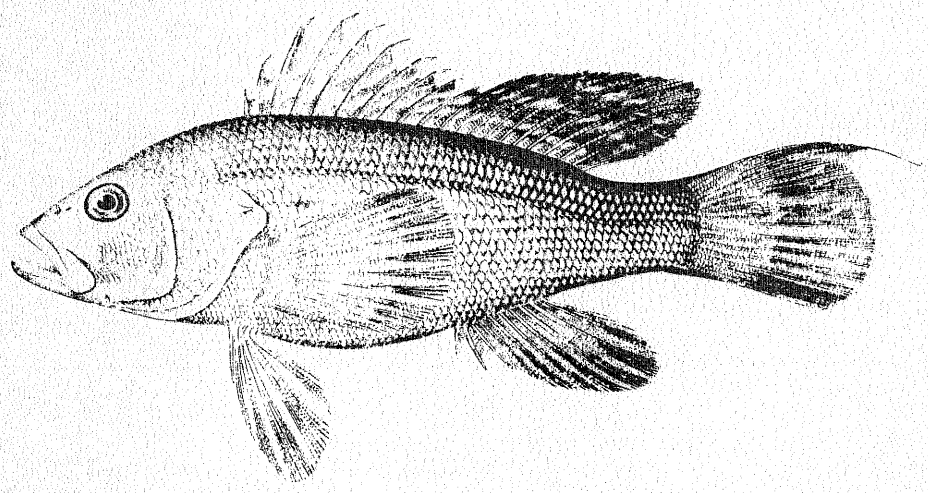

BIOLOGICAL & FISHERIES DATA
ON
BLACK SEA BASS, *Centropristis striata* (LINNAEUS)

MAY 1977

Biological and Fisheries Data

on

black sea bass, *Centropristis striata* (Linnaeus)

by

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TABLES

FIGURES

1. IDENTITY

1.1 Nomenclature

1.11 Valid Name

Centropristis striata (Linnaeus, 1758).

1.12 Objective Synonomy (based mainly on Miller, 1959).

Labrus striatus, Linnaeus, 1758
Perca ataria, Linnaeus, 1766
Perca furva, Walbaum, 1792
Coryphaena nigrescens, Bloch and Schneider, 1801
Lutjanus trilobatus, Lacepede, 1803
Perca varia, Mitchill, 1815
Centropristes, Cuvier and Valenciennes, 1829
Centropristes nigricans, Cuvier, 1829
Centropristis, Cuvier, 1829b
Centropristis nigricans, DeKay, 1842
Centropristis nigricans, Storer, 1846
Centropristes atrarius, Holbrook, 1860
Centropristes nigrescens, northern form, Gill, 1861
Centropristis atrarius, southern form, Gill, 1861
Centropristis atrarius, north and south, Gill, 1873
Serranus atrarius, Jordan and Gilbert, 1882
Serranus furvus, Jordan, 1885, northern form
Serranus atrarius, Jordan, 1885, southern form
Centropristis striatus (Linn. Ed. X), Jordan and Eigenmann, 1890
Centropristes striatus, Boulenger, 1895
Centropristes striatus, Jordan and Evermann, 1896
Centropristes striatus, Jordan, Evermann and Clark, 1930
Centropristes to *Centropristis*, Briggs, 1960 (corrected spelling error)

1.2 Taxonomy

1.21 Affinities

Phylum: Chordata
Class: Pisces - Osteichthyes
Superorder: Acanthopterygii
Order: Perciformes
Suborder: Percoidei
Family: Serranidae
Subfamily: Serraninae
Genus: *Centropristis*
Species: *striata*

1.22 Taxonomic Status

The species of *Centropristis* are characterized by their gross morphology. Over the years there have been several attempts to separate northern and southern forms of *C. striata*

along the Atlantic coast on morphological characters. There may be two groups on the Atlantic coast - one centered off the Middle Atlantic Bight and the other off South Carolina.

1.23 Subspecies

Miller (1959) considered C. melana Ginsburg, 1952 a subspecies of C. striata, however, Bailey et al., 1970, list C. melana as a separate species. Whether the Gulf of Mexico population is a separate species (C. melana) or a subspecies (C. striata melana) awaits breeding or biochemical experiments.

1.24 Common Names

Standard common name - black sea bass (Bailey et al., 1970).

Vernacular names - black fish; tally-wag; hannahill; black-will; black-Harry; black perch; black bass; bluefish; rock bass.

1.3 Morphology

1.31 External Morphology (based mainly on Hildebrand and Schroeder, 1928 and Miller, 1959) (Table 1) (Figures 1-3)

Body elongate to robust, somewhat compressed; back elevated; head rather thick; snout moderately pointed 3.35 to 4.35 in head; eye 3 to 4.9; interorbital 6.65 to 9.75; mouth large, oblique; maxillary reaching about opposite middle of eye, 2.3 to 2.45 in head; teeth pointed, in bands, on jaws, vomer, and palatines, no distinct canines; tongue smooth; preopercular margin finely serrate, lower teeth somewhat antrose; gill rakers long and slender, slightly longer than pupil; supraoccipital and parietals with strong crests extending forward to a point between post frontal processes; frontals posteriorly with an angular transverse ridge in front of supraoccipital connecting the parietal crests; posterior processes of premaxillaries not reaching frontals; scales moderate to large, ctenoid, reduced on head and cheeks - smooth area on top of cranium short and small - extending somewhat on the bases of fins; lateral line complete following the curvature of the back; dorsal fin continuous, the spines strong, the soft part elevated and notably higher than the spines in the adult; anal fin with three strong graduated spines, the soft rays very long in the adult; ventral fins moderate, inserted under or slightly in advance of base of pectorals; pectoral fins long, reaching beyond tips of ventrals, 1.35 to 1.45 in head.

TABLE 1. Quantitative morphological data of Centropristis striata, mostly from Miller, 1959.

Character	Number Examined	Range	Mean
Meristic Characters			
Total gill rakers	122	23-29	26.2
Number pectoral rays	249	18-20	18.8
Scale rows-dorsal fin to lateral line	120	6- 8	6.8
Scale rows-anal fin to lateral line	117	+13-18	15.2
Predorsal scale rows	109	9-17	13.8
Dorsal fin spines		10	10
Dorsal fin rays		11	11
Anal fin spines		3	3
Anal fin rays		7	7
Dorsal primary caudal rays		9	9
Ventral primary caudal rays		8	8
Dorsal secondary caudal rays		9	9
Ventral secondary caudal rays		8	8
Precaudal vertebrae		10	10
Caudal vertebrae		14	14
Proportional Characters (as percent standard length)			
Dorsal fin origin to snout	66	33-42	
Anal fin to caudal-base	66	40-48	
Dorsal fin origin to lateral line	64	10-14	
Caudal peduncle length	65	9-15	
Caudal peduncle depth	65	12-15	
Head length	123	37-43	

