

DISTRIBUTION OF SOME COASTAL PELAGIC FISHES IN THE WESTERN ATLANTIC

Edward F. Klima

The coastal pelagic resource of the Gulf of Mexico and South Atlantic is presently underutilized--mainly because it occurs in many small, fast-traveling schools that cannot be harvested by conventional fishing. The Pascagoula Exploratory Fishing and Gear Research Base has been developing harvesting systems for this vast resource (Klima, 1970). This paper summarizes the scant information available on its distribution and abundance.

I have used the exploratory catch data collected since 1950 by the Pascagoula Fishery Center to provide some idea of the magnitude and distribution of the coastal pelagic resource in the Gulf of Mexico and western Atlantic. The Atlantic, including the Gulf of Mexico and Caribbean Sea, is subdivided into 27 exploratory fishing zones (Figure 1). Unfortunately, sufficient data are not available to describe seasonal distribution within any one year, so the catch data for 1950 to 1969 were combined by season within subareas. Variation within a year was assumed to be unimportant in terms of seasonal distribution trends. To describe roughly the seasonal depth-distribution trends, the records of all exploratory fishing with gill nets and bottom, shrimp, and midwater trawls were combined.

Quantitative data are not available for the species discussed, and each fishing record represents a valid identification. Grouping these data, however, is assumed as an index of the relative availability of a species. In addition, commercial landing statistics provided additional distributional data for Spanish sardine, thread herring, and round scad.

COASTAL PELAGIC FISHES

A preliminary acoustical survey of the coastal schooling fishes from North Carolina to Florida was conducted in 1968. Selected data (Drummond, MS) provide an overall picture of the seasonal north-south distribution

of the midwater schooling fishes from Cape Hatteras to Cape Kennedy. Figures 2, 3, and 4 show the north-south distribution for March, July, and November. In the spring, midwater schools are most commonly located between St. Simons Island, Georgia, and St. Augustine, Florida (transects 17 to 21), and from south of Jacksonville to south of Cape Kennedy (transects 24 and 25). Generally, few schools occurred north of St. Simons Island.

Summer and Fall

During the summer, midwater schools were found throughout the entire survey area but with much greater frequency in the southern portion. Fish schools were most common off South Carolina; St. Simons Island, Georgia; Mayport and St. Augustine, Florida. There seems to be a slight shift northward in school concentrations from spring to summer. In the fall, there is less frequency of schools in the extreme northern portion from Cape Hatteras southward to Georgia; there is a significant increase in frequency in the central portion off St. Simons Island, Georgia, and a slight increase southward from New Smyrna to Fort Pierce, Florida. Apparently, there is a southward shift in the population during the fall; a definite aggregation of its major portion is off St. Simons Island, Georgia, and central Florida.

SCALED SARDINE (*Harengula pensacolae*)

This species is widely distributed from Florida southward to Brazil, including the Gulf of Mexico. It is a near-surface, schooling, plankton feeder along coasts, but it is sometimes found several miles offshore. Exploratory records indicate that this fish is usually found within the 20-fathom curve but, on occasion, it has been seen as far offshore as the 165-fathom curve in the northern Gulf of Mexico (Figure 5) and the 257-fathom curve

Dr. Klima is Acting Base Director, National Marine Fisheries Service, Exploratory Fishing and Gear Research Base, P.O. Drawer 1207, Pascagoula, Mississippi 39567. Contribution #248.

