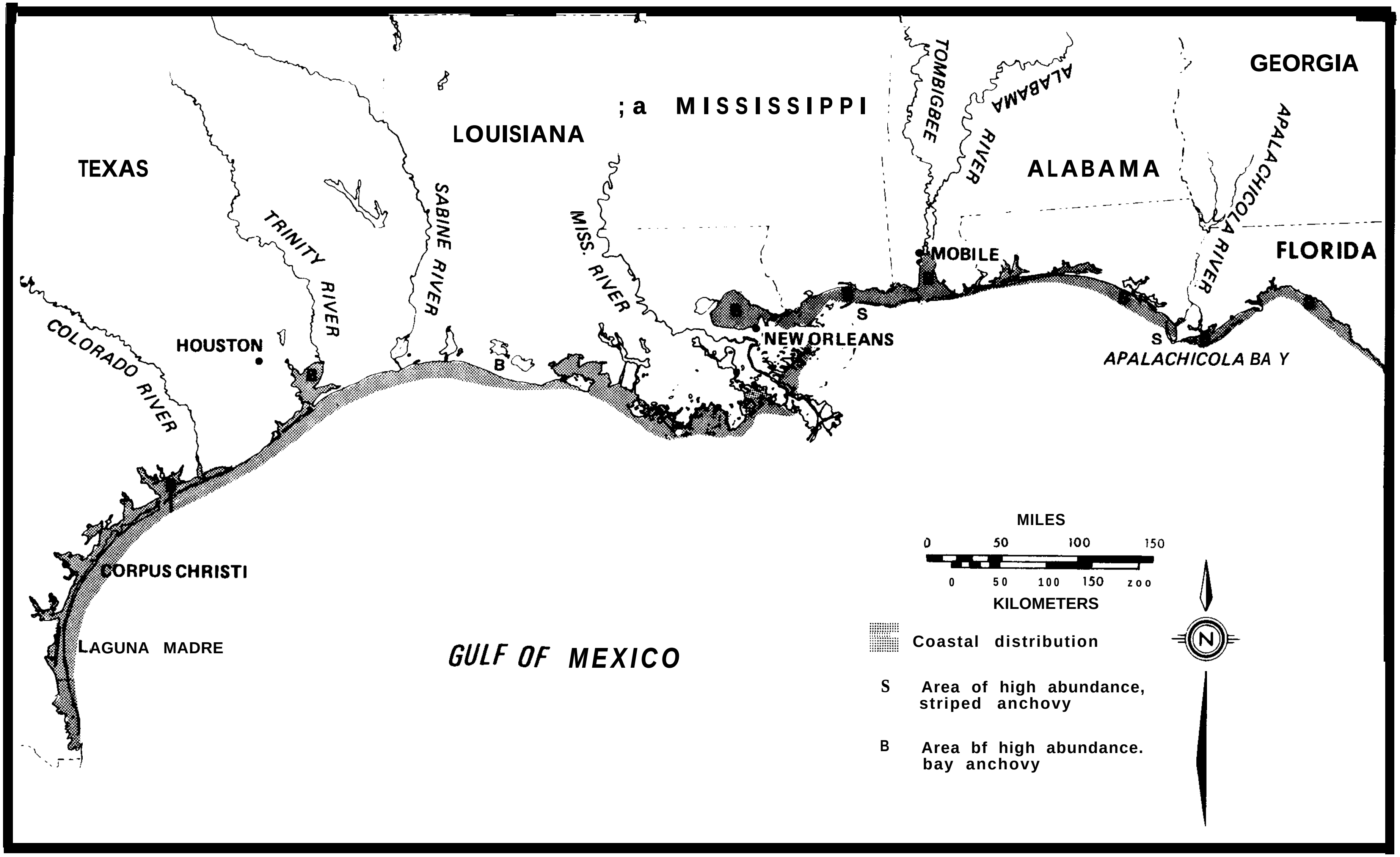

Figure 2. Bay and striped anchovies occur along the entire gulf coast. Bay anchovies are more numerous in the shallow areas of bays whereas the striped anchovies prefer deeper water.