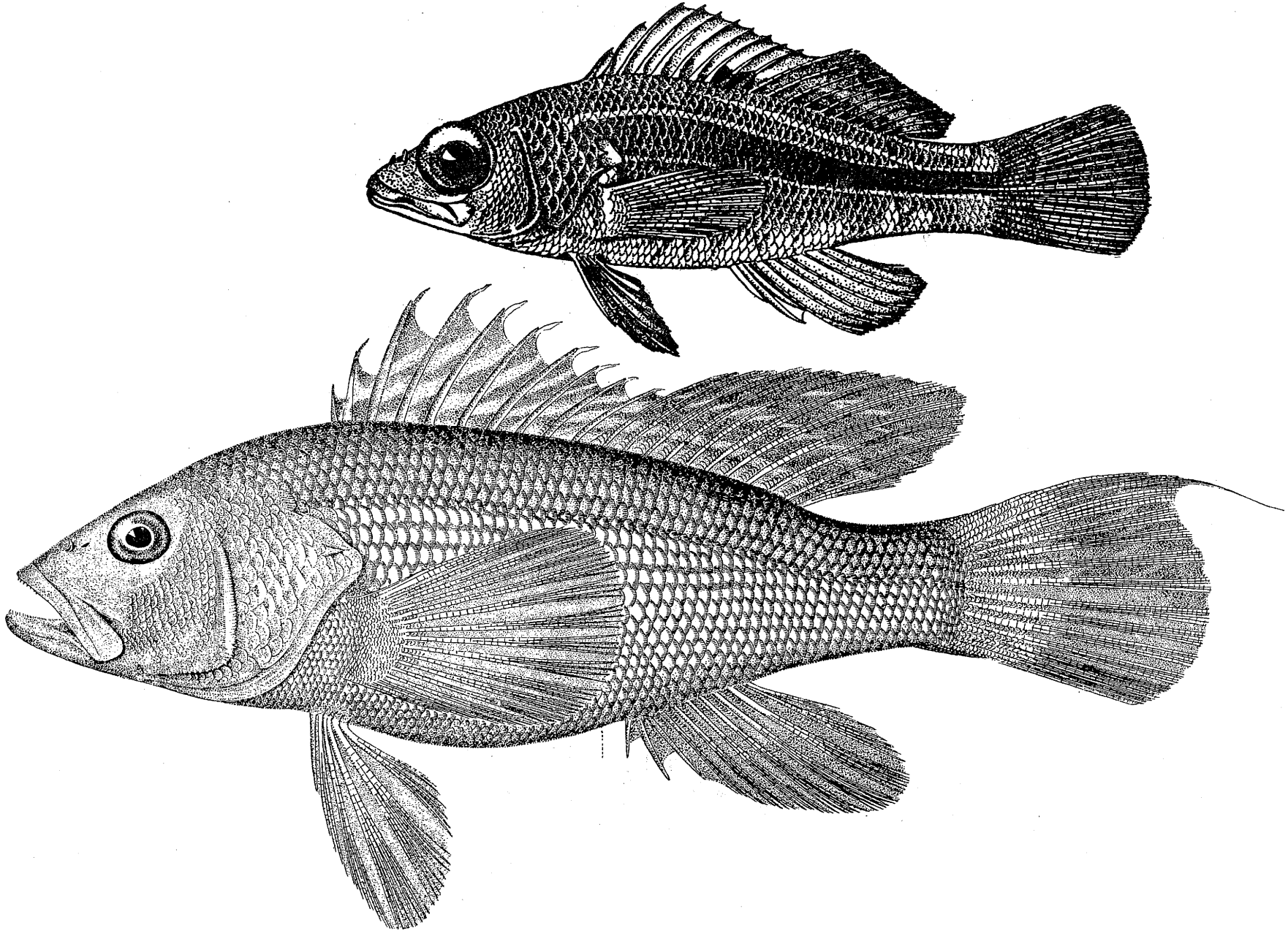


Figure 1. Juvenile and adult black sea bass.

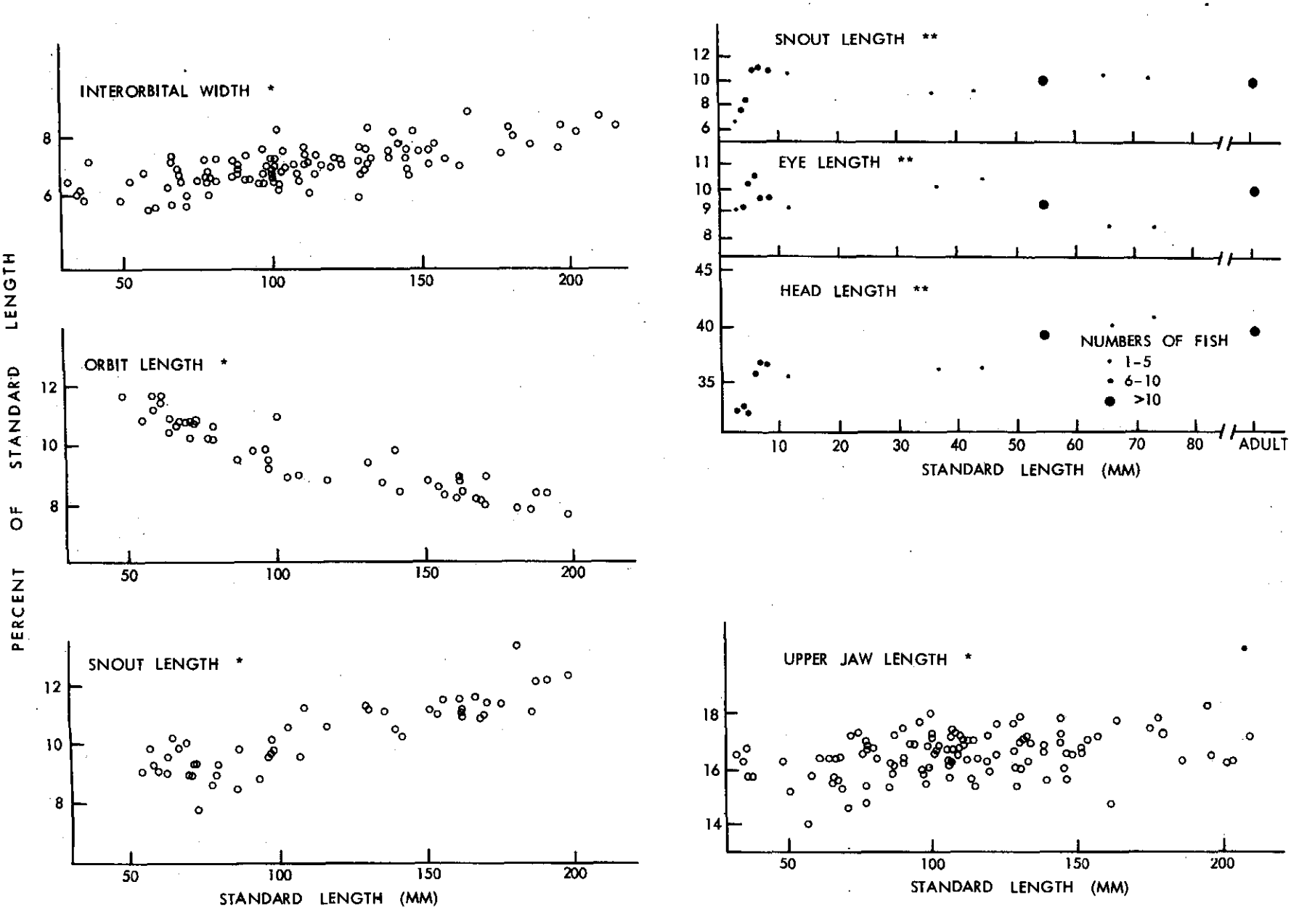


Figure 2. Body proportions of black sea bass associated with the head. * from Miller, 1959. ** from Kendall, 1972.