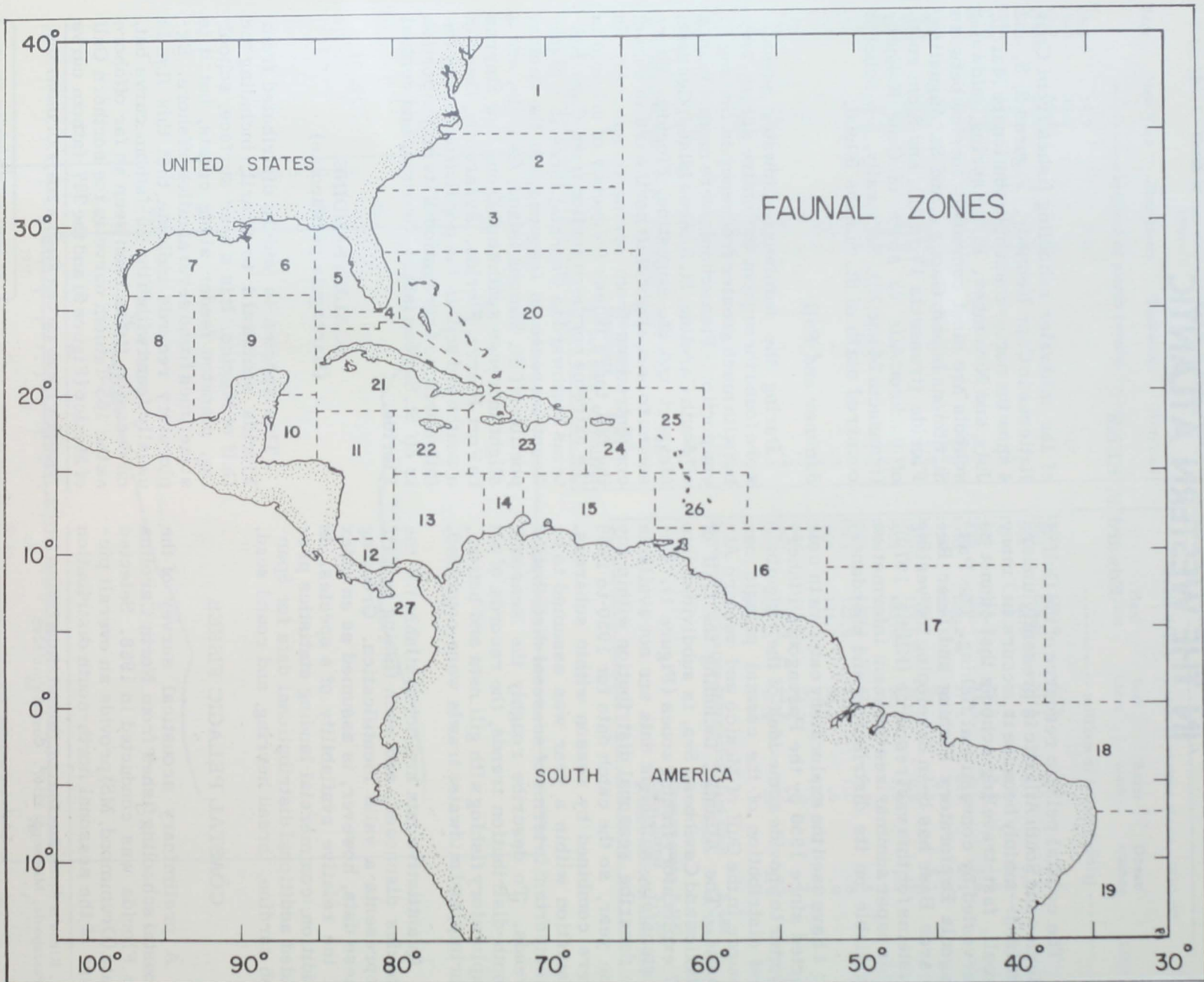


FIG. 1. Exploratory fishing faunal zones.

off Colombia. It may be found with *H. humeralis* and *H. clupeiola* in the Florida Keys and along the north coast of Yucatan, but it is the only species of *Harengula* inhabiting the Gulf Coast of the United States.

Scaled sardines are not exploited in the Gulf of Mexico, although they are harvested off the coast of Venezuela (personal communication, Rivas), where they are caught with beach seines and canned for local consumption. In Miami, Florida, they are caught with lift nets around piers and bridges in the fall and winter and sold as live bait (Klima, 1959).

SPANISH SARDINE (*Sardinella anchovia*)

It ranges from Cape Cod to southern Brazil, including the Gulf of Mexico, Caribbean Sea, Bermuda, Bahamas, and West Indies. It is normally found close to the coast, well within the 50-fathom curve, but it has been caught as far offshore as the 200-fathom line in the Atlantic.