Table 1. Comparison of some meristic and morphometric characters of *Anchoa mitchilli* and *A. hepsetus*.

Character	*Anchoa mitchilli*	*Anchoa hepsetus*
Fin rays	D. 14-16, A. 24-30, P. 11-12[a]	D. 13-17, A. 18-24, P. 13-17
	D. 13-17, A. 23-30, P. 10-13[b]	D. 14-17, A. 20-24, P. 14-17
	D. 14-16, A. 24-30, P. 11-12[c]	D. 13-16, A. 18-23, P. 13-15
	D. 13-17, A. 23-30, P. 10-13[d]	D. 13-17, A. 18-24, P. 13-17
	D. 14-16, A. 23-30, P. 11-12[e]	D. 13-16, A. 18-23, P. 13-15
Scales	38-40[a]	37-43
	38-44[c]	37-43
	38-44[d]	37-43
	38-44[e]	37-43
Gill rakers	15-19 + 21-23[a]	15-20 + 18-24
	15-20 + 20-25[b]	17-20 + 20-23
	15-19 + 20-26[c]	15-20 + 18-24
	15-20 + 20-26[d]	15-20 + 18-25
	15-19 + 20-26[e]	15-20 + 18-24
Vertebrae	38-41[b]	41-44
	38-44[c]	40-44
	38-44[d]	40-44
	38-44[e]	40-44
Body: depth	19-24[b]	22-28
	16-27[c]	18.5-22
	16-27[d]	18.9-22.6
	16-27[e]	18.5-22
Head: length	24-28[b]	22-28
	22-26.5[c]	25-30
	22-28[d]	26.1-28.9
	22-26.5[e]	25-30
Diameter of eye	7.4-9.0[b]	6.5-7.3
	5.8-8.2[c]	7.15-8.7
	5.8-9.0[d]	6.5-8.0
	5.8-8.2[e]	7.2-8.7

[a]Hoese and Moore 1977.
[b]Daly 1970.
[c]Bigelow et al. 1963.
[d]Jones et al. 1978.
[e]Mansueti and Hardy 1967.

July. Swingle (1971) reported bay anchovy larvae 20 mm or smaller collected during most months and concluded that spawning probably occurs throughout most of the year.

Tampa Bay (Florida) bay anchovies spawn during the spring and early summer with peak egg densities from April through July. Spawning began after surface water temperatures reached 20°C and ceased by November (Phillips 1981). Spawning off the North Carolina coast occurred from June through August and peaked in July (Kuntz 1914).

Early young-of-the-year bay anchovy become sexually mature during their first summer. Specimens 49 to GO mm long, taken in late July and during August at Beaufort, North Carolina, contained well-developed roe (Bigelow et al. 1963). Spawning usually occurs in the early evening (Kuntz 1914).

Eggs

The eggs of the bay anchovy are slightly oblong with the major axis about 0.75 mm and the minor axis about 0.62 mm. The average size of the eggs of the bay anchovy decreases as water salinity increases (Jones et al. 1978). The egg of the striped anchovy is larger, with the major axis about 1.40 to 1.60 mm and the minor axis about 0.70 to 0.85 mm. Eggs of both species have no oil globule and are transparent (Bigelow et al. 1963). The yolk is composed of separate masses (Kuntz 1914). The bay anchovy egg hatches in about 24 hr at room temperature, compared to 48 hr at a water temperature of 19" to 21°C for striped anchovy eggs (Bigelow et al. 1963).

Larvae

Kuntz (19'14) observed that newly hatched yolk-sac larvae of the bay anchovy are 1.8 to 2.0 mm in length. The yolk sac is areatly elongated and tapers to a point posteriorly. The larvae are transparent and show no pigmentation. The yolk sac is completely absorbed 15 to 18 hr after hatching. The mouth is apparently functional about 36 hr after hatching. Larvae 7 to 8 mm in length have definite dorsal and anal fins and some pigmentation in the thoracic region and at the base of the anal fin. At 12 mm in length, the dorsal and anal ray counts are 15 to 16 and 23 to 31, respectively (Mansueti and Hardy 1967).

