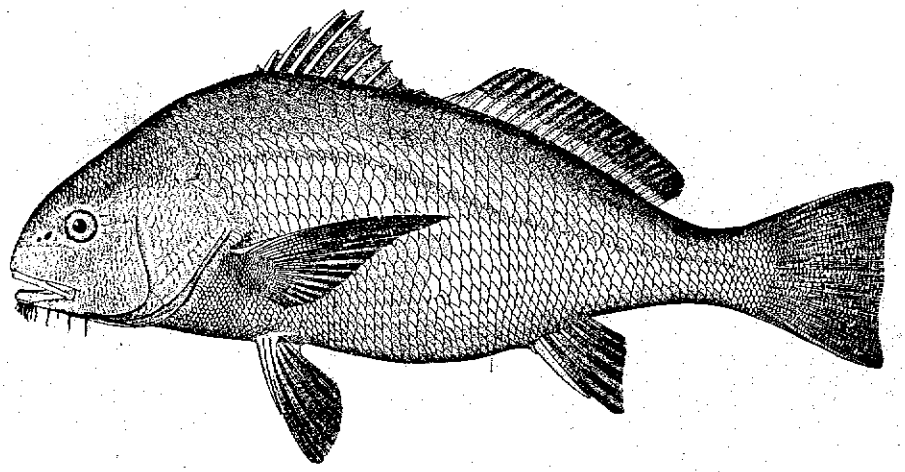

BIOLOGICAL & FISHERIES DATA

ON

BLACK DRUM, *Pogonias cromis* (Linnaeus)

OCTOBER 1979

Biological and Fisheries Data

on

black drum, *Pogonias cromis* (Linnaeus)

by

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PREFACE

The black drum is one of the largest foodfish on our coast and the largest member of the drum (Sciaenidae) family. It is considered an important food and gamefish over parts of its range. The information contained within this report was compiled from existing literature and does not contain any original research by the author.

1. IDENTITY

1.1 Nomenclature

1.1.1 Valid Name

Black drum, *Pogonias cromis* (Linnaeus). The name from the Greek *Pogonias* which means "bearded", and *cromis* "to grunt" or "to croak".

1.1.2 Objective Synonymy

The following list of scientific names used is summarized from Bean (1902) and Jordan et al. (1930):

Labrus cromis, Linnaeus, Syst. Nat. Ed. XII, 1766; p. 479.

Pogonias fasciatus, Lacépède, Hist. Nat. Poiss. Vol. III 1802: 137.

Mugil grunniens, Mitchill, Rept. Fish. N. Y., 15, 1814.

Mugil gigas, Mitchill, Rept. Fish. N. Y., 16, 1814.

Labrus grunniens, Mitchill, Trans. Lit. & Phil. Soc. N. Y., 1, 105, 1815.

Sciaena fusca, Mitchill, Trans. Lit. & Phil. Soc., N. Y., 1, 409, 1815.

Pogonias cromis, DeKay, N. Y. Fauna, Fishes, 80, 1842.

Pogonias fasciatus, DeKay, N. Y. Fauna, Fishes, 81, pl. 14, Fig. 40, 1842.

Pogonias cromis, Jordan & Gilbert, Bull. 16, U. S. Nat. Mus., 568, 1883.

1.2 Taxonomy

1.2.1 Affinities

Phylum: Chordata
Class: Osteichthyes
Superorder: Acanthopterygii
Order: Perciformes
Suborder: Percoidei
Family: Sciaenidae
Genus: Pogonias
Species: cromis

1.2.2 Taxonomic Status

No evidence was found to indicate that this is not a morpho-species.

1.2.3 Subspecies

None are recognized.

1.2.4 Common Names

The generally accepted common name is black drum (Bailey et al., 1970). It is also known by the following: sea drum, gray drum, oyster cracker, drum fish, banded drum, striped drum, puppy drum, and butterfly drum (young).

1.3 Morphology

The morphological description from Hildebrand and Schroeder (1928) is as follows:

"Head, 2.9 to 3.45; depth 2.65 to 2.8; DX-I, 20-22; A-II 6 or 7; scales 41 to 45. Body oblong, compressed; the back much elevated; ventral outline nearly straight; head moderately short; snout blunt, 2.85 to 3 in head; eye 2.85 to 3.95; interorbital 3 to 4; mouth horizontal; lower jaw included, with numerous small barbels, none of them exceeding half the length of eye; maxillary scarcely reaching middle of eye; 2.55 to 2.8 in head; teeth in jaws in broad bands; none of them especially enlarged; preopercular margin entire; gill rakers very short, 14 to 16 on lower limb of first arch; scales firm, ctenoid, reduced in size on head; dorsal fins contiguous, the first with stiff, slender spines, third [sic; fourth] spine longest, notably higher than any of the rays in second fin; caudal fin subtruncate; anal fin short, the second spine much enlarged; ventral fins rather large, inserted slightly behind base of pectorals; pectoral fins long, pointed, 3.3 to 3.6 in length."

Color of adult is silvery with brassy luster in life, becoming dark gray after death, grayish white below; all fins dusky or black. The markings of young black drum differ from that of older fish in having four to six black bars on the side and in the very young the pectorals are plain and the caudal is sometimes plain. Pearson (1929) stated that after 25 mm the color pattern remained essentially the same but as the fish aged the pectoral and anal fins assumed a black cast, the body darkened, and the bars disappeared. Figure 1 illustrates an adult specimen.

2. DISTRIBUTION

2.1 Total Area

The species ranges from Argentina north to southern New England (Bigelow and Schroeder, 1953) straying as far north as the Bay of Fundy (Bleakney, 1963). It is common from New Jersey southward, abundant from Chesapeake Bay to the mouth of the Rio Grande and most abundant in the Gulf of Mexico.

2.2 Differential Distribution

2.2.1 Spawn, Larvae, and Juveniles

The black drum spawns at sea near mouths of rivers, bays or sounds from Delaware Bay south to Texas along the U. S. coast. The larvae and juveniles are found in estuarine areas.

2.2.2 Adults

Usual range is not farther north than New Jersey. Common from Cape Hatteras, North Carolina, to New Jersey, and fairly common over the northern localities of Florida's east and west coast. Abundant along the coasts of Louisiana and Texas, being most abundant along the coast of Texas (Migdalski, 1958). Black drum are primarily a coastal species but are occasionally caught offshore in trawls (Struhsaker, 1969).

2.3 Determinants of Distribution Changes

Black drum are euryhaline. Young fish frequently inhabit brackish and fresh water (Gunter, 1942, 1956; Frisbie, 1961; Thomas, 1971), whereas adults commonly occur in hypersaline estuaries along the Gulf coast. They adapt quickly to wide ranges of salinity, i.e. 10-85 o/oo, the usual range is 25-50 o/oo (Simmons and Breuer, 1962).