Roithmayr (MS) has shown that the two western Atlantic forms may be either valid

species or seasonal races of a single species. Both forms coexist in the coastal waters of the Gulf of Mexico, Trinidad, and Brazil. Until this taxonomic problem is solved, and for the purpose of this report, it is referred to as *Sardinella anchovia*.

This silvery-blue fish is harvested with beach seines along the west and northwest Florida coasts for bait in the sport fishery. Yearly production is under 150,000 pounds, worth less than \$5,000 (Figure 6). The increasing trend in yield from 1960 to 1968 is more than likely due to an increase in sports fishing; the species is one of the major sources of bait in west Florida. The fishery takes advantage of the numerous schools close to the beach during spring and summer. Usually in late fall and winter, the fish move offshore and probably migrate southward.

Diver observations around submerged structures indicate that this species mixes freely with round scad and, to some extent, with scaled sardine. Fishing captains indicate they catch Spanish sardine and round scad together.

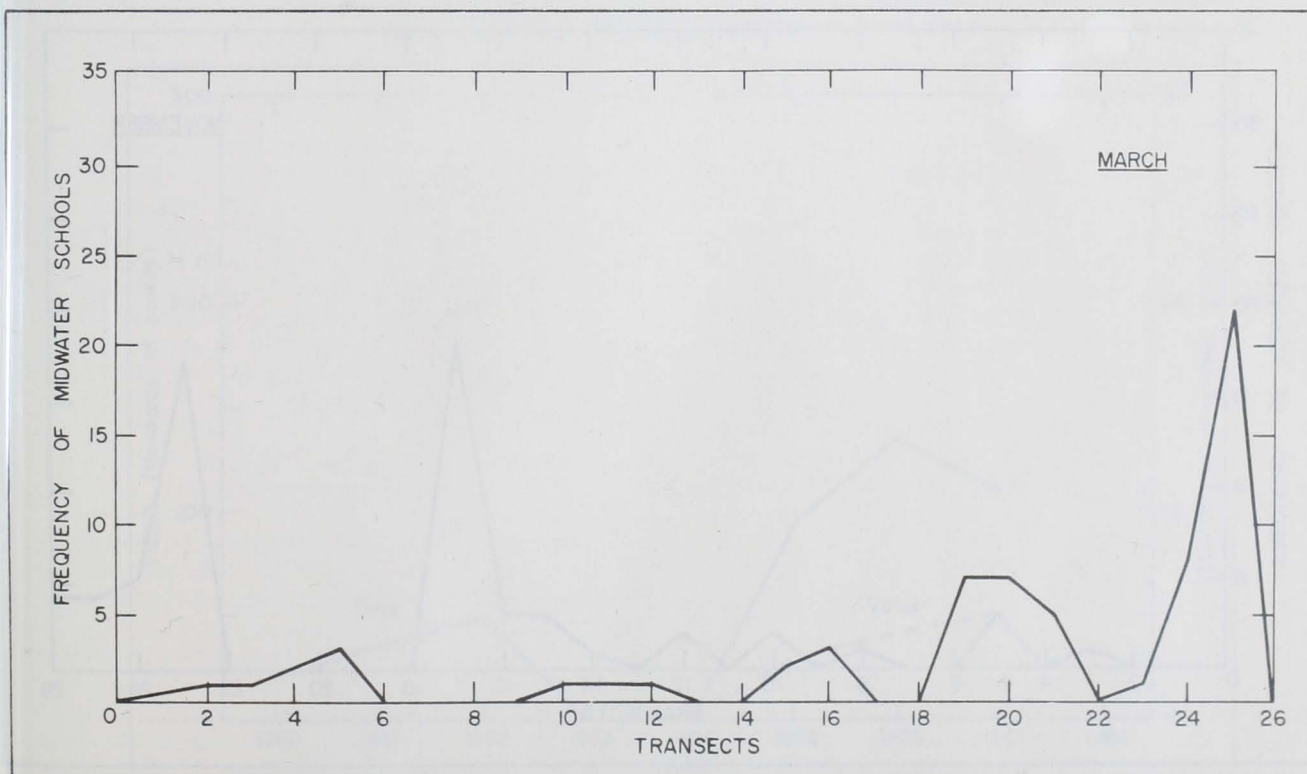


Fig. 2 - North-south distribution of midwater fish schools in March, Transect 1, Cape Hatteras through Transect 26, Cape Kennedy.