Bigelow et al. (1963) reported that newly hatched yolk-sac larvae of the striped anchovy are about 3.6 to 4.0 mm in length. The yolk-sac is absorbed in about 24 hr after hatching at 19" to 21°C. The fish is then about 4.0 to 4.5 mm long, has a functional mouth, and is still transparent. When the larvae are about 5 mm long, pigmentation appears in the ventral thoracic area, and the mouth is large, terminal, and oblique. Rays of the dorsal and anal fins can be counted when the fish reaches 10 mm in length. The caudal fin is well developed and forked when the fish is 15 mm long.

Although these larvae have been described from laboratory work, larvae are too similar to separate early stages from the other four engraulids occurring in the northern Gulf of Mexico (*A. cubana*, *A. lyolepis*, *Anchoviella perfasciata*, and *Engraulis eurostyle*) (Benson 1982). Engraulid larvae are usually identified as Engraulidae sp. or *Anchoa* sp. at best

(David Ruple, Gulf Coast Research Laboratory, Ocean Springs, Mississippi; pers. comm.).

Juveniles

The projecting snout of the bay anchovy is not developed until the fish reaches 20 to 25 mm in length (Bigelow et al. 1963). The body of the bay anchovy becomes deeper with age. Body depth is about one-twelfth of body length in 16-mm fish, one-ninth of body length in 20-mm fish, and about one-fifth of body length in 25-mm fish. Juveniles differ from adults in having a terminal mouth and a short rounded maxillary, which does not reach the margin of the opercle. Juveniles lack the silvery lateral band. The fish acquire all adult characters by the time they are 60 mm in length (Hildebrand and Schroeder 1927).

When the striped anchovy reaches 35 mm in length, the mouth becomes almost horizontal and the conical snout projects prominently, pigmentation increases, and the indistinct silvery lateral band appears. The body depth is about one-sixth of the body length at 35 mm (Bigelow et al. 1963). The striped anchovy is considered a young adult when the fish reaches 40 'to 45 mm in length. It is more slender than an older adult, but is fully pigmented, has a well-developed silvery lateral band, and is fully scaled (Bigelow et al. 1963). The fish becomes mature at about 1 year and 75 mm in length (Hildebrand and Cable 1930).

GROWTH CHARACTERISTICS

The length-weight relationships of the bay anchovy and striped anchovy are similar. Dawson (1965) used fish collected from coastal waters of Mississippi and Louisiana and calculated c and n for the general length-weight equation [$W = cL^n$ or $\log w = \log c + n \log L$, where W = weight in grams and L = length in millimeters] for 216 and 219 specimens of bay anchovy and striped anchovy, respectively. Log c was -4.76779 and n was 2.81451 for the bay anchovy, and log c was -4.73869 and n was 2.82589 for the striped anchovy.

Matlock et al. (1975) developed a regression equation between standard length (SL) and total length (TL) for bay anchovies collected from Galveston Bay, Texas. The conversion equation was TL = 0.22391 + 1.20634 SL. Roessler (1970) plotted length frequency diagrams for striped anchovy catch data in the Everglades National Park, Florida. There was a progression of the modal size group from 55 mm in May 1963 to 105 mm in January 1964. In May 1964, another mode of 45-mm fish appeared, and this mode seemed to increase to a length of 85 mm by the following December. It appeared that individuals grew to 105 to 115 mm in 1 year. Hellier (1962) noted the growth of the bay anchovy in the Laguna Madre of Texas. Fish with a modal length of 25 mm entered the catch in March, grew to 32 mm in August, 35 mm in September, and reached 45 mm by the following March. The September group averaged 0.407 g/individual, which represented 0.034 g/mo weight increase in 6 months whereas the 45-mm group from March averaged 1.03 g or a gain of 0.104 g/mo over the year.

ANCHOVY POPULATIONS

Numerous trawling and seining surveys confirm that the bay anchovy is one of the most abundant fish of estuarine waters in the northern Gulf of Mexico (Table 2). Striped anchovies were commonly taken in these surveys, but did not often constitute a large percentage by numbers of the catch. Shipp (1979) classified the bay anchovy as an abundant pelagic

Table 2. Summary of selected ichthyofaunal surveys from the Gulf of Mexico regarding abundance of *Anchoa mitchilli* and *A. hepsetus*. Check marks indicate presence.