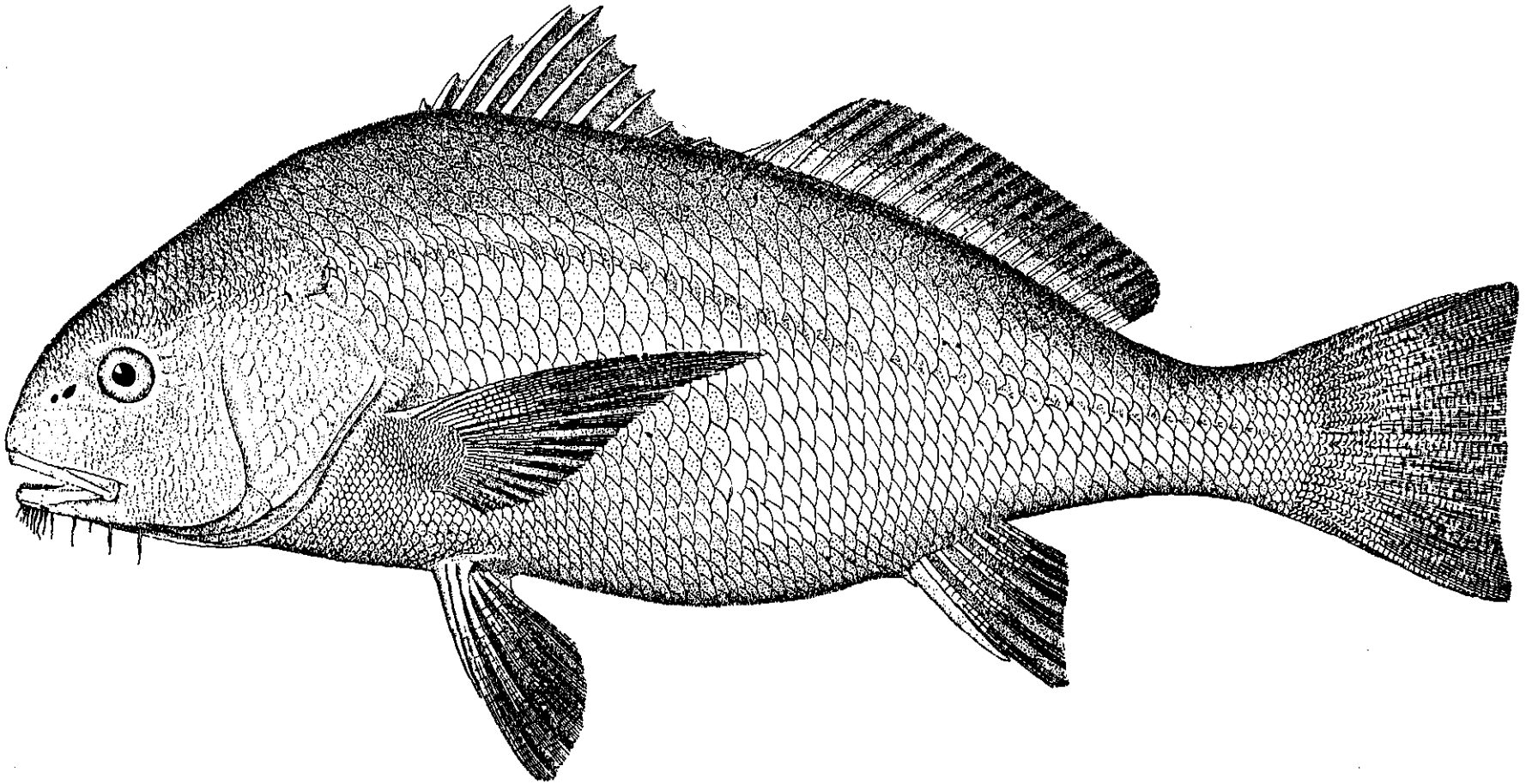

FIGURE 1. Adult black drum, Pogonias cromis (Linnaeus) (Goode, 1884).

2.4 Hybridization

No data available.

3. BIONOMICS AND LIFE HISTORY

3.1 Reproduction

3.1.1 Sexuality

Black drum are gonochoristic. They possess no accessory reproductive organs, and there is no way to distinguish the sexes by external characteristics.

3.1.2 Maturity

Black drum become sexually mature by the end of the second year (Pearson, 1929; Gowanloch, 1933; Simmons and Breuer, 1962) when they are about 285-330 mm. Thomas (1971) found young up to 200 mm with very small underdeveloped gonads. Pearson (1929) stated that once sexually mature, they spawn annually until death.

3.1.3 Mating

The act of mating has not been documented. A distinctive characteristic of black drum is schooling for purposes of migrating to spawning grounds. The black drum while migrating make a drumming sound which is audible from a boat (Pearson, 1929; Fish and Mowbray, 1970). Thomas (1971) indicated that female drum are also capable of producing sounds. Chao (1976) indicates a drumming muscle is present in both males and females, however the females drum in a softer tone than males.

3.1.4 Fertilization

Fertilization takes place externally.

3.1.5 Gonads

Pearson (1929) estimated that a 100-cm (44 in) ripe female from the Texas coast contained nearly six million eggs (approximately 5,976,000 averaging 0.6 mm in diameter).

3.1.6 Spawning

Spawning takes place at sea near larger sounds and bays from Delaware Bay south to Texas. Thomas (1971) indicates that peak spawning occurs between the second and fourth

week in May for the Delaware Bay area. Joseph et al. (1964) found eggs in lower Chesapeake Bay in mid to late May. Richards (1973) indicates that spawning can occur in Chesapeake Bay from April to mid-June when temperature near the mouth of the bay reached 17.5° ± 2.7°C. Frisbie (1961) suggests spawning in offshore waters along the mid-Atlantic from March to May. Lippson and Moran (1974) indicated spawning along the Atlantic coast from December to May. Reid (1954) mentions that spawning occurs in the spring in the vicinity of Cedar Key, Florida. Jannke (1971) reports spawning in the Florida Everglades from November to March. In the Gulf of Mexico along the Texas coast from February to May near mouths of bays and lagoons. A possible second or split spawning from late July to November with some of the younger age classes (Pearson, 1929). Simmons and Breuer (1962) mention spawning in all the bays as well as in the Gulf near passes. "Most spawning takes place in February or March, but there is a prolonged or split season in May or June."

3.1.7 Spawn

The relatively small eggs of black drum are pelagic. Their diameter ranges from 0.816 to 1.020 mm. Early stage eggs have 2 to 6 oil globules, averaging 2 or 3, which coalesce to a single globule prior to hatching (Joseph et al., 1964; Lippson and Moran, 1974).

3.2 Pre-Adult Phase

3.2.1 Embryonic Phase

Embryonic development was estimated to have been completed in less than 24 hours at 20°C (Joseph et al., 1964).

3.2.2 Larval Phase

Larvae at hatching ranged from 1.9-2.4 mm total length and 0.5-0.8 mm in depth (Joseph et al., 1964). Lippson and Moran (1974) characterize larvae less than ca. 2.0 mm as having a continuous finfold which is deepest behind the vent. The dorsal finfold extends almost around the snout. The vent proximal to yolk sac. Small indistinct melanophores on head and sides of abdomen, behind the vent, and along the dorsal and ventral margins of mid-caudal region (Figure 2). At about 2.8 mm (0.9 mm deep) the yolk sac is almost completely absorbed; pigmentation on the head and