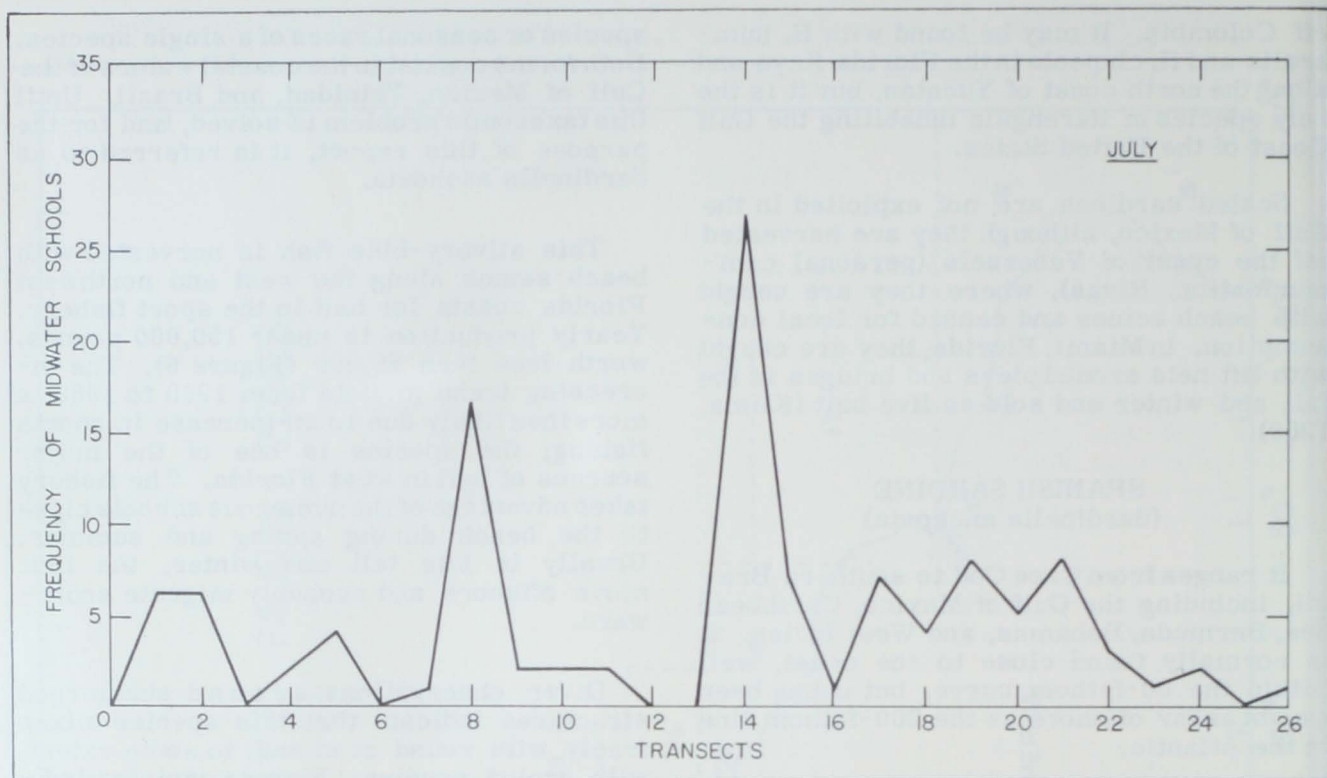


Fig. 3 - North-south distribution of midwater fish schools in July, Transect 1, Cape Hatteras through Transect 26, Cape Kennedy.