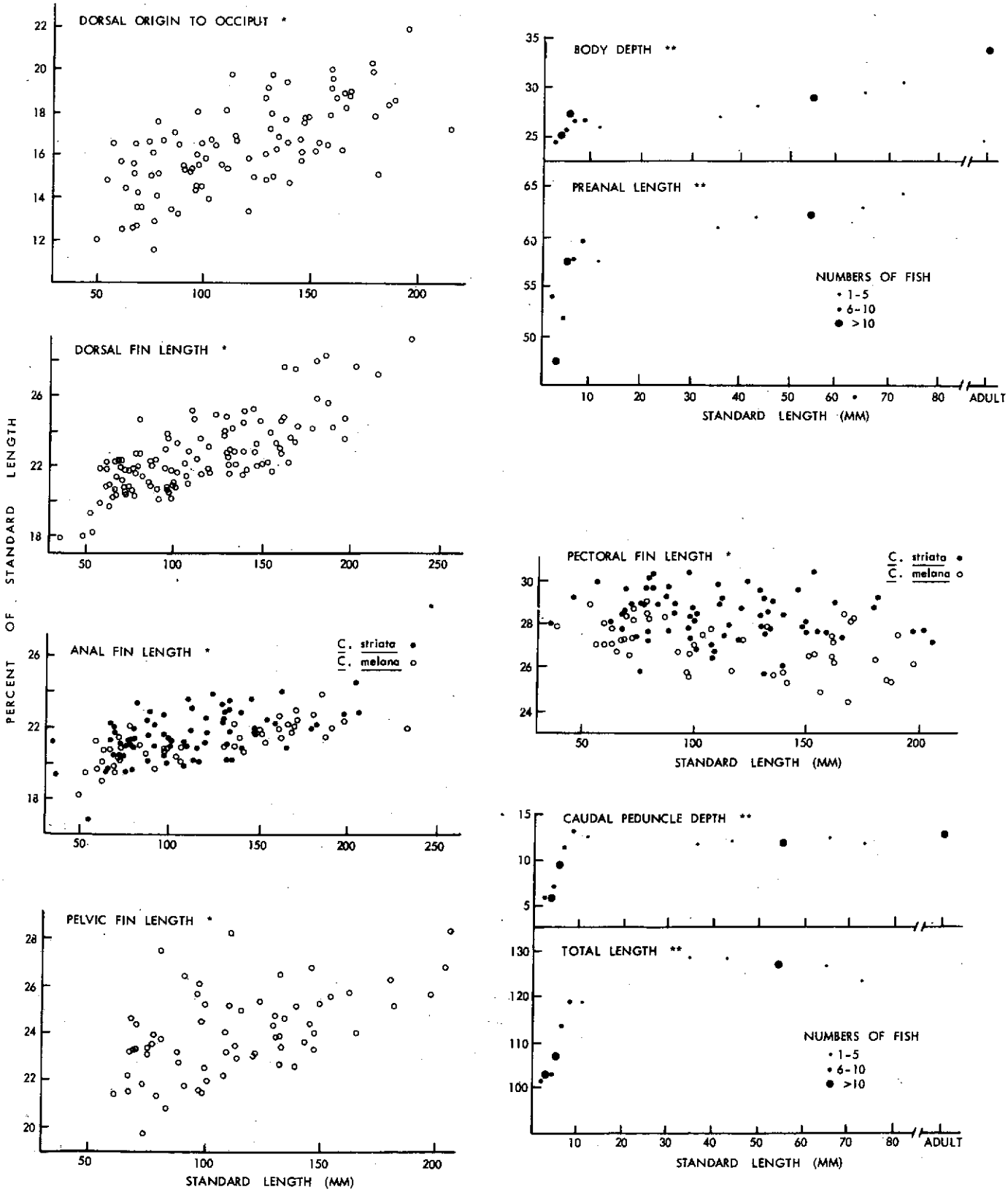


Figure 3. Body proportions of black sea bass associated with the trunk. * from Miller, 1959. ** from Kendall, 1972.

Ground color dark, usually dark brown in alcohol, smoky gray to dusky brown or blue black in life. Exposed parts of scales paler than margins, giving appearance of being barred with longitudinal series of pale dots. Seldom with traces of seven vertical bars on sides. Belly only slightly paler than sides, never white. Fins dark, dorsal marked with several series of whitish spots and bands. Dermal flaps extend only slightly past tips of dorsal spines. Young with dark lateral stripe and distinct black spot at base of last dorsal spines; dark blotches on jaws usually absent in young.

2. DISTRIBUTION

2.1 Total Area

Atlantic coastal waters, commonly from Cape Cod, Massachusetts to Cape Canaveral, Florida. Occasionally into the Gulf of Maine and frequently south to Miami. Perhaps occasionally south to the Florida Keys (Miller, 1959).

2.2 Differential Distribution

Eggs of black sea bass have not been identified from field samples. Location of spawning has been inferred from the distribution of ripe females and small larvae. They spawn pelagic eggs in the open ocean in depths of 18-45 m. They spawn during spring and summer. Spawning occurs earlier in the year in the southern part of their range than in the northern part; in late May off Chesapeake Bay and in early summer off southern New England. Males running ripe are found as early as late February and females are found ripe in early April off North Carolina (F. J. Schwartz, pers. comm.).

Larvae of black sea bass have been identified in several collections of ichthyoplankton along the east coast. Larvae have been found at the mouth of the Chesapeake Bay, in Long Island Sound and in Narragansett Bay. Extensive sampling offshore resulted in small catches of larvae from June to November. They occurred from 4 to 82 km from shore. Water depths over capture locations were between 15 and 51 m. Surface temperature ranged between 14.3° and 28.0°C, surface salinity ranged from 30.3 to 34.6 o/oo. They occurred from North Carolina, the southern limit of the survey to New Jersey. Seasonally, there was some indication of northward progression of larval occurrences (Kendall, 1972).

Juveniles of black sea bass have been taken in saline areas of estuaries along the coast from Florida to Massachusetts. Some also occur in offshore areas (Cupka et al., 1973). In South Carolina estuaries juveniles were found in salinities of 8.8 to 37.8 o/oo and temperatures of 5.6° to 30.4°C and are present mainly from July to November ranging from 20 to 140 mm SL (Cupka et al., 1973). Tagatz (1968) found them in water with salinities as low as 7.7 o/oo

in Florida. They apparently move inshore after early larval development offshore and become associated with hard bottom such as oyster beds.

North of Cape Hatteras adults move inshore and offshore seasonally. Larger and older fish move offshore sooner and winter in deeper water (73-165 m) than do young-of-the-year specimens. They seem to stay in water at least 9°C. Thus, they move inshore during warmer months and offshore during cooler months. South of Cape Hatteras they are residents in given areas year round, where they are found in depths of from 10 to 120 m with most from 20 to 60 m, and larger specimens were found mainly in the deeper water (Cupka et al., 1973). Over the past 70 years it appears, from catch records, that the center of abundance of black sea bass in the Middle Atlantic Bight has shifted south from the New York-Delaware region to the Chesapeake region. Recently total catches have decreased substantially.

2.3 Determinants of Distribution Changes

Long-term changes in bottom characteristics may influence the distribution of black sea bass adults. Decrease in extent of oyster beds off southern New England may be related to decrease in black sea bass abundance. Seasonally black sea bass distribution seems influenced by temperature with 10°C cited as a lower preferred limit.

3. BIONOMICS AND LIFE HISTORY

3.1 Reproduction

3.11 Sexuality

Black sea bass are protogynous hermaphrodites. Females are usually sleeker and more graceful with a more pointed snout and narrower caudal peduncle than males. During the female stage at sexual maturity the fish become rotund and coloration changes to a medium yellow-green which occasionally darkens. The males older than 6 years develop a large fleshy bright blue nuchal hump during the spawning season. The median fins develop filaments at the tips of the rays and coloration intensifies to vivid flourescent hues of blue and green. The exserted upper caudal rays are usually longer in the male (Lavenda, 1949). The color changes, concomitant with seasonal maturity, become more pronounced with increasing age.

3.12 Maturity

Females apparently mature as 2-year olds at a length of about 17 cm. Generally, males tissue is first seen in

fish 3 years old at about 18 cm, although smaller males have been recorded (Reinboth, 1965). The largest females are about 34 cm and 8 years old, while males attain 45 cm and at least 12 years (Lavenda, 1949).

3.13 Mating

Mating has not been observed although some sort of mate recognition and selection and territoriality is suggested by the sexual dimorphism.

3.14 Fertilization

External fertilization is probable since the eggs are pelagic and no intromittent organ is present. Self fertilization is not possible since, although there is a large overlap of sizes of males and females during sexual transformation, the sexes remain functionally distinct at all times.

3.15 Gonads

The ovotestis shows various stages of transformation with increased size. Regressive ovarian tissue is found in males immediately anterior to the genital duct. Most fish transform at lengths of 15-24 cm and ages 2-5 years. However, eggs are seen dispersed throughout the testicular material in fish up to 15 years old and some males as young as 6 years old have no ovarian tissue. Tubular, male tissue is seen developing in the oviducts of females. Estimates of fecundity of fish from South Carolina yielded the following equation:

$$\log_{10}F = 0.30843 + 1.97265 \log_{10}SL \qquad r = 0.674$$

Observed fecundities of 1-to 5-year old fish ranged from about 30,000 to 122,000 eggs (Cupka et al., 1973).

3.16 Spawning

Sea bass apparently spawn seasonally, but no information on the number of times an individual spawns during a season is available. Spawning or spawning behavior has not been observed in black sea bass. Ripening of sex products has been induced by injections of chrionic gonadotrophic hormones (Hoff, 1970).[1/]

1/ Hoff, 1970 was working with C. melana, the Gulf of Mexico sibling species of C. striata. Since his data represent the only available laboratory work on several phases of study, he will be cited in appropriate sections, even though he was working with a different, but quite similar species.

3.17 Spawn (Figure 4)

Eggs of black sea bass are buoyant in sea water and non-adhesive. They are apparently free-floating in nature during development. They are 0.9-1.0 mm in diameter, are round with a smooth, unsculptured egg membrane. There is a moderately narrow perivitelline space and the yolk is surrounded by a plain membrane. There is a single small oil globule in the yolk. Apparently, the live eggs are colorless when they are spawned.

3.2 Pre-Adult Phase

3.21 Embryonic Phase

Embryonic development has been described in extreme detail by Wilson (1891). The pattern of development is typical of teleosts with pelagic eggs. They hatch in about 75 h at 16°C. Early cleavage forms a blastoderm opposite the oil globule on the surface of the yolk. Segmentation is regular and the blastomeres equal in size through the 16-32 cell stage. After this, the blastodermal cap becomes circular and grows around the yolk. The embryo is first seen as the neural streak extending from the dorsal lip. Ectoderm and endoderm can be distinguished at this stage and mesoderm is soon seen also. At the anterior end of the embryo the head starts to take shape with the optic capsules prominent. At the posterior end the blastopore closes and Kuppfer's vesicle is present. Differentiation continues and by the time of hatching the embryo has a median fin fold, pectoral fin buds, but unpigmented eyes.