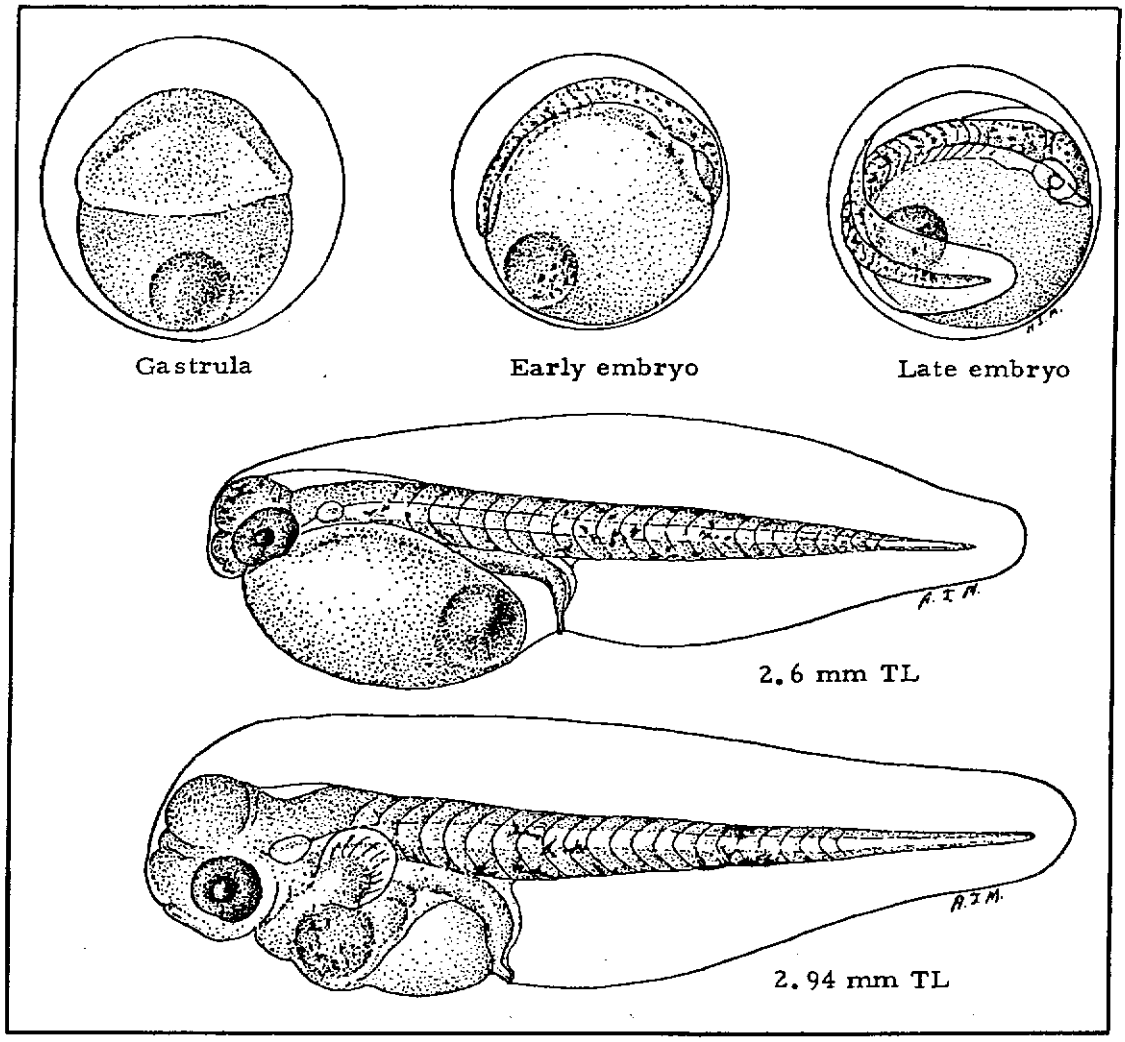

FIGURE 2. Eggs and larvae of black drum (Lippson and Moran, 1974).

trunk is more distinct; distinguishable at this size by 2 large branching melanophores on dorsal and ventral margins of tail. At about 4.5 mm, two groups of branching melanophores appear on the tail, one slightly posterior to and above vent, the other at the base of future anal fin. Scotten et al. (1973) observed larvae ca. 5 mm to have three-four small preopercular spines present; caudal fins generally differentiated along with a soft dorsal and anal fin. The full complement of rays is present at about 8 mm along with dark chromatophores appearing dorsally and laterally which begin to form the five to six black vertical bars that remain until the adult size is reached. Thomas (1971) found 9-10 mm black drum from Delaware Bay had only a few melanophores on the body and none on the membranes of the dorsal fins. Spines and rays were fully developed at 12 mm TL.

At 13-14 mm TL, melanophores along the dorsal portion of the body have coalesced to form the vertical bars. At about 15.0 mm, larvae acquire the mandibular barbels, characteristic of adults. The five or six dark bars are clearly visible from the dorsal fin base to the lateral line. All fins but the dorsal are unpigmented (Lippson and Moran, 1974). When a size of 15 mm TL is reached, the young black drum assume the general adult shape. The five or six black bars are pronounced (Pearson, 1929). See Figure 3.

3.2.3 Adolescent Phase

It has been indicated by a number of researchers (Pearson, 1929; Frisbie, 1961; Thomas, 1971; Richards, 1973) that the young spend the early part of their lives in shallow, muddy water and can tolerate extremes of salinity and temperature (Simmons and Breuer, 1962). The young have been taken in fresh water (Gunter, 1942, 1956; Frisbie, 1961; Thomas, 1971; Thomas and Smith, 1973). Juvenile black drum start to move out of shallow waters into deeper parts of bays or into the open sea along the Texas coast when about 10 cm (Pearson, 1929). They start to move out of the upper creeks into Delaware Bay near the end of June and early July when they are 30-50 mm (Thomas, 1971; Thomas and Smith, 1973).

The food of young drum consists chiefly of marine annelids, small fishes and soft crustaceans. Pearson (1929) for the Texas coast found the main food of the black drum, after it

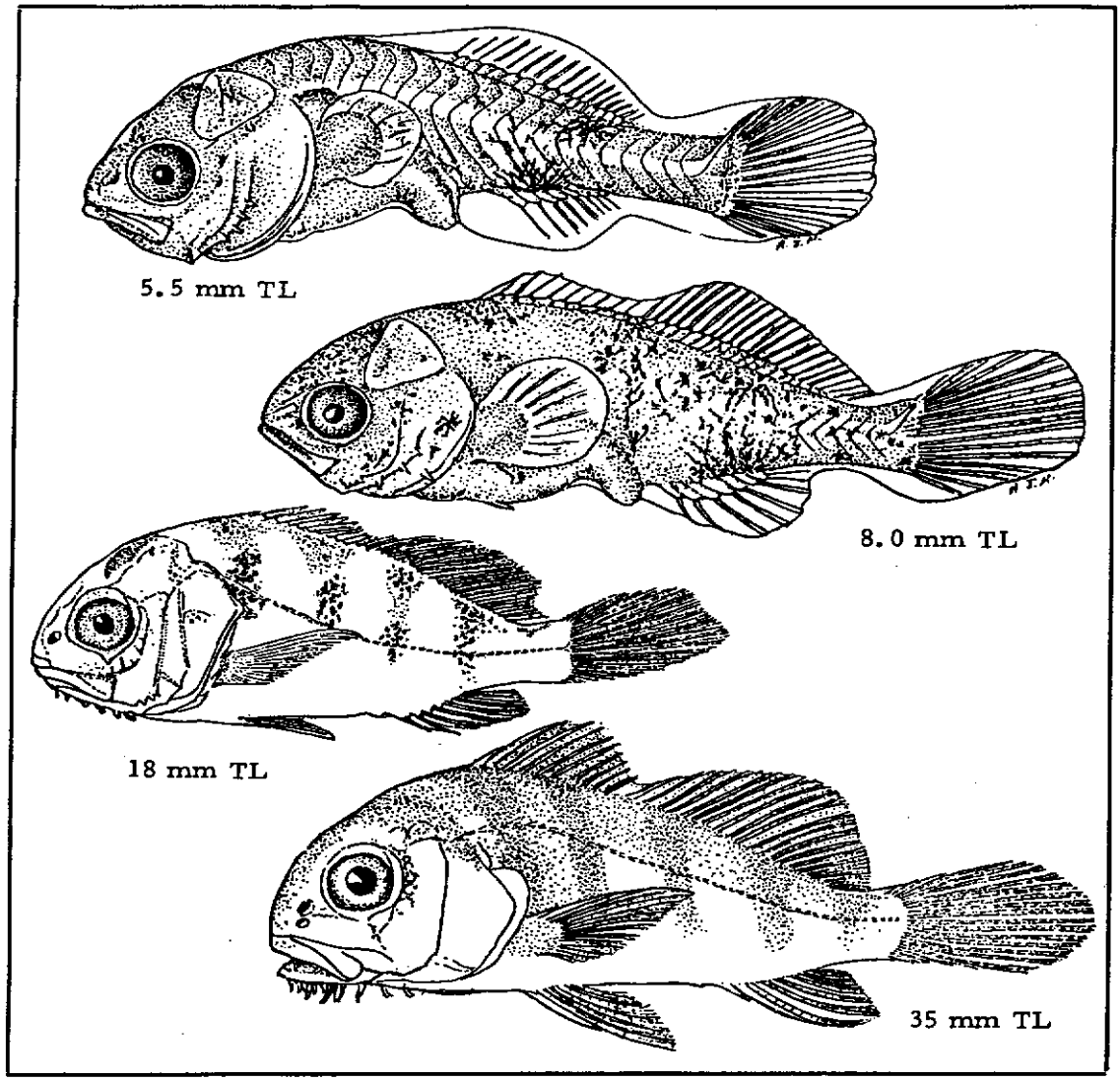

FIGURE 3. Larvae and juvenile black drum (Lippson and Moran, 1974).

had attained a length of about 20 cm, is a small mollusk, Mulinia transversa corbuloides, which abounds in muddy and shallow bays. Thomas (1971) found copepods made up about 90% of the diet of young black drum taken during June in creeks along the Delaware. The diet for August was 95% amphipods. Amphipods by far comprised the major food supply. de Sylva et al. (1962) found Polychaeta and Pelecypoda to be the most important food group among young black drum caught along the shore zone of the Delaware River estuary. The young apparently feed on the most abundant food organisms available.