A. mitchilli	*A. hepsetus*	Rank of abundance	Season of peak abundance	Location	Study
√		1		Laguna Madre, Texas	Hellier 1962
√		3		East Bay (Galveston), Texas	Reid 1955[a,b]
√		2	April → June	East Bay (Galveston), Texas	Arnold et al. 1960[c]
√		3		Aransas Bay, Texas	Moore 1978[a]
√		1		Estuaries, Louisiana	Perret 1971[a,b]
√		1	February → June	Barataria Bay, Louisiana	Dunham 1972[a]
√		1	November → January	Lakes Pontchartrain and Maurepas, Louisiana	Tarver and Savoie 1976[a,b]
√		1		Estuaries, Louisiana	Juneau 1975[a,b]
√		1		Dredged canals, Louisiana	Adkins and Bowman 1976[a]
	√	11		Dredqed canals, Louisiana	Adkins and Bowman 1976[a]
	√		August	Mississippi Sound	Swingle 1971[a]
√		1, 15 2, 4	July → October	Mississippi Sound, Mobile Bay, Mobile Delta, Perdido Bay, respectively	Swingle 1971[a]
√		1, 2, 6, 8	July → October	Mississippi Sound, Mobile Bay, Mobile Delta, Little Lagoon, respectively	Swingle 1971[b]
	√	1	October-f May	Florida Bay, Florida	Tabb and Manning 1961
√		1	September+ November (juveniles) March → November (adults)	Everglades National Park, Florida	Tabb and Manning 1961
√		1	October → January	Apalachicola Bay, Florida	Livingston et al. 1976

[a]Trawl.
[b]Seine.
[c]Cast net and dip net.

estuarine species and the striped anchovy as a common pelagic estuarine species. He also summarized information on forage fish of Mobile Bay and other northern Gulf of Mexico estuaries. The bay anchovy was the most abundant pelagic estuarine forage fish in five different estuaries, while the abundance of striped anchovy was fourth in two estuaries and third in two other estuaries.

Months of peak abundance vary, but anchovies are generally common from spring through the early winter in the northern Gulf of Mexico (Table 2). Night catches of bay anchovy were greater than daytime catches in the Aransas Pass Inlet, Texas (Hoese et al. 1968). The authors speculated that the smaller daytime catches could have resulted from the fish's ability to avoid the trawl, a daytime surface migration, or both. Significantly, more bay anchovy were caught during the day at 11 m than during the night.

The bay anchovy is often the dominant fish even in areas of environmental stress (Bechtel and Copeland 1970; Livingston 1975). Gallaway and Strawn (1975) sampled above, below, and within a heated water discharge area in Galveston Bay, Texas, and found that the discharge area had significantly greater species richness than either control area. The bay anchovy was the second most numerous species both years of the study.

IMPACT BY COMMERCIAL FISHERIES

Christmas et al. (1960) inventoried fish taken along with menhaden (Brevoortia patronus) in the commercial menhaden purse seine fishery and found the striped anchovy occurred rarely and the bay anchovy was absent. Even though anchovies were numerous in the areas fished, they are usually small enough to escape through the net. Both anchovy species combined never made up more than 2.7% of the industrial trawl fishery per month in the Gulf of Mexico in 1959 (Haskell 1961). Burns (1970) surveyed the composition of catches made by a 40-ft shrimp trawl of one and five-eighth-inch mesh and found striped anchovy was rarely taken.

ECOLOGICAL ROLE

Both the striped and bay anchovies depend largely upon zooplankton for food (Bigelow et al. 1963). Zooplankton constituted 58% of the diet of juvenile (30 to 49 mm) bay anchovy and 43% of the diet of adult (50 to 74 mm) bay anchovy collected in Lake Pontchartrain (Darnell 1961). Darnell further found that juvenile and adult bay anchovy guts contained 9% and 10% micro-invertebrates, respectively, and 33% and 34% organic detritus, respectively. Sheridan (1978) examined the food habits of bay anchovy collected in Apalachicola Bay, Florida, and found calanoid copepods were the major food. With fish growth, copepod importance declined and was replaced by larger zooplankters such as mysids. Diets were similar for fish collected at different sites in the estuary, but mysids, insect larvae, and cladocerans were major food items for fish collected near the mouth of the Apalachicola River. Copepods were the dominant prey in all months, but were less important in October, December, and February, when other crustaceans and insect larvae became relatively more abundant.