3.22 Larval Phase (Figures 4 and 5)

Larvae have been described from wild plankton samples, so no estimates of time required for development are available. Larval development of black sea bass proceeds in a manner typical of lower percoids. It is a rather direct development, with few larval specializations. There is a characteristic pigment pattern consisting of several spots of pigments at diffinitive positions along the ventral body surface. There is a medial spot posterior to the lower jaw, a spot on each angular, one at the junction of the cleithra, one at the vent, several along the anal fin and posterior to it and one at the base of the caudal fin. The sequence of fin development proceeds: caudal, second dorsal, anal, pelvic, pectoral, first dorsal. Changes in body proportions are discussed in 1.31 and illustrated in Figures 2 and 3.

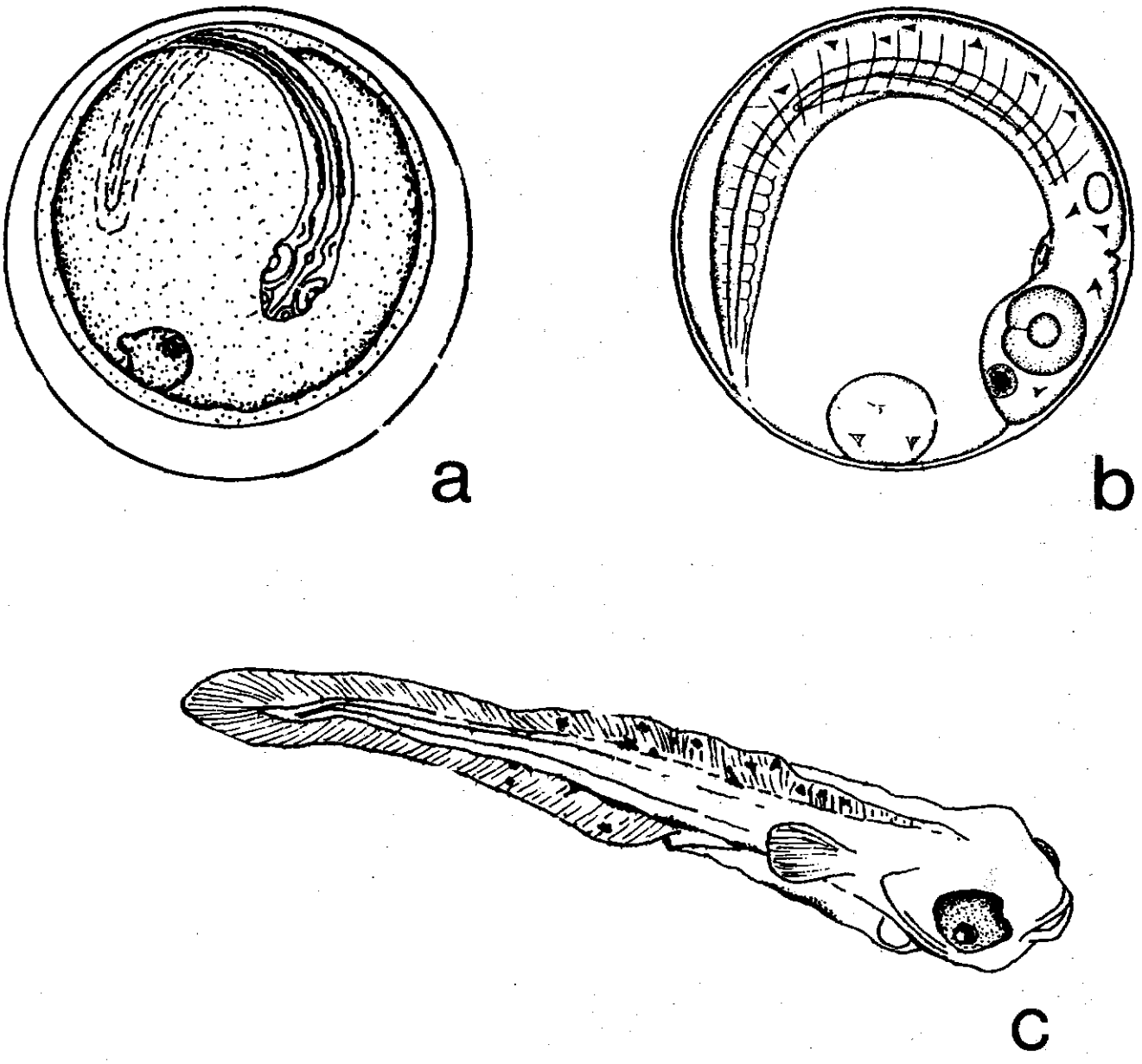


Figure 4. Black sea bass eggs and prolarva. A. egg, 23 h after fertilization at 23°C, from Hoff, 1970 (Figure 8); B. egg, 65 h after fertilization at 16°C, from Wilson, 1891 (Figure 151); C. prolarva, 54 h after hatching at 23°C, 2.01 mm TL, from Hoff, 1970 (Figure 9).

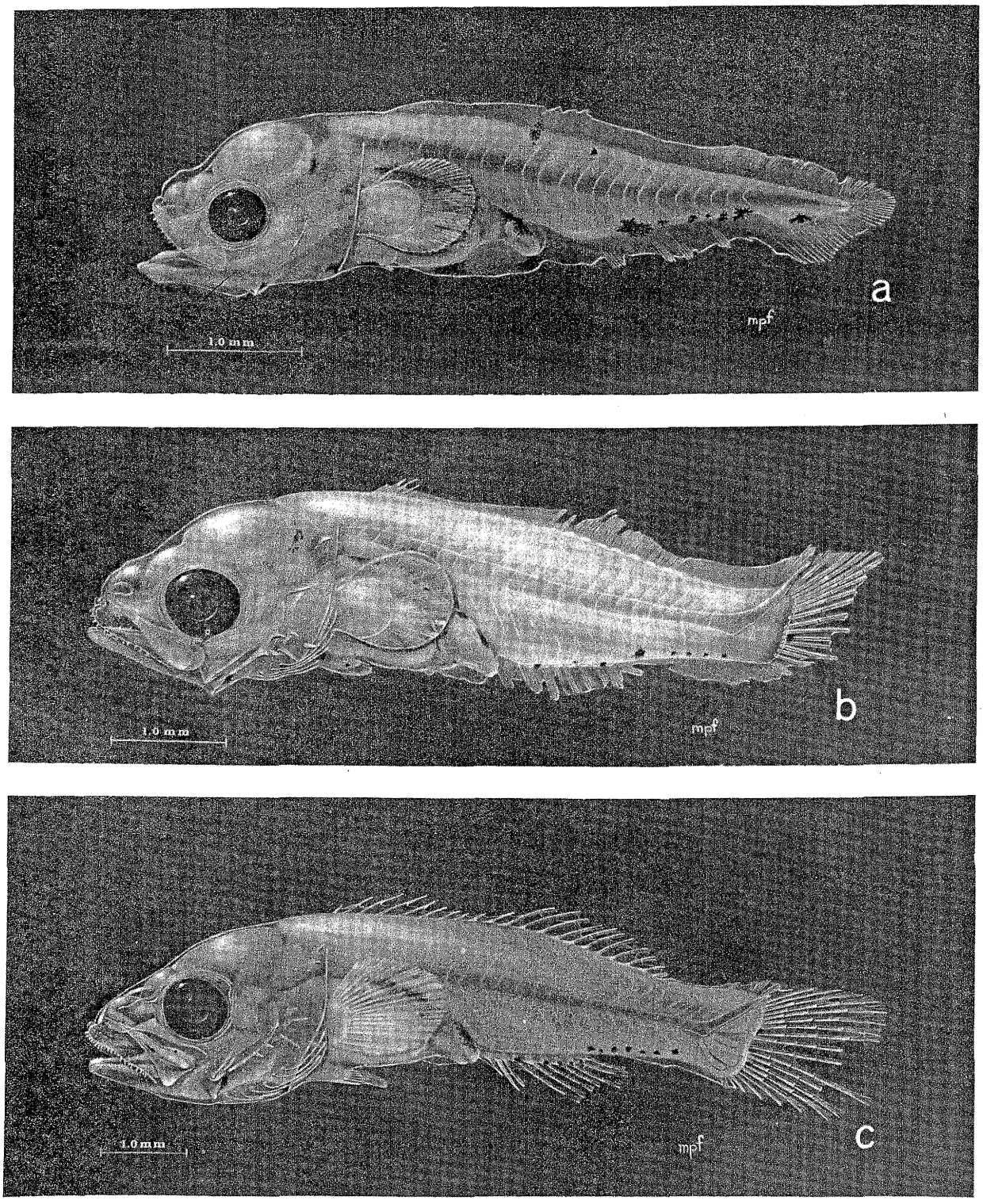


Figure 5. Black sea bass larvae from Kendall, 1972. A. 5.1 mm SL; B. 6.2 mm SL; C. 7.9 mm SL.