3.3 Adult Phase

3.3.1 Longevity

Age and growth studies have revealed that this species can exceed 35 years (Richards, 1973). The largest recorded specimen ever caught weighed 66.28 kg (146 lbs) and was caught off the coast of Florida (Bigelow and Schroeder, 1953). The record capture by rod and reel weighed 51.28 kg (113 lbs 1 oz). It was taken at Cape Henlopen, Delaware on September 15, 1975. The average size caught is from 1 to 3 pounds in Texas waters and 10 to 40 pounds in Virginia waters.

3.3.2 Hardiness

Black drum have been taken from waters with salinities as high as 80 o/oo and as low as 0 o/oo (Simmons and Breuer, 1962; Thomas, 1971). Only the young are found in fresh water. The adults cannot survive low temperature (below 3°C) for long and large kills have been reported from Texas (Pearson, 1929; Simmons and Breuer, 1962).

3.3.3 Competitors

No data available.

3.3.4 Predators

No data available

3.3.5 Parasites, Diseases, Injuries, and Abnormalities

Ectoparasites are fairly common on black drum. They include the copepods, Caligus repax Milne Edwards, C. bonito Wilson, C. latiprons Wilson, C. pelamydis Kroyer, C. haemulonis Wilson. In Baffin and Alazan Bay, Texas "a parasitic

copepod, Caligus rapax, infected the entire black drum population during the winter of 1951-52. The number of copepods per drum ranged from one to several hundred, although the fish apparently suffered no ill effects from the parasitim." (Breuer, 1957). The isopod, Nerocila acuminata Schioedte and Neinert were taken from drum by Bere (1936) and Simmons and Breuer (1962); and Thomas (1971) found Livonica ovalis on fish collected in Delaware.

The most obvious internal parasite found in the black drum is a nematode called "spaghetti worm" which is similar to Poecilancistrium robustum Chandler. They occur in the muscle mass and are more noticeable in large drums. This parasite at any stage is not harmful to man (Simmons and Breuer, 1962).

"With the shallow bays [Texas intercoastal waters] preferred by the drum nearly completely isolated from the deeper ones, escape in times of danger is not accomplished readily. Navigation within these shallow waters is difficult, and many of the migrating adults have their bellies badly lacerated from the continual friction in passing over oyster reefs, particularly during the excitement of breeding" (Pearson, 1929).

"It was noted in Baffin Bay that many of the jet black drum were malformed, either by loss of eyes, mechanical damage to mouth or with deformed backbones.... It is possible that many of the malformed drum in the Upper Laguna Madre [Texas] received injuries from boat props. The senior author has observed commercial fishermen run motorboats through schools of drum feeding in shallow water, then go back and pick up a tubful of injured fish" (Simmons and Breuer, 1962).

Adult black drum observed in salinities as high as 80 o/oo were found to have had glazed eyes and some even were blinded and had lesions on the body (Simmons and Breuer, 1962). Thomas (1971) observed the following: a young black drum with a blind left eye and one with a barbel on the upper lip. Six young black drum showed signs of pugheadedness. Deformed gill covers and some damage to the gill filaments probably caused by the isopod, Livonica ovalis.

3.4 Nutrition and Growth

3.4.1 Feeding

Thomas (1971) observed from stomach contents that feeding of young black drum occurred during both day and night. It is apparently least intense during early morning hours.

Black drum are primarily bottom feeders but do feed at times, at or close to the surface, upon small pilchard and small menhaden (Ackerman, 1951). They are well adapted for bottom feeding in that their subinferior mouth and sensitive chin barbels aid them greatly in searching for food. They take up invertebrates from the bottom and with their heavily paved pharyngeal teeth crush the shells of the mollusks. The black drum often are vertically oriented while feeding and in this position in shallow water, their tails may stick out of the water (Pearson, 1929).

3.4.2 Food

From the Delaware Bay area, de Sylva et al. (1962) and Thomas (1971) reported that young drum feed chiefly on small invertebrates such as: copepods, annelids, polychaetes, pelecypods, and amphipods. Figure 4 shows numerical composition of food items from stomachs of young black drum from Delaware waters. Pearson (1929), Simmons (1957), and Simmons and Breuer (1962), for Texas waters, found the young drum feed on marine annelids, small fishes, and soft crustaceans. "Over 90 percent of the food of the black drum was bivalves, alive or dead. When live shellfish were not available, dead shell was consumed" (Simmons, 1957). Simmons and Breuer (1962) indicated that the black drum feed on the algae attached to the shells. Pearson (1929) found the main food consumed after they had attained a length of about 20 cm was a small mollusk, Mulinia transversa corbuloides. Various other mollusks, such as mussels (Mytilus) and oysters (Ostrea) were eaten too. Small crabs ranked second in quantity to Mulinia, and shrimp were consumed at times. The smaller-sized black drum under 20 cm with less powerful crushing teeth, tended to prey upon the softer food organisms, such as small fishes, annelid worms, and the smaller crustaceans. Older black drum confine their food largely to mollusks and crabs. Fishermen often use dead mullet, crab or shrimp for bait. Pearson (1929) found as much as 2 pounds of broken mollusk shells in a large drum (see section 3.2.3).