Posthatch larvae (2 mm) of bay anchovy selected copepod nauplii, copepodites, and adult copepods when potential food organisms were stocked at a density of 1,600 to 1,800/l (Detwyler and Houde 1970). Initial prey organisms were 50 to 75 μm in body width. After reaching 8 mm in length, the larvae did not eat copepod nauplii. In another study, Houde

(1977) stocked bay anchovy eggs at densities from 0.5 to 32.0/l along with wild plankton stocked at a range of 50 to 5,000 organisms/l. Survival exceeded 40% when prey was 1,000 organisms/l or greater. Growth and dry weight yields increased significantly at the higher food concentrations. Houde (1978) also showed that 10% survival of bay anchovy larvae could be predicted when prey concentration equaled approximately 100/l and that the weight of the larvae increased 13.4 times in 16 days at a prey density of 100/l. Compared to larvae of sea bream (Archosargus rhomboidalis) and lined sole (Achirus lineatus), bay anchovy larvae had the best predatory ability. When larval growth rates, survival rates, and growth efficiencies were considered, however, sea bream larvae were the most efficient predators and the least likely of the three species to be limited by low prey concentrations (Houde and Schekter 1980).

Hildebrand. and Schroeder (1927) examined the stomach contents of bay and striped anchovies of the Chesapeake Bay. The adults fed primarily on mysids and the young fed on copepods. Minor food items of the bay anchovy were other anchovies, gastropods, and isopods. Stevenson (1958) found that copepods were the most abundant organisms in stomachs of both species from Delaware Bay, forming 53% and 31% in the bay anchovy and the striped anchovy, respectively.

Their relatively small size and large numbers make the anchovies one of the most important groups of forage fish in the Gulf of Mexico. Sea birds also feed heavily upon these fish.

ENVIRONMENTAL REQUIREMENTS

Temperature

Bay anchovy tolerate a wider temperature range than striped anchovy. Gallaway and Strawn (1974) found the bay anchovy to be seemingly unaffected by 32°C+ water temperatures near the outfall from a powerplant thermal discharge in Galveston Bay. Indeed, Dunham (1972) collected bay anchovy in Barataria Bay when the water was 39.8°C. Bay anchovy have been collected in water ranging from 4.5" to 39.8°C, while striped anchovy have been taken from water ranging from 15.0° to 34.9°C (Table 3). As previously implied from catch data, bay anchovies tend to remain in the bays and estuaries during the winter, whereas striped anchovy evidently winter in deeper water. Temperature was not a significant predictor for bay anchovy population abundance in a stepwise multiple regression analysis (Livingston et al. 1976).

Houde (1974) investigated the relationship among growth, survival, and starvation at temperatures of 22° to 32°C for the bay anchovy, the lined sole, and the sea bream. The rate at which the number of hours after hatching until starvation decreased in relation to temperature for unfed larvae did not differ significantly among the three species, ranging from -5.4 to -6.3 hr per degree increase in temperature. If the "critical period" is considered relative to time of hatching, lined soles need not find food for 3 to 3.5 days after hatching, but bay anchovy and sea bream must feed within 2.5 days of hatching.

Salinity

Both anchovies are euryhaline, but the bay anchovy is more often found at low salinities (Table 3). The bay anchovy has been taken from coastal freshwater to salinities of 45 parts per thousand (ppt) and the striped anchovy from salinities of 0.3 to 44 ppt. Neither Roessler (1970) nor Livingston et al. (1976) found a significant correlation between salinity and presence of anchovies.

Table 3. Temperature, salinity, and dissolved oxygen values associated with catches of adult (A) and larvae (L) *Anchoa mitchilli* and *A. hepsetus* in the Gulf of Mexico.