3.3 Adult Phase

3.31 Longevity

Being protogynous hermaphrodites, males appear to live longer than females. Individuals pass through a female phase and then become males. The oldest females found are 8 years old, with most about 5 years old. Males first appear as 3 year-olds and apparently live to at least 20 years old. Age classes 6 and 7 are predominant among males. Thus for individual fish the average life expectancy is about 5-6 years and maximum longevity of about 20 years.

3.32 Hardiness

In captivity: "Sea bass are hardy and can withstand low winter temperature, low pH ranges, low oxygen levels, and high nitrite-nitrate for short durations. They need little room to survive and can exist, if necessary, with low circulation and small amounts of food. For best results, they cannot be subjected to long periods of environmental extremes, although during emergencies, such as power or pump failure, they may be able to survive" (Hoff, 1970).

Schwartz (1964) kept five adult black sea bass in a large aquarium and observed them as seasonal cooling occurred. They lived for about 95 days, but died when water temperature dropped to 2.2° to 1.7°C and at a salinity of 15 o/oo. They stopped feeding soon after the water dropped to 8.0°C.

3.33 Competitors

No studies of competition have been done, but from their diet, and habitat preference, they probably compete with other fishes within their range which live on hard bottoms and are generalized predators.

3.34 Predators

No studies available but any large piscivore whose range overlaps that of black sea bass is likely to be at least an occasional predator.

3.35 Parasites

Linton (1901) found various acanthocephalans, cestodes, and nematodes, encysted in the walls of the digestive tract of black sea bass. They are generally free of external parasites (Cupka et al., 1973).

3.4 Nutrition and Growth

3.41 Feeding

Black sea bass are apparently visual feeders so presumably feed mostly during daylight. In captivity and in the wild, there was a variation in food consumption seasonally associated with spawning cycle, with less feeding occurring during the spawning season (Cupka et al., 1973). Feeding was heaviest for the 6-month period following spawning (Hoff, 1970).

3.42 Food

Black sea bass are opportunistic omnivores eating in order of importance, crustaceans, fish, molluscs, echinoderms, and plants (Miller, 1959; Cupka et al., 1973). Adults prefer crabs and fish while the young eat shrimp, isopods, and amphipods. In captivity adults ate thread herring, squid, and oyster meats (Hoff, 1970). Among adults, there are no size related differences in chosen food.

3.43 Growth Rate (Figure 6)

In captivity adult black sea bass grew from a mean of 265 gm and 170 mm SL on 9 May to 880 gm and 284 mm on 7 February (9 months). A length-age curve based on scale samples (Lavenda, 1949) for males and females of New Jersey has been drawn. Cupka et al. (1973) calculated growth based on otoliths for black sea bass from South Carolina. They found annual growth increments of 24 to 54 mm for 1 to 7 year-old fish. Fish 1 year old were 153 mm long and those 7 years old were 337 mm long.

Regression analysis of weight-length data for South Carolina fish 84 to 380 mm SL and 15 to 1490 gm resulted in the following equation:

$$\log_{10}W = -4.57608 + 3.02372 \log_{10}SL \qquad r = 0.994$$

A regression of length on age fitted the Walford line:

$$Y = 53.4 + 0.9166X \qquad r = 0.998$$

Y = standard length (mm) at age t + 1 and
X = standard length (mm) at age t

The Bertalanffy growth equation was:

$$L_t = 625(1-e^{-0.088\ (t+1.33)}) \text{ for length in mm SL}$$

and

$$W_t = 7549(1-e^{(-0.088(t+1.33))})^3 \text{ for weight in gm}$$

3.5 Behaviour

3.51 Migrations and Local Movements

Several tagging studies have shown very limited movements of black sea bass over short time periods (Arves, 1960; Topp, 1963; Beaumariage, 1969; Cupka et al., 1973). They seem to move inshore and north in summer and offshore and south in winter, at least in the Middle Atlantic Bight. In the South Atlantic Bight they may remain in one place year-round.

3.52 Schooling

Apparently black sea bass do not school, but hover above hard bottoms individually or in loose aggregates.

4. POPULATION (Figure 6)

4.1 Structure

4.11 Sex Ratio

Since black sea bass are protogynous hermaphrodites (3.11) sex ratio varies with age and size of the fish. Larger fish are all males. Nearly all fish >25 cm are males. Thus catches of large fish will consist of males.

4.12 Age Composition

See 3.31.

4.13 Size Composition

Female black sea bass reach a length of about 34 cm with most about 25-28 cm. Males reach 50 cm and most are 28-33 cm (Figure 6).

4.2 Abundance and Density of Population

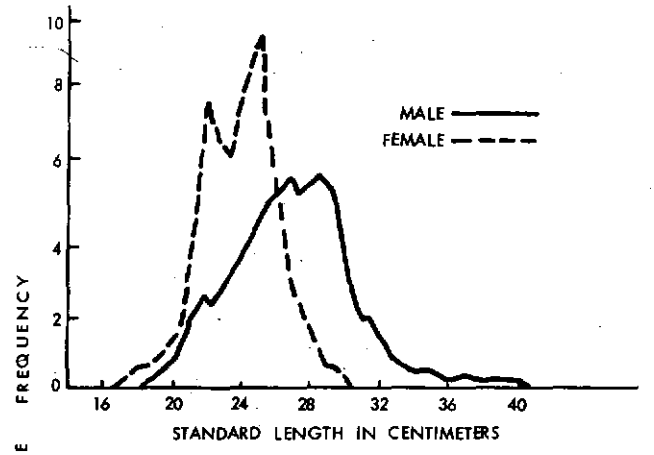
No data available.

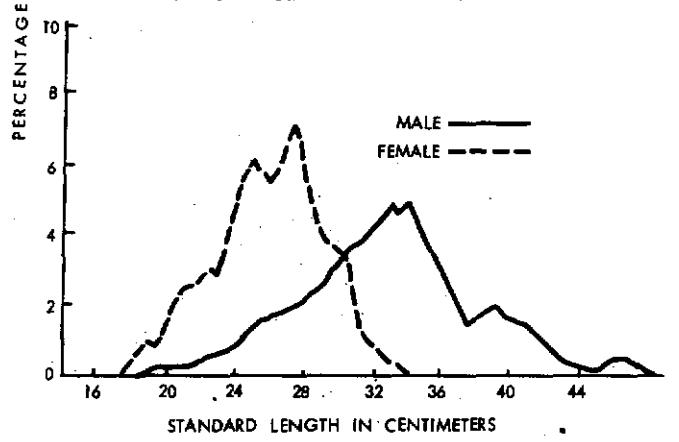
4.3 Natality and Recruitment

No data available.

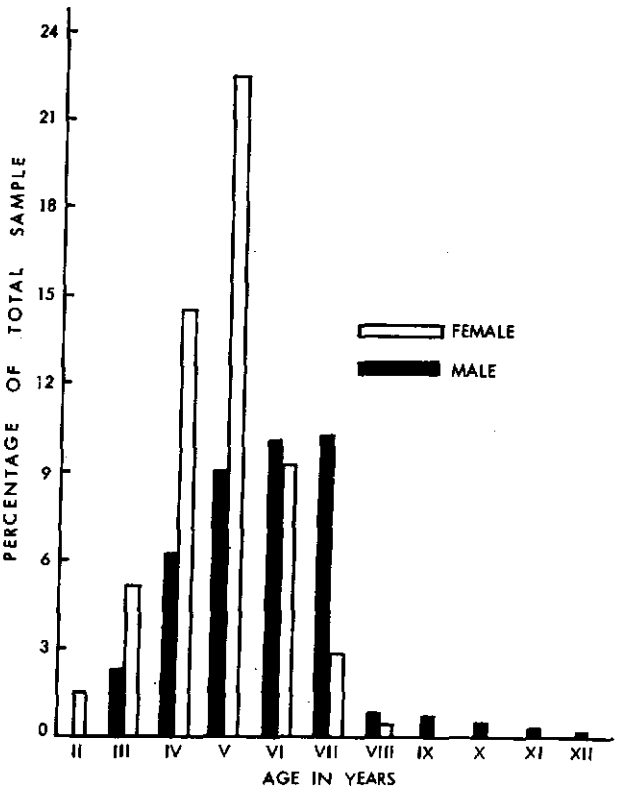
4.4 Mortality and Morbidity

No data available.