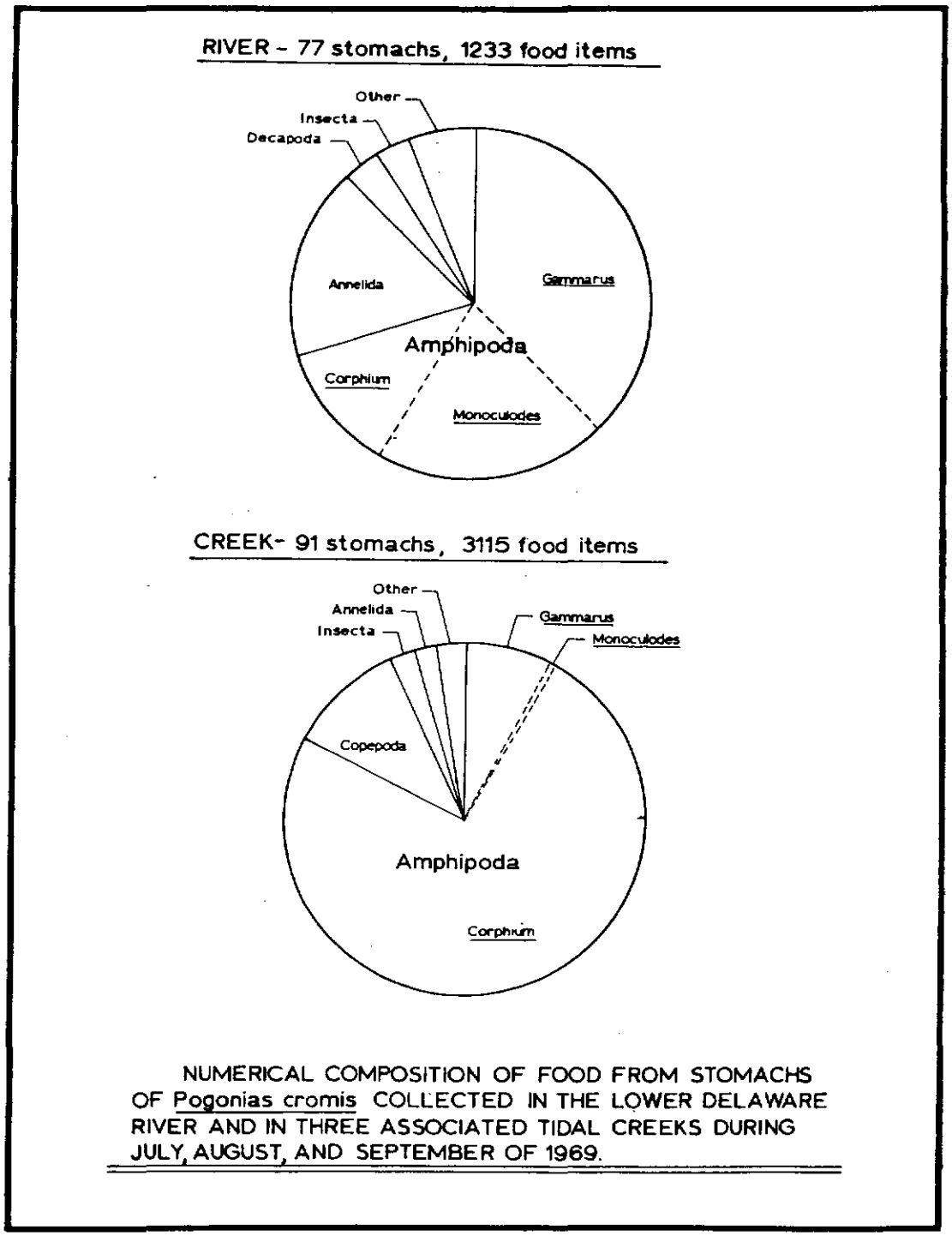

FIGURE 4. Numerical composition of food items from stomachs of young black drum from Delaware waters (Thomas, 1971).

In summary, food habits change with age. The young stages apparently feed indiscriminately on the most abundant food organisms available and the medium size fish consume larger amounts of mollusks, crabs, and shrimp. Older black drum confine their food largely to mollusks and crabs.

3.4.3 Growth Rate

The black drum is the largest sciaenid species found along the Atlantic coast. Pearson (1929), for the Texas coast, cited a modal length of 250 mm at the end of the first year and 370 mm at the end of the second year. Simmons (1957) reported that black drum attained a length of 225 mm for the first year and 285 mm by the end of the second year.

Richards (1973) aged black drum from Virginia and adjacent marine waters by a combination of three techniques: standard scale reading technique, time sequential sampling of juveniles, and analog computer simulation. "The equation expressing the scale length-fork length relationship is:

$$Y = 2.83663_X + 3.7277$$

where Y is fork length in cm and x is scale length magnified 16.8 times in cm. The correlation coefficient R is 0.955 with 426 degrees of freedom, t is 78.0, and P is less than 0.001."

"A matching of length-weight and length-age data indicates that after the fourth year more than one ring is formed each year.... If each ring were a true annulus, then the curves for age-length and age-weight would never attain the weight and length of black drum actually sampled...or caught by sport fishermen. It is not possible to match data plots and also have maximum length and weight values in the growth equation that are the same magnitude as lengths and weights actually sampled, If, however, back-calculated lengths...[Table 2] for ring classes 6, 8, and 10 are plotted as age groups V, VI and VII, [Table 1] the points fall very near the growth curves for length-age..." (Richards, 1973). Figure 5 shows length-age and weight-age curves.

Marcello and Strawn (1972) determined the average growth rate in length and weight for two black drum reared in a cage for 233 days at 0.3 mm/day (9.0 mm/month) and 1.9 g/day (57.0 g/month). Table 3 gives average lengths and weights and absolute growth during the experiment.

TABLE 1. Length and weight estimates for fish 1 to 10 years (Richards, 1973).

Age	Average Fork Length (mm)	Mean Weight (kg)
I	223	.17
II	406	1.09
III	562	2.93
IV	695	5.59
V	809	8.83
VI	906	12.4
VII	989	16.2
VIII	1,060	19.9
IX	1,121	23.5
X	1,172	26.9

TABLE 2. Back-calculated fork lengths and average capture lengths in mm for black drum from Virginia and adjacent marine waters, 1959-1970 (Richards, 1973).

Ring Class	Number of Samples	Mean Capture Length	Calculated Length at each Scale Ring									
			1	2	3	4	5	6	7	8	9	10
1	14	334	211									
2	23	522	190	418								
3	56	577	182	381	538							
4	21	706	194	394	573	662						
5	30	790	192	408	564	675	758					
6	35	813	207	384	545	656	732	786				
7	38	883	196	393	558	673	760	816	860			
8	22	921	192	393	553	688	771	829	871	900		
9	7	938	217	426	602	699	762	821	865	894	919	
10+	26	1,024	210	411	555	655	746	814	864	903	930	956
Total	272											
Grand Mean			195	396	554	669	753	810	864	900	928	956

TABLE 3. Average length in millimeters and average weight in grams for 2 black drum reared in a cage (Marcello and Strawn, 1972).

Sampling Date	Days of Growth	Average Length	Average Weight	Absolute Growth	
				mm/day	g/day
7-21-71	Start	211.0	234.0		
9-3-71	44	246.5	385.5	0.8	3.4
10-8-71	35	262.5	487.5	0.5	2.9
11-17-71	40	277.0	527.0	0.4	1.0
12-8-71	21	277.5	534.0	0.0	0.3
2-4-72	48	280.0	631.5	0.0	2.0
3-10-72	35	288.5	670.0	0.2	1.1
Overall	233	77.5	436.0	0.3	1.9