Bay anchovy	Striped anchovy	Salinity (ppt)	Temperature (°C)	Dissolved oxygen (mg/l)	References
A		15			Reid 1955
A			24.5-32.5		Gallaway and Strawn 1974
A		0.4-33.9	5.5-39.8		Dunham 1972
	A	10.0-32.0	21.5-29.5		
	A	7.0-29.9	19.5-34.9		Perret 1971
A		0.0-31.5	5.0-34.9		
	A	1.5-17.8	28.0-30.1		Juneau 1975
A		0.0-25.8	4.5-32.1		
	A	0.3-14.9	15.0-34.9		Tarver and Savoie 1976
	A	4.1-30.7	19.3-30.6	3.0- 8.7	Barrett et al. 1978
A		0.0-32.9	6.9-31.5	1.5-11.9	
	A	7.5-24.9			Swingle and Bland 1974
A		25.0-30.0			
	A	7.5-25.9	21.1-31.1		Gunter and Hall 1963
A		0.1-29.0	16.7-31.1		
A		0.0-34.0			Swingle 1971
	A	4.3-21.3	29.4-30.5		
	A	17.1-27.6			Franks 1970
A		7.0-29.0			
	A	1.8-11.1			Gunter and Hall 1965
	L	17.5-35.5			
A		0.2-35.7			
	A	17.3-44.1	15.5-34.0		Roessler 1970
A		15.5-45.2	16.0-34.0		

Dissolved Oxygen

Bay anchovies have been taken from water containing no more than 1.5 mg/l dissolved oxygen and striped anchovies have been taken from water with 3.0 mg/l dissolved oxygen (Table 3). The bay anchovy is certainly susceptible to oxygen depletions, but both Gallaway and Strawn (1974) and Livingston et al. (1976) found that the bay anchovy showed its tolerance by being the dominant fish in pollution-stressed areas.

Other Environmental Requirements

The literature is replete with generalities about environmental conditions associated with catch data, but contains little specific information. Reid (1955) collected bay anchovy in East Bay, Galveston, Texas, over a mud to muddy sand substrate in water with a 50-cm to 70-cm turbidity value. Livingston (1975) speculated that bay anchovies may be attracted to areas of high turbidity. Gallaway and Strawn (1974) concluded that bay anchovy in Galveston Bay preferred a sand and silt substrate with no water current to oyster reefs. Bay anchovies are usually associated with the "shallows," while striped anchovies are more often associated with deeper water in the bays and outer margins of the sampling areas. Hoese et al. (1968) recorded that bay anchovy were taken from 11 m in their daytime trawls in the Aransas Pass area.

Catches of striped anchovy at Buttonwood Canal, Florida, (Roessler 1970) were significantly positively correlated with temperature, rainfall, and season (higher catches in summer). There were also significantly higher catches on ebb tides.

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16. Abstract (Limit: 200 words)

Species profiles are literature summaries of the taxonomy, morphology, range, life history, and environmental requirements of coastal aquatic species. They are prepared to assist in environmental impact assessment. The bay anchovy (Anchoa mitchilli) is one of the most abundant pelagic estuarine species and the striped anchovy (Anchoa hepsetus) is a common pelagic estuarine species along the entire coast of the northern Gulf of Mexico. Both fish are important forage species because of their abundance and small size. Striped anchovies may have two major spawning/periods (spring and summer), but spawning of bay anchovies probably occurs throughout the year. Length-weight relationships of the bay anchovy and striped anchovy are similar. Zooplankters (especially copepods) constitute the major portion of the diet of both species. Bay anchovies and striped anchovies have been taken from water with temperatures ranging from 4.5" to 39.8" C and 15.0" to 34.9" C, respectively from water with dissolved oxygen ranging from 1.5 mg/l to 11.9 mg/l and 3.0 mg/l to 8.7 mg/l, respectively; and from water with salinity ranging from 0.0 ppt to 45.0 ppt and 0.3 ppt to 44 ppt, respectively. Bay anchovies occur more often at low salinities than do striped anchovies.