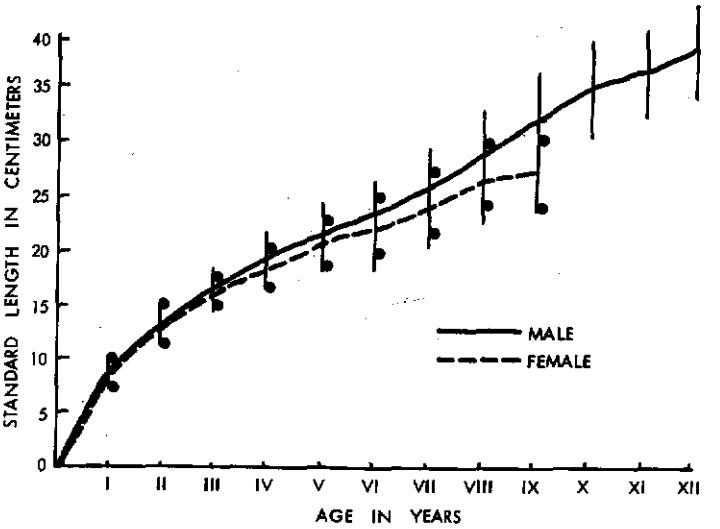




Length-frequence distributions of representative summer populations of sea bass. UPPER: from Cape May, New Jersey, June, 1945; 323 males and 252 females. LOWER: from Cholera Bank, New York, June 1945; 268 males and 221 females.



Composition by age and sex of a representative population of sea bass, from Cape May, New Jersey, August, 1946; 512 fish.



Length-age curves for the two sexes of sea bass, based on 2339 specimens from the southern New Jersey shores. The lengths at year I were determined by scale reading of two-year old fish. Twice the standard deviation for each sex is indicated by vertical lines and points along the lines.

Figure 6. Length-age and sex composition of catch of black sea bass from Lavenda, 1949.

4.5 Dynamics of Population (as a whole)

No data available.

4.6 The Population in the Community and the Ecosystem

No data available.

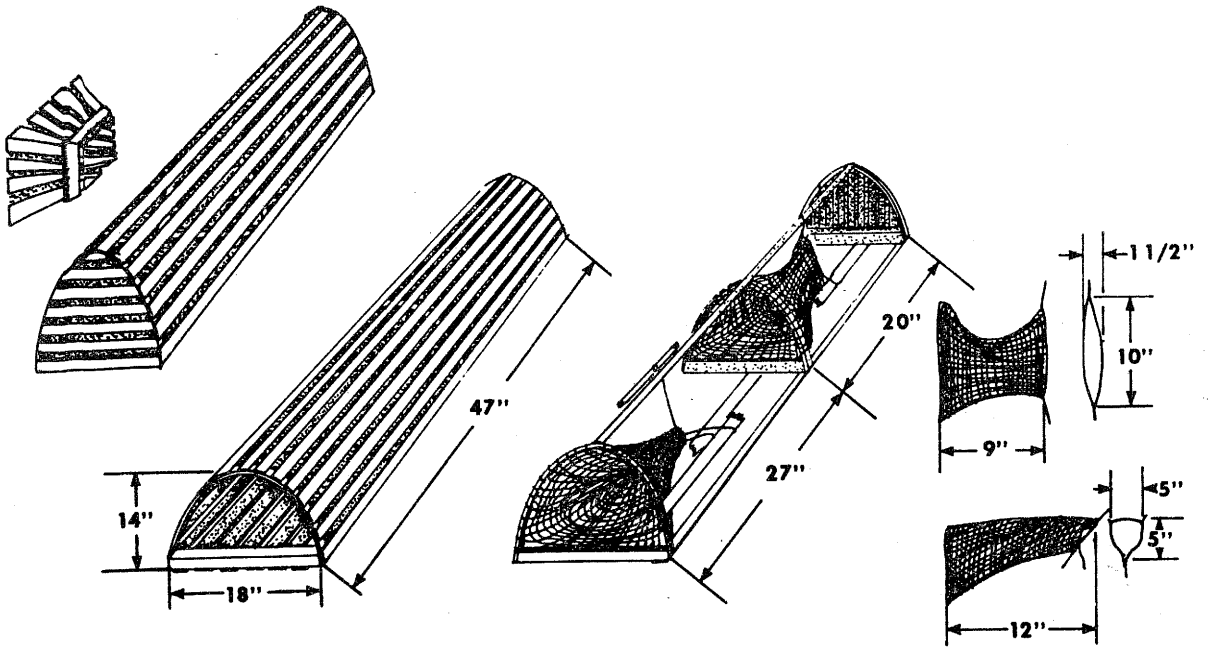
5. EXPLOITATION

North of Cape Hatteras only C. striata is taken, however, south of Cape Hatteras the congeners C. ocyurus and C. philadephicus also occur and are taken. The species of Centropristis are not separated in catch records or accounts of fishing methods. Thus in this section, it must be kept in mind that the combined catches of these species of Centropristis are represented south of Cape Hatteras.

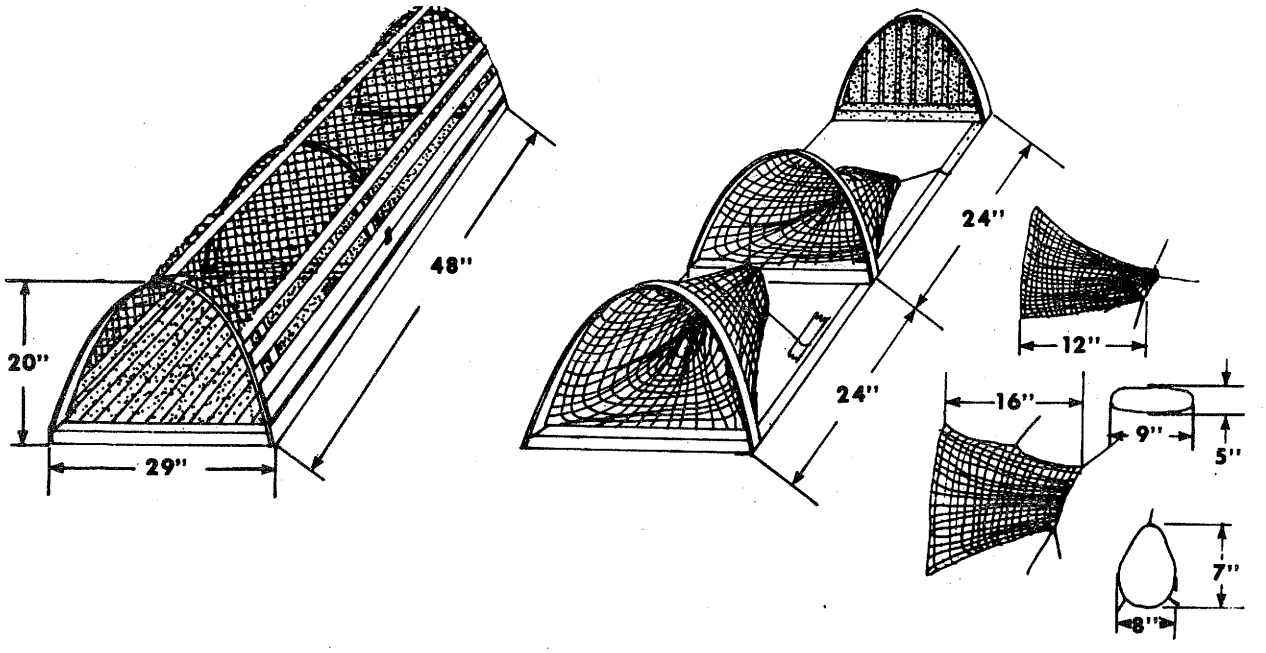
5.1 Fishing Equipment (Figure 7) - paraphrased from Frame and Pearce, 1973

"Trawls for capturing sea bass range in size from a No. 35 to No. 41 Yankee. Bosom and wing foot ropes have wooden or rubber rollers and the cod-end is protected by chafing gear. Trawls are fishing over a wide range of depths, 50 feet in the North Atalntic to greater than 300 feet in the Middle Atlantic. Trawling is restricted, however, to firm bottoms in the vicinity of rocks, wrecks, and reefs. South Atlantic fishermen refer to the low profile coral formations as "live bottoms". The bulk of the trawl catches in the North Atlantic are confined to two periods, March to June and September to November. Landings in the Middle and South Atlantic are greatest during September to March, although fishing is conducted throughout the year."