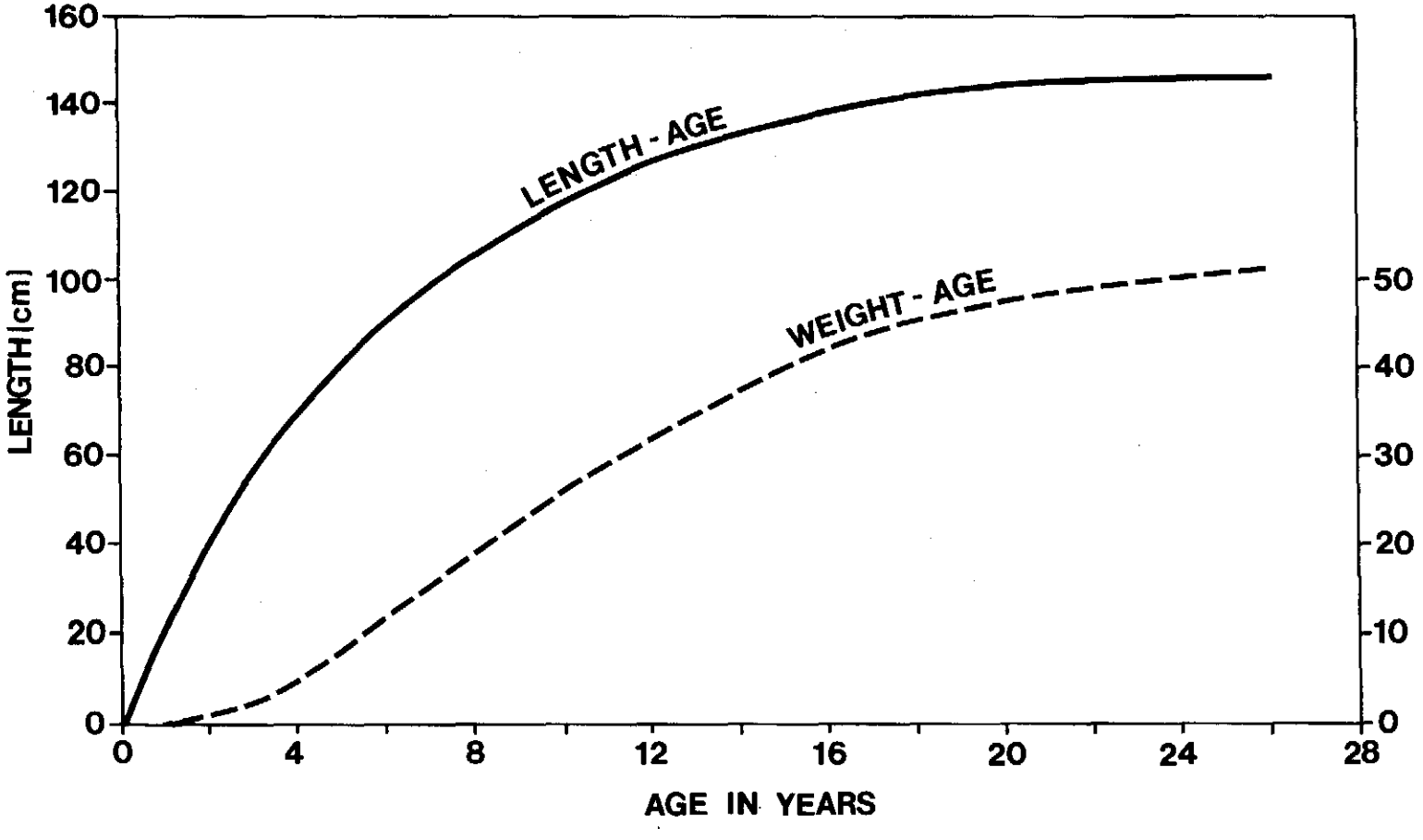

FIGURE 5. Length-age and weight-age curves for black drum from Virginia waters (Richards, 1973).

3.4.4 Metabolism

No data available.

3.5 Behavior

3.5.1 Migrations and Local Movements

"A migrating species that apparently moves northward and inshore along the northwest mid-Atlantic coast each spring, adults retreat inconspicuously southward and offshore by late fall" (Richards, 1973). "Black drum enter the bay [Delaware] from mid to late April. Peak catches by New Jersey sports fishermen occur from mid to late May, and adults generally leave the bay during early June. Adults are believed to enter the Delaware side of the bay, then move up, across, and down the Jersey shore in a general clockwise pattern..." (Thomas, 1971). Black drum concentrate for spawning in Virginia waters and disperse through Chesapeake Bay after spawning (Richards, 1973).

Along the Texas coast "black drum are commonly found in hypersaline waters but can adapt quickly to wide ranges in salinity. A tendency for drum to move into streams and inlets has been described by Breuer (1957). With the possible exception of spawning migrations this temporary surge to fresh water is the most pronounced and positive of all drum movements. There is also a constant movement in search of food and the fish often travel in large schools during these periods. When food is abundant there is little intra-bay movement. Of the 94 recovered tagged fish from the Laguna Madre and Baffin Bay...56 fish or nearly 60 per cent, were recaptured within five miles of the site of tagging. It must be noted that some of these fish moved southward into the lower Laguna Madre and eight more were recaptured in Corpus Christi Bay. The movements northward are attributable to spawning but the cause for the southward movement is not known.

"Movement may be accelerated by adverse conditions. In 1953 hypersalinity and high temperatures destroyed most bivalves in the upper Laguna Madre and a mass exodus of drum occurred. Tag returns indicate that these fish moved as far north as San Antonio Bay and returned to the Laguna Madre when food again became available. The longest migration recorded to date was from the central Laguna Madre to Texas City near Galveston, a distance of 245 miles covered in one year or less.

"Breuer has noted that in the lower Laguna Madre small drum are present all year and these move northward as spring approaches. At the same time large drum enter the bay at Brazos Santiago Pass and move northward. Shortly after this large school appears in the lower section of the upper Madre although too few fish have been tagged in the lower lagoon to verify the origin of these schools. There has has been movement of at least 10 tagged fish southward from the upper Laguna Madre into the lower Laguna Madre during fall and winter months. These seasonal movements are complicated by the fact that there was a northward movement of tagged drum out of the upper Laguna Madre during spring months..." (Simmons and Breuer, 1962).

Pearson (1929) for the Texas coast noted that just prior to spawning they gather into large schools to migrate from the shallow intercoastal waters to spawning grounds in the Gulf of Mexico.

Larvae make their way from the spawning grounds, probably by tidal current into the bays. Pearson (1929) reported that young black drum make a determined effort to reach isolated bays and lagoons. Simmons and Breuer (1962) stated that the smallest specimens sampled were located in channels, stagnant sloughs or boat basins. Thomas (1971) for Delaware Bay and Richards (1973) for Virginia waters caught the smallest specimens in the mid to upper portions of marsh creeks with muddy bottoms and in areas with little or no current (see section 3.2.3).

3.5.2 Schooling

Black drum gather in large schools to feed where food is plentiful (Simmons and Breuer, 1962). As mentioned above, they also school just prior to spawning only to disperse after spawning. The larger drums, for the most part, are solitary.

4. POPULATION

4.1 Structure

4.1.1 Size Composition

The average weight caught commercially along the Gulf states is about 1 kg (2 lbs) or less compared with Virginia's 4.5 kg (10 lbs) and larger.

The drum enter the commercial fishery when less than a year old, ~165 mm. Maturity is reached at the end of the second year when approximately 320 mm long (Breuer, 1962). The maximum size is over 1.2 m (4 ft).

Length-weight relationships for the Delaware Bay area (Thomas, 1971) based upon 100 fish (33-185 mm) can be described by the formula:

$$\log W = -5.3227 + 3.2405 \log L$$

where W = weight in grams and L = length in millimeters (Figure 6).

Richards (1973) length-weight relationships for Virginia waters are:

$$\log W = 3.0655 \log L = -4.9023$$

where W = weight in kilograms and L = length in centimeters.

$$\log Y = 3.0655 \log X = -3.3250$$

where Y = weight in pounds and X = length in inches. Drum sampled for length-weight data were from 2.2-132.4 cm in length and less than 1 gram to 46 kg.

Marcello and Strawn (1972) length-weight relationship for Texas waters is described by the formula:

$$\log W = -4.98107 + 3.16465 \log L$$

where W = weight in grams and L = standard length in millimeters. Based on 14 drum ranging in size from 192-300 mm.

4.2 Abundance and Density

The black drum varies in abundance along its range. It is abundant over the Texas coast, in Louisiana waters, over the northern portions of both Florida coasts and to a lesser extent from Hatteras north (Ackerman, 1951).

4.3 Natality and Recruitment

No data available.

4.4 Mortality and Morbidity

No data available.