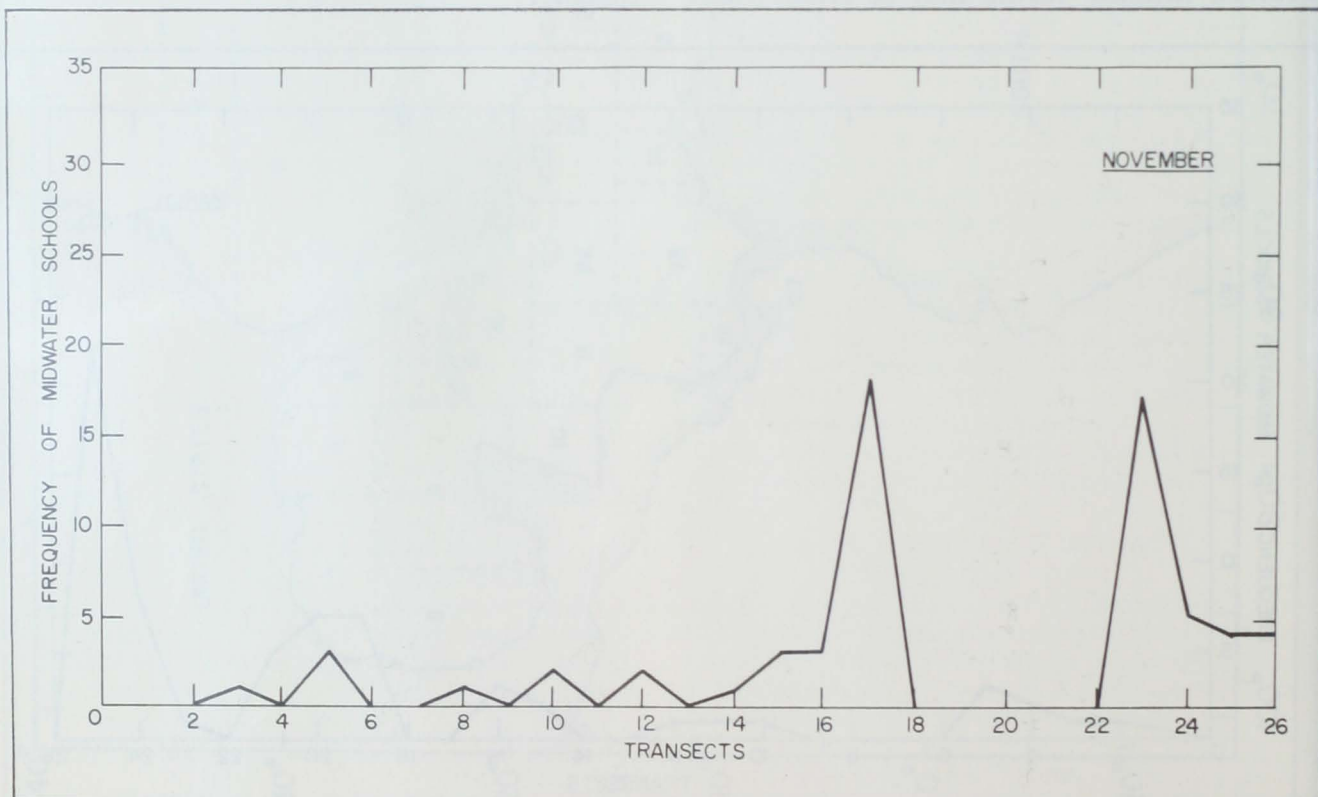


Fig. 4 - North-south distribution of midwater fish schools in November, Transect 1, Cape Hatteras through Transect 26, Cape Kennedy.