17. Document Analysis a. Descriptors

Estuaries
Fishes
Populations
Food habits

b. Identifiers/Open-Ended Terms

Bay anchovy
Striped anchovy
Anchoa mitchilli
Anchoa hepsetus
Life history
Embryology
Spawning

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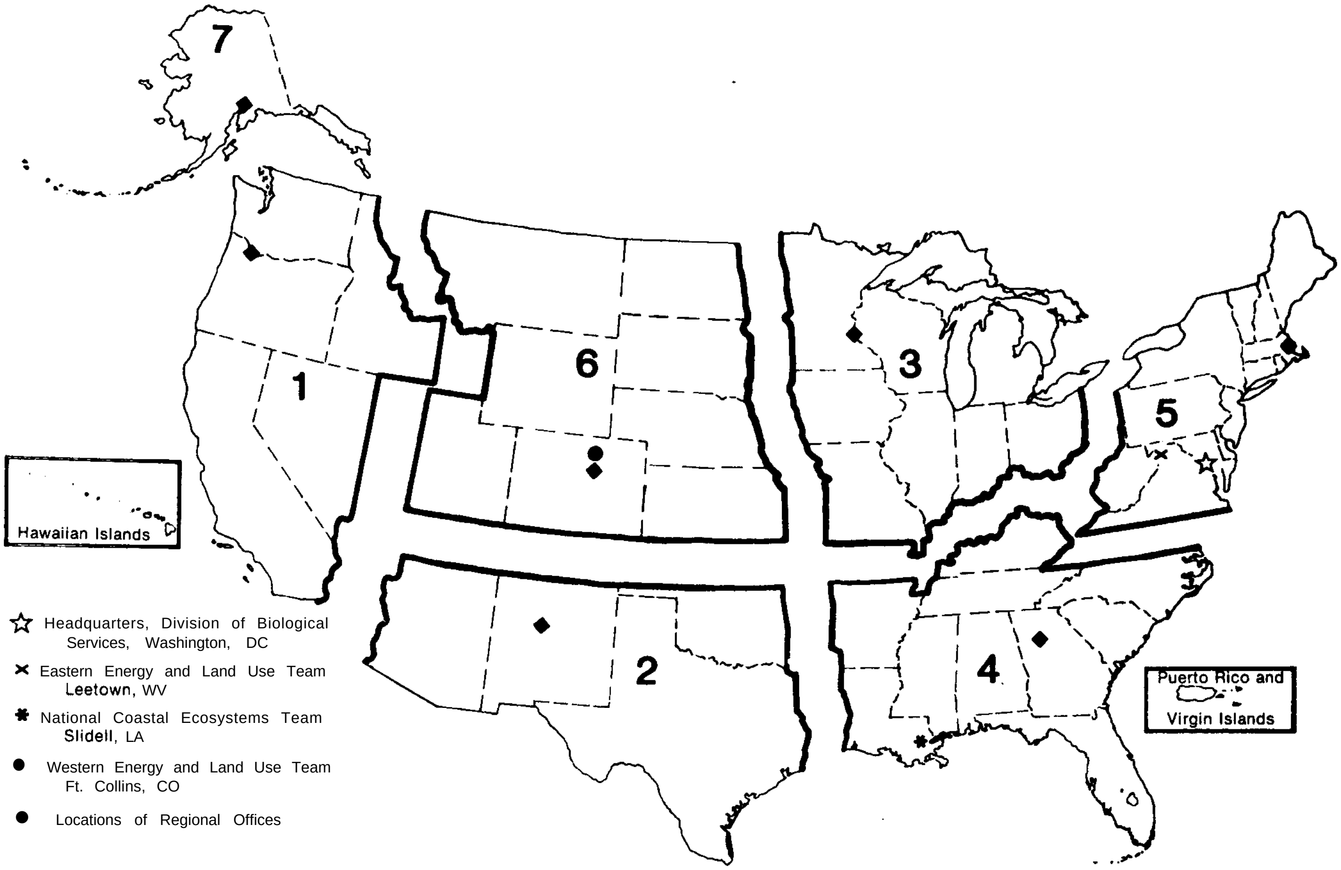

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