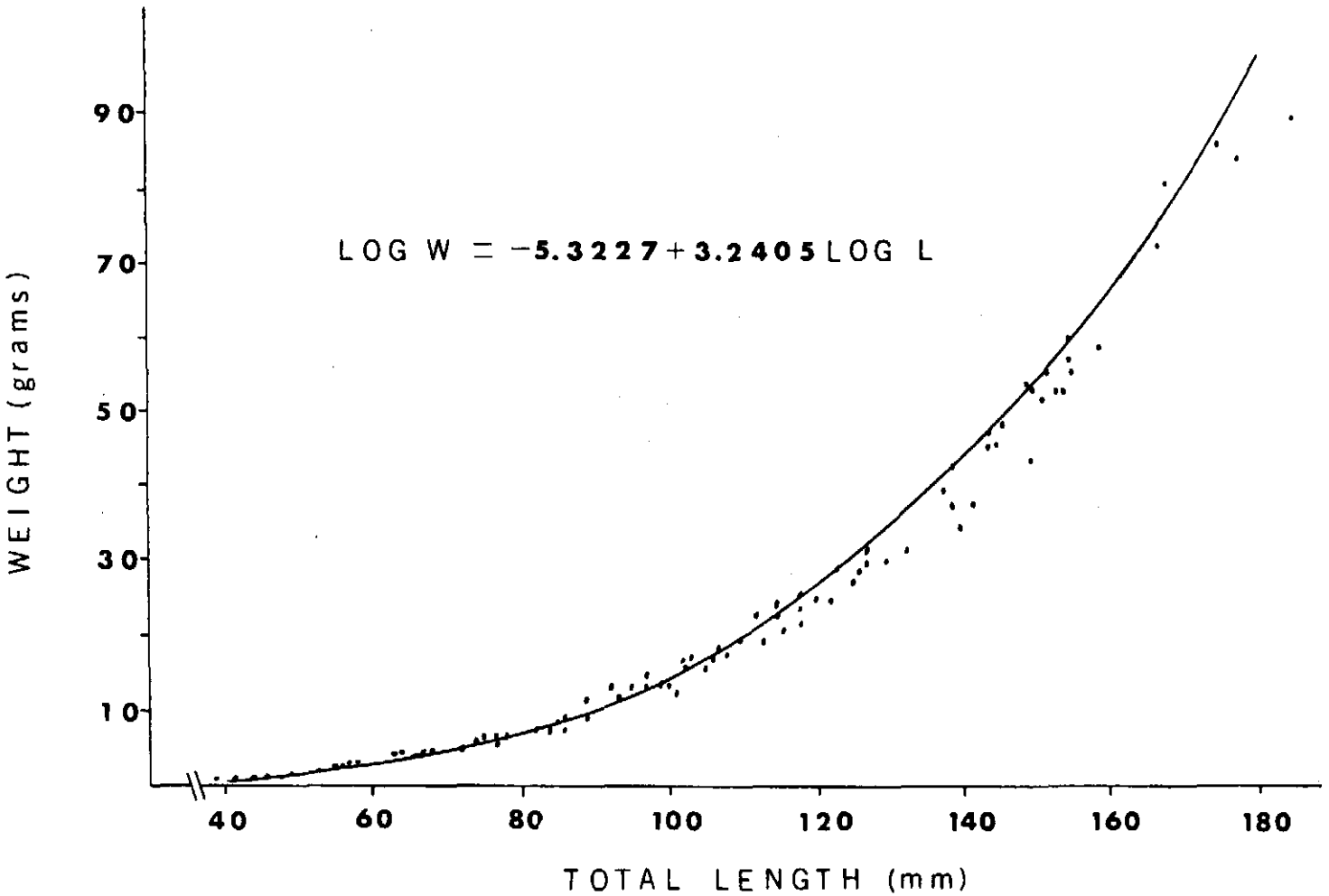

FIGURE 6. Length-weight relationship of 100 young black drum collected in Delaware waters (Thomas, 1971).

4.5 Dynamics of Population (as a whole)

No data available

4.6 The Population in the Community and the Ecosystem

No data available

5. EXPLOITATION

5.1 Fishing Equipment

5.1.1 Gear

Commercial fishermen in Virginia inshore waters use pound nets, haul seines, beach seines and trawls. Along the coast, otter trawls and other types of nets are used. In the Gulf states, gill nets, trammel-nets, drag seines, trawls, other types of nets and trot-lines are used. Sport fishermen along the coast and Gulf states use rod and reels and hand lines.

5.1.2 Boats

Commercial fishermen use small trawlers and various types of work boats. Sport fishermen likewise use a variety of boats.

5.2 Fishing Areas

5.2.1 General Geographic Distribution

See section 2.1.

5.2.2 Geographic Range

Commercial and sportfish catches are taken along the Atlantic coast from New Jersey to Florida; along the west coast of Florida and Gulf states (Figure 7). The Gulf states represent the area of greatest abundance, occurring mainly in the shallow waters along the coast and larger estuarine areas. The areas of greatest abundance are to be found within the major estuaries of Texas.

5.2.3 Depth Range

The black drum is found in shallow waters along our coast and have been taken in waters less than a meter. There are no records available as to how deep they are found or how far offshore. No doubt, the adult black drum are not found in water much deeper than where their main food supply occurs.

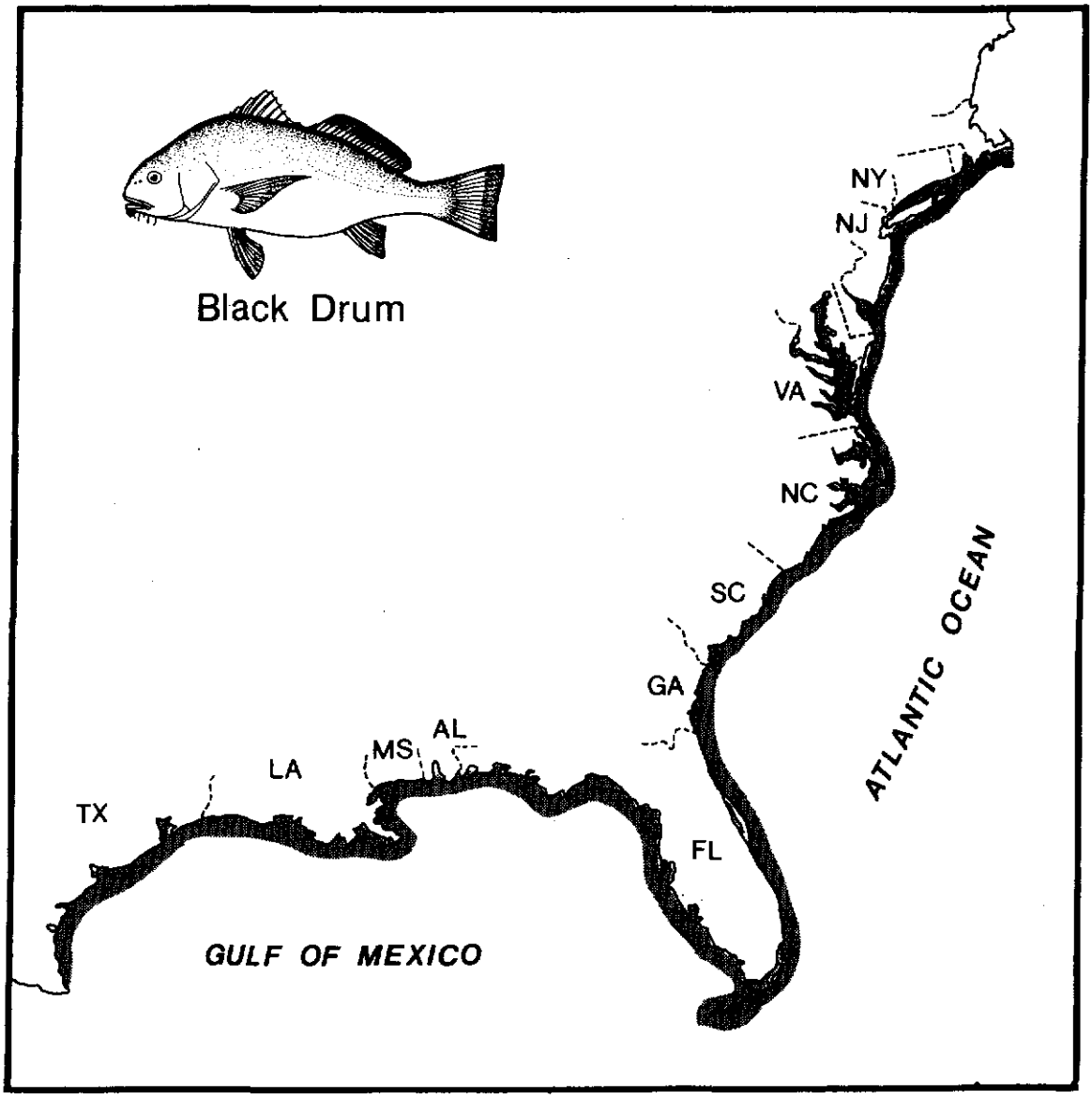

FIGURE 7. Geographic range of black drum along the east and Gulf coast of the United States.