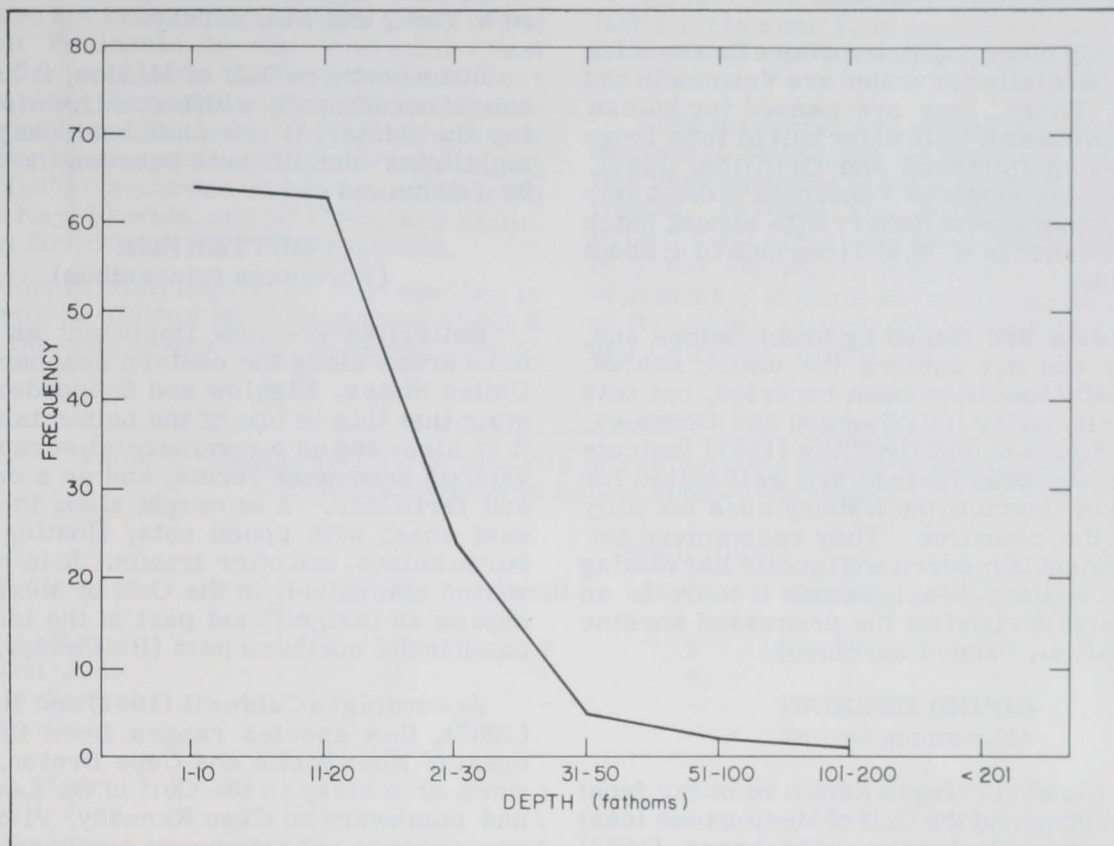


Fig. 5 - Depth distribution of scaled sardines in faunal zone 6.