"Wooden and wire traps are designed to catch sea bass. Within each category there is a traditional and a modern trap. Traditional wooden traps are used in the Middle and North Atlantic. In New York, the traditional sea bass traps have been modified to catch American lobster; sea bass landings by these traps are incidental to the lobster catch. Each fisherman in the Middle Atlantic lifts a part of his several hundred wooden sea bass traps each fishing day. No baits are used because, according to fishermen, they attract crabs. As a result of declining fish catches in recent years, some fishermen in the Middle Atlantic States have shifted to a modern trap, which is designed to capture light poundages of both lobster and sea bass. Depths fished in the Middle Atlantic range from 65 to 100 feet over rocks and reefs. All traps are first set in May and are removed from the water for storage in November. The largest catches are made in May and October. In the South Atlantic, traditional wire traps designed after the Chesapeake Bay blue crab pot are used. Each South Atlantic fisherman owns only about 30 traps. He sets and hauls all the traps four to five times a day and, occasionly, allows



Traditional sea bass trap used by fishermen in New Jersey, Maryland, and Virginia. In the upper left is a sea bass trap modified for lobster fishing.



A modernized sea bass-lobster trap utilized by fishermen in New Jersey.

Figure 7. Black sea bass traps from Frame and Pearce, 1973.

them to remain in the water overnight. Practically all fishermen prefer the traditional trap over the larger modern trap, which was designed to capture greater numbers of sea bass. The catches, however, have not met the fishermen's expectations. In our survey we observed only two fishermen using the modern wire trap. Traps are baited with squid, striped mullet, or Atlantic menhaden. Depths and bottom types where bass are found do not differ appreciably from those in the Middle Atlantic, but fishing takes place throughout the year; the highest landings occur from September to June."

"Small numbers of sea bass are captured by other types of commercial gear. In the North Atlantic, they are caught by fixed and floating pound nets and hand lines; in the Middle Atlantic, by gill nets, fixed pound nets, hand lines and purse seines, and in the South Atlantic by haul seines and hand lines."

5.11 Gears

Black sea bass are taken commercially by otter trawls, fixed pound nets, floating pound nets, hand lines, wooden traps and wire traps. Echo-sounders are used by trap and trawl fishermen to locate irregular bottom where black sea bass congregate.

5.12 Boats

Vessels used vary considerably. In the northern areas lobster boats are used by the trap fishermen and regular trawlers by the trawl fishermen. Off the Carolinas black sea bass are taken in the cooler months, during the off season for shrimpers and sport fishing. Thus boats used for these pursuits in warm weather are used for black sea bass fishing in cool weather. The lengths vary from 20-110 feet.

5.2 Fishing Areas

Fishing for black sea bass takes place all along the east coast from Massachusetts to Florida. Fishing moves with the fish, inshore in summer and offshore in winter. Distance from shore, therefore, varies seasonally. Trawling takes place in water 50 feet deep in the North Atlantic to 300 feet deep in the Middle Atlantic. Traps are set in water 65-110 feet deep. Historically, most of the black sea bass in the South Atlantic area were taken in pots off Charleston, South Carolina, but in recent years, trawling and pot fishing has extended all along the Carolina coast. Fishing is restricted to firm bottoms, near rocks, wrecks and reefs and in the South Atlantic trawlers seek low coral growth.

5.3 Fishing Seasons

The fishing season for black sea bass varies considerably along the coast and with the type of gear. In the North Atlantic trawling

occurs during two periods - March to June and September to November. In the Middle and South Atlantic trawling is most successful from September to March, but is carried out all through the year. Traps are fished in the Middle Atlantic area from May to November. In the South Atlantic traps are fished throughout the year, but most landings occur from September to June due in part to the contribution to the catch by off-season operation of the shrimpers and sport fishery fleet.

5.4 Fishing Operations and Results

Frame and Pearce (1973) devised a measure of CPUE for the trap fishery using mean number of pounds of fish per trap day. North of Cape Hatteras the traps are fished like lobster pots, leaving them soak for several days; south of Cape Hatteras the traps are allowed to soak for only an hour or so. North of Cape Hatteras each boat fishes about 1,000 traps, south of Cape Hatteras each boat fishes only about 30 traps. The catch per trap-day north of Cape Hatteras ranged from 0.15 to 3.11 pounds while south of Cape Hatteras it ranged from 5.41 to 179 pounds. No estimates of CPUE for the trawl fishery are available. Trawl catches make up about 65% of the total catch; traps the other 35%. North of Cape Hatteras the trawlers catch black sea bass as part of their total catch, south of Cape Hatteras, sea bass are caught by shrimpers during their off season in winter. The trap fishermen north of Cape Hatteras catch black sea bass and lobsters at the same time. South of Cape Hatteras the trap fishery is conducted by the sport fishery fleet during their off season in cooler weather.

North of Cape Hatteras the traps are made with twine meshes about 1 inch bar. South of Cape Hatteras the traps are made of galvanized chicken wire about 1.5 in mesh. Annual yields for various gears and among the different states over the past several years have been tabulated (Table 2 and 3).

As shown in Table 3, traps and otter trawls account for most of the catch. Other gear includes pound nets and hand lines. In the North Atlantic otter trawls take most black sea bass in most years with wooden traps and floating pound nets fluctuating between second and third. Historically otter trawling in the Middle Atlantic region has produced more black sea bass than any other gear-region combination. In the Middle Atlantic wooden traps have generally taken about half as much as trawls in that region. In the South Atlantic the trap catch has recently overtaken the trawl catch and since 1970 nearly twice as much has been taken by trap in the South Atlantic than in any other gear-region combination.

The total annual yield of black sea bass has been decreasing over the last 20 years (Figure 8). In 1952 nearly 22 million pounds were landed while since 1966 catches have been less than 5 million pounds and reached a low of 2.4 million pounds in 1971 (Table 2). Most of the fluctuation has occurred in the Middle Atlantic and Chesapeake regions. New England landings have been practically constant.

TABLE 2. Commercial landings by state of black sea bass in thousands of pounds

	NEW ENGLAND			MIDDLE ATLANTIC		CHEASPEAKE		SOUTH ATLANTIC				
	Mass.	R.I.	Conn.	N.Y.	N.J.	Md.	Va.	N.C.	S.C.	Ga.	Fla.	Total
1950	49	327	100	1,897	4,564	395	5,311	76	254	-	-	12,973
1951	104	725	61	2,792	5,658	320	8,772	94	185	-	-	18,711
1952	134	656	52	1,680	9,207	279	9,778	110	100	-	-	21,998
1953	81	459	40	1,096	5,829	214	6,657	82	78	2	-	17,238
1954	132	304	60	1,261	5,029	166	4,383	41	60	2	-	11,438
1955	140	437	143	936	4,134	229	5,291	19	17	-	14	11,360
1956	74	413	24	510	4,207	230	6,110	80	33	2	6	11,689
1957	119	334	216	809	3,636	205	4,202	36	5	1	41	9,595
1958	81	376	48	842	4,227	252	5,730	27	18	.5	39	11,640
1959	62	183	37	612	3,739	156	3,268	41	38	1	46	8,183
1960	64	210	36	524	2,206	128	3,669	126	29	1	28	7,021
1961	51	170	42	313	1,497	138	3,211	635	324	1	23	6,405
1962	49	146	30	524	2,621	339	4,127	1,287	268	.5	46	9,436
1963	17	114	29	576	2,812	304	4,316	739	265	2	63	9,237
1964	10	151	28	501	2,195	293	3,752	906	234	1	49	8,115
1965	11	98	24	381	2,146	243	4,771	1,090	83	4	48	8,899
1966	.5	90	19	221	961	212	1,186	1,267	136	3	62	4,859
1967	6	48	1	110	816	154	1,410	1,994	66	3	77	4,685
1968	8	42	1	67	539	124	1,598	1,193	204	12	69	3,857
1969	7	34	.5	69	392	147	1,770	1,047	722	9	70	4,267
1970	20	55	1	70	308	202	1,482	1,178	773	11	62	4,162
1971	19	39	1	55	308	140	658	748	514	43	93	2,648
1972	40	46	-	44	423	227	782	635	547	61	115	2,920
1973	54	34	-	105	694	207	1,282	684	289	27	69	3,445

TABLE 3. Landings of sea bass by the Branch of Statistics, National Marine Fisheries Service, 1960-1968 from Frame and Pearce, 1973; 1969-1972 from Statistical Digests.