5.2.4 Conditions of the Grounds

The black drum's survival depends upon the use of the estuary for the first few months of life as well as feeding and spawning for adults. The continuing destruction of these nursery grounds through landfill, dredging, dumping of industrial and domestic wastes, etc. can only adversely affect the future of this fishery.

5.3 Fishing Seasons

5.3.1 General Pattern of Season(s)

The fishing for black drum is generally year-round along the Gulf coast; from mid-spring to early winter along the Atlantic coast.

5.3.2 Dates of Beginning, Peak, and End of Season

In the Middle Atlantic states, black drum are caught from April to December, but the best catches are made between April to the end of June. In the Gulf of Mexico they can be caught year-round. The most productive seasons are from late January to May and from late summer to early fall.

5.4 Fishing Operations and Results

5.4.1 Effort and Intensity

Commercial harvest of black drum is confined primarily to the Gulf states with Texas harvesting 50 to 80 percent of the total commercial catch. Commercial catches of drum along the Atlantic are generally incidental.

5.4.2 Selectivity

The smaller black drum are valued higher as food than larger adults, which are usually infested with parasitic worms that virtually destroy the marketability of the fish unless the flesh is cut into fillets or steaks.

5.4.3 Catches

The total annual catch based upon commercial landing statistics for the Atlantic and Gulf states suggest a rather stable fishery in recent years. Table 4 shows the annual landings by state from 1950 to 1976.

The sportfishing catch is considerably more in pounds than the commercial catches. The angler's survey (Clark, 1962; Deuel and Clark, 1968; Deuel, 1973) estimated the pounds caught for 1960 at 42.6 million and for 1965 at 38.4 million pounds. The estimated catch for 1970 was 42.7 million pounds (Table 5).

TABLE 4. Commercial landings of black drum by state (thousands of pounds), 1950-1976 (source: Fishery Statistics of the United States).

Year	New England			Middle Atlantic			Chesapeake		South Atlantic				Gulf					Total
	MA	RI	CT	NY	NJ	DE	MD	VA	NC	SC	GA	FL East Coast	FL West Coast	AL	MS	LA	TX	
1950	-	-	-	-	13	2	18	47	100	13	5	68	49	3	19	197	708	1,247
1951	-	-	-	-	3	-	14	58	84	7	1	163	35	10	8	235	702	1,324
1952	-	-	-	-	2	-	1	45	98	4	1	87	126	2	2	139	614	1,125
1953	-	-	-	-	15	5	1	63	102	4	1	101	71	2	5	64	770	1,204
1954	-	-	-	-	3	4	12	414	51	-	1	69	45	2	1	68	2,191	2,861
1955	-	-	-	-	15	1	21	100	24	-	1	97	48	3	14	128	1,972	2,424
1956	-	-	-	-	24	31	22	149	14	-	1	71	69	5	39	148	1,852	2,425
1957	-	-	-	-	23	(1)	6	130	24	(1)	-	103	62	2	21	184	1,502	2,057
1958	-	-	-	-	11	(1)	5	55	11	-	1	63	128	9	28	178	1,071	1,559
1959	-	-	-	-	1	-	10	247	23	2	-	62	124	10	38	161	1,288	1,966
1960	-	-	-	-	56	(1)	4	172	53	(1)	3	49	191	2	15	190	1,520	2,255
1961	-	-	-	-	2	(1)	1	248	75	3	1	64	75	2	23	388	1,635	2,517
1962	-	-	-	-	26	-	12	376	143	2	-	68	58	2	22	309	1,373	2,391
1963	-	-	-	-	8	-	22	328	50	3	1	116	100	10	17	344	1,363	2,362
1964	-	-	-	-	33	-	2	68	53	12	1	112	88	5	46	306	1,409	2,147
1965	-	-	-	-	5	-	2	106	152	3	2	131	65	3	33	195	1,470	2,167
1966	-	-	-	-	3	-	90	391	96	-	1	83	65	4	20	247	1,007	2,007
1967	-	-	-	-	7	-	18	190	90	2	2	83	75	8	33	264	1,061	1,833
1968	-	-	-	-	3	-	22	329	23	(1)	1	75	84	16	75	360	677	1,665
1969	-	-	-	-	11	-	3	110	15	1	(1)	145	63	43	114	478	610	1,593
1970	-	-	-	-	4	*	7	72	23	1	7	113	50	24	53	434	783	1,573
1971	-	-	-	-	44	-	(1)	101	36	(1)	(1)	133	73	31	21	506	1,138	2,244
1972	-	-	-	-	33	*	1	24	39	1	2	88	96	44	23	540	1,165	2,057
1973	-	-	-	-	25	-	1	11	30	(1)	5	98	84	80	14	542	1,208	2,098
1974	-	-	-	-	33	-	2	33	24	*	3	92	60	53	10	440	1,357	2,107
1975	-	-	-	-	96	-	27	7	46	*	4	148	171	20	20	275	1,172	1,986
1976	-	-	-	-	25	-	6	31	9	1	2	120	27	19	48	575	2,091	2,958

- Information not available

(1) Less than 1,000 pounds

* Less than 500 pounds

TABLE 5. Sportfish catch statistics for black drum in 1960, 1965, and 1970 salt-water angling surveys. All values in thousands (Clark, 1962; Deuel and Clark, 1968; Deuel, 1973).

		Maine-New York	New Jersey-Cape Hatteras, North Carolina	Cape Hatteras North Carolina-Florida Keys East	Florida Keys West-Texas	Total
1960	No. of anglers	-	16	207	242	465
	Pounds caught	-	3,300	26,760	12,570	42,630
	No. of fish					
	boat	-	34	3,738	2,913	6,685
	shore	-	98	1,127	1,667	2,892
	TOTAL	-	132	4,865	4,580	9,577
1965	No. of anglers	-	-	136	182	318
	Pounds caught	-	-	14,477	23,880	38,357
	No. of fish					
	boat: private, rent	-	-	486	1,279	1,765
	boat: charter, party	-	-	229	65	294
	shore	-	-	3,038	579	3,617
	TOTAL	-	-	3,753	1,923	5,676
1970	No. of anglers	-	3	160	315	478
	Pounds caught	-	1,454	12,123	29,100	42,677
	No. of fish					
	boat: private, rent	-	26	2,671	5,052	7,749
	boat: charter, party	-	-	792	16	808
	shore	-	-	1,732	4,421	6,153
	TOTAL	-	26	5,195	9,489	14,710

6. PROTECTION AND MANAGEMENT

6.1 Regulatory Measures

Stability of landings based upon commercial landing statistics, would suggest no management procedures are currently necessary.

7. AQUACULTURE

"Tolerance, rapid growth, and its feeding habits make it a potential aquatic farming species. A saleable size can be reached in one year or less and juveniles are more widely marketable than adults" (Richards, 1973).

Marcello and Strawn (1972) experimented with cage culture of some marine fishes including black drum. A total of 2 drum were maintained in cages for 233 days in the intake canal of a steam-electric generating station in Galveston Bay, Texas. The feed used was Purina trout chow (40% protein) with a pellet size of 7 x 5 mm. The amount of supplemental food was 3% or 5% of total weight in a cage. Both percentages were used at different times. The fish were fed once daily, 6 days per week. Toward the end of the experiment, after the December 1971 growth sampling the black drum did not receive supplemental feed. The average length and weight increased about 78 mm and 436 g and the relative growth in average weight was 186.3% (Table 3).

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