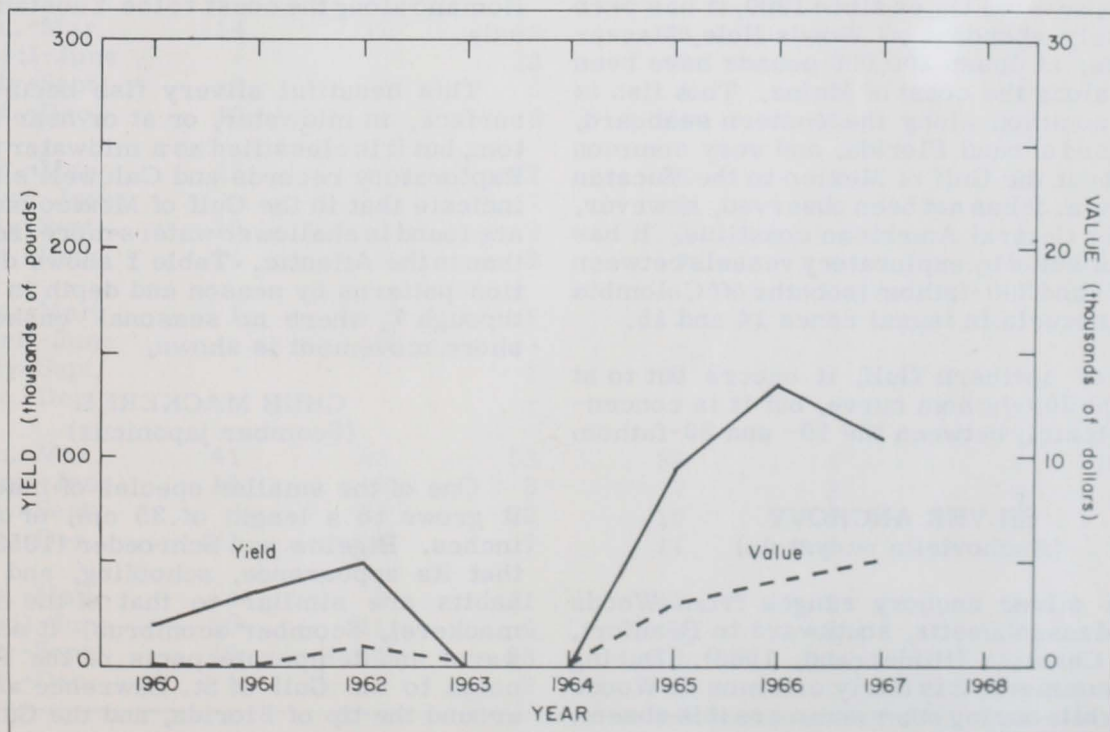


Fig. 6 - Gulf of Mexico Spanish sardine catch.

Harvested in Venezuela & Brazil

The only other countries where this species is commercially harvested are Venezuela and Brazil. There, they are canned for human consumption and/or iced for bait in tuna long-line fishing (Simpson and Griffiths, 1967). This species supports Venezuela's most important commercial fishery with annual catch usually in excess of 40,000 tons valued at about \$700,000.

Sardines are fished by beach seines and, usually, one set catches the entire school. Sets of 400 tons have been reported, but sets are usually under 100 (Simpson and Gonzalez, 1967). Simpson and Griffiths (1967) indicate that although beach seines are well suited for the Gulf of Cariaco, the fishery does not fully exploit the resource. They recommend the development of modern and mobile harvesting gear to replace beach seines if there is an increase in demand for the processed sardine product (i.e., canned sardines).

ROUND HERRING
(*Etrumeus teres*)

The round herring is known to occur from Maine throughout the Gulf of Mexico to at least the Yucatan Peninsula. Hildebrand (1963) states that it rarely occurs north of New Jersey but, several times since 1900, it has been extremely abundant off Woods Hole, Massachusetts; at least 200,000 pounds have been landed along the coast of Maine. This fish is fairly common along the eastern seaboard, southward around Florida, and very common throughout the Gulf of Mexico to the Yucatan Peninsula. It has not been observed, however, along the Central American coastline. It has been collected by exploratory vessels between the 100- and 300-fathom isobaths off Colombia and Venezuela in faunal zones 14 and 15.

In the northern Gulf, it occurs out to at least the 200-fathom curve, but it is concentrated mainly between the 10- and 30-fathom curves.

SILVER ANCHOVY
(*Anchoviella eurystole*)

The silver anchovy ranges from Woods Hole, Massachusetts, southward to Beaufort, North Carolina (Hildebrand, 1963). During some summers, it is fairly common at Woods Hole, while during other summers it is absent.

It appears only occasionally off Connecticut, New York, and New Jersey.

In the northern Gulf of Mexico, it has been caught occasionally with bottom trawls. During the winter, it often has been caught with nightlights and lift nets between the 20- and 30-fathom curves.

BUTTERFISH
(*Poronotus triacanthus*)

Butterfish are now important as food in most areas along the eastern seaboard of the United States. Bigelow and Schroeder (1953) state that this is one of the better table fish. It is also used as a commercial scrap fish in various processed forms, and as a crab bait and fertilizer. It is caught along the northeast coast with pound nets, floating traps, purse seines, and otter trawls. It is not harvested extensively in the Gulf of Mexico, except as an insignificant part of the industrial catch in the northern part (Roithmayr, 1965).

According to Caldwell (1961) and Haedrich (1967), this species ranges from the outer coast of Nova Scotia and Cape Breton, northward as a stray to the Gulf of St. Lawrence, and southward to Cape Kennedy, Florida. It appears to be absent around southern Florida and, in the Gulf, the species ranges from Cape Romano along the coast to the Yucatan