	NORTH ATLANTIC					MIDDLE ATLANTIC				SOUTH ATLANTIC				
Year	Otter Trawls	Fixed Pound Nets	Floating Pound Nets	Hand Lines	Wooden Traps	Otter Trawls	Fixed Pound Nets	Hand Lines	Wooden Traps	Otter Trawls	Hand Lines	Wire Traps	Misc. Gear All[1] Areas	TOTAL[2]
1960	629,000	3,000	140,200	1,920	55,900	4,733,200	13,600	14,400	1,235,600	37,000	85,500	33,000	100	6,982,420
1961	378,900	4,200	112,900	3,000	76,500	3,750,200	700	5,200	1,089,500	326,400	112,600	519,800	300	6,380,200
1962	524,700	2,200	95,200	1,100	115,000	4,833,600	1,700	10,000	2,241,400	971,200	61,900	521,600	400	9,380,000
1963	469,700	900	76,000	400	188,800	5,069,400	800	6,700	2,351,300	525,900	89,500	387,700	3,000	9,170,100
1964	367,500	1,600	127,400	500	184,400	4,062,300	700	13,000	2,161,200	613,700	61,500	464,800	--	8,058,600
1965	272,300	1,900	83,800	300	155,400	4,792,100	300	10,400	2,348,500	629,000	66,900	476,700	100	8,837,700
1966	182,000	4,300	63,300	200	51,400	1,876,800	2,500	1,400	1,170,500	639,400	38,500	591,100	4,100	4,625,500
1967	54,700	5,200	39,400	400	64,900	1,352,400	--	3,600	1,020,600	641,000	8,500	1,410,200	--	4,600,900
1968	73,900	2,500	33,900	500	6,900	1,553,800	400	1,800	703,700	626,400	38,700	731,600	--	3,774,100
1969	76,600	7,500	15,600	2,400	8,400	1,629,500	700	17,100	627,000	478,700	3,900	1,286,700	33,900	4,188,000
1970	92,200	2,000	26,800	2,500	22,900	108,880	2,100	21,300	862,400	424,400	300	1,526,700	996,600	4,089,000
1971	31,500	1,800	25,000	700	--	695,200	3,600	18,200	440,700	254,400	93,000	1,049,500	32,000	2,391,200
1972	44,800	7,000	32,900	--	1,500	767,100	9,200	39,800	596,900	84,500	120,000	1,146,600	6,900	2,862,200

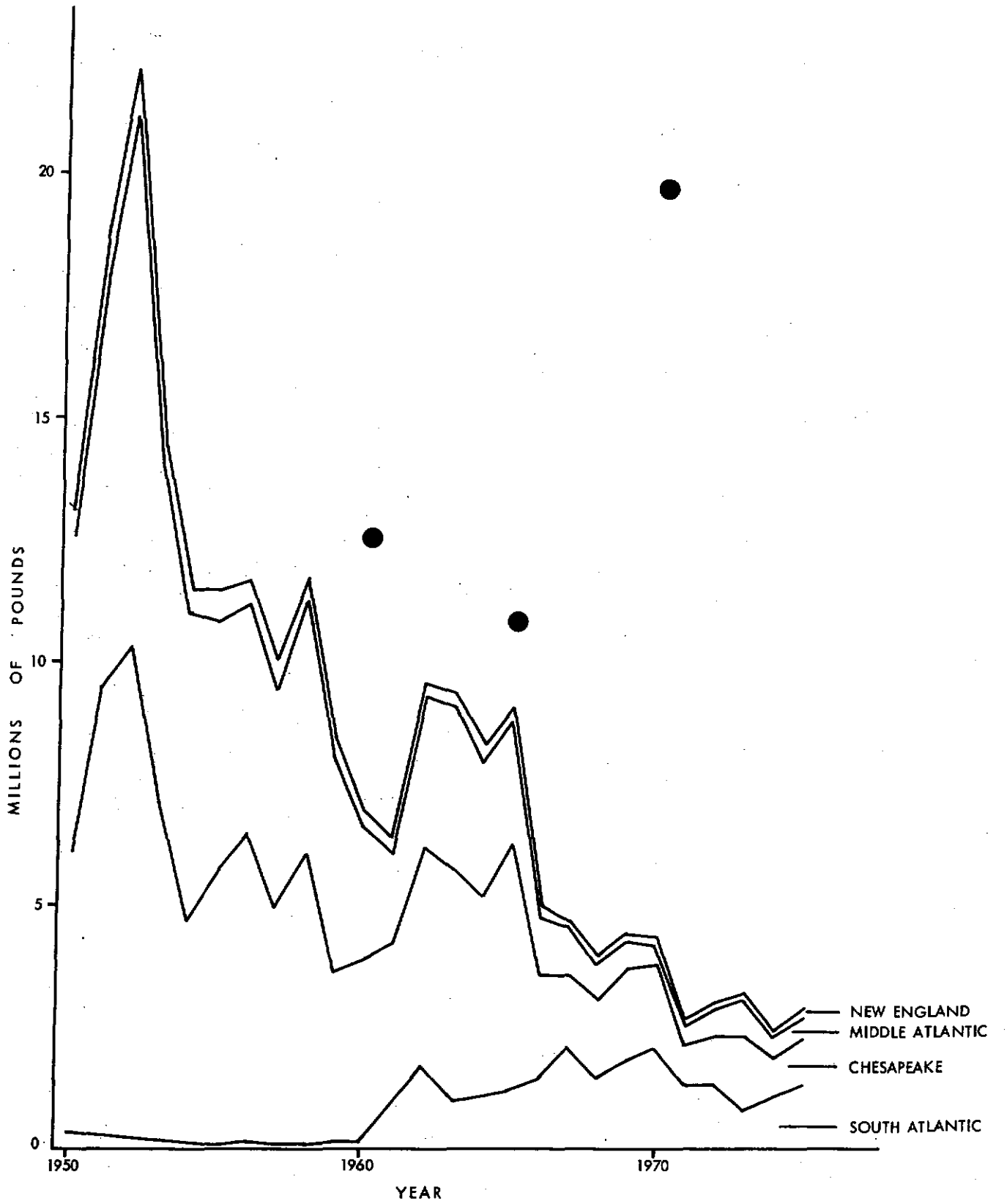


Figure 8. Cumulative catch curve, south to north for black sea bass. Sport catch for east coast represented by dots.

The South Atlantic contribution to the catch has increased since 1960, mainly due to increases in North and South Carolina catches.

The sport fish catch has been estimated for 1960, 1965, and 1970 (Table 4). In each year the total sport fish catch was greater than the commercial catch. The greatest difference was in 1970 when the commercial catch was 4 million pounds and the sport catch was nearly 20 million pounds (Figure 8). Most of the sport catch was from the Middle Atlantic in 1960 and 1965, but in 1970 the South Atlantic catch was nearly double the combined north and Middle Atlantic catches. Most of the increase was in charter boat and shore-related catches in the South Atlantic.

6. PROTECTION AND MANAGEMENT

6.1 Regulatory Measures

Bilateral agreements between the United States and Poland and the United States and U.S.S.R. regulate the offshore winter trawl fishery.

6.2 Control or Alteration of Physical Features of the Environment

Catches of black sea bass were increased about threefold in an area planted with oyster shells as compared to a control area in Chincoteague Bay, Maryland (Arve, 1960).

6.3 Control or Alteration of Chemical Features of the Environment

No data available.

6.4 Control or Alteration of the Biological Features of the Environment

No data available.

6.5 Artificial Stocking

No data available.

7. POND FISH CULTURE

No data available.

TABLE 4. Sport fish catch statistics for black sea bass, east coast. All values in thousands.

		Maine-New York	New Jersey-Cape Hatteras	Cape Hatteras-Florida East Coast	Total
1960	pounds caught	1,490	10,410	650	12,550
(Clark, 1962)	no. anglers	112	323	22	457
	no. fish				
	boat	1,056	6,795	433	8,284
	shore	188	641	-	829
	TOTAL	1,244	7,436	433	9,113
1965	pounds caught	2,110	7,088	1,690	10,888
(Deuel & Clark, 1968)	no. anglers	82	267	40	389
	no. fish.				
	Ocean	819	4,432	365	5,616
	Bay, Sound, River	302	892	678	1,872
	Boat: private, rent	578	1,663	887	3,128
	Beat: charter	474	3,303	137	3,914
	Pier	58	288	11	357
	Bank, Jetty	11	72	8	91
	TOTAL	1,121	5,324	1,043	7,488
1970	pounds caught	615	6,710	12,381	19,706
(Deuel, 1973)	no. anglers	74	206	278	558
	no. fish				
	Ocean	178	1,773	5,367	7,318
	Bay, Sound, River	108	2,071	1,851	4,030
	Boat: private, rent	207	2,081	1,433	3,721
	Boat: charter	16	1,530	3,895	5,441
	Pier	17	144	1,399	1,560
	Bank, Jetty	46	89	491	626
	TOTAL	286	3,844	7,218	11,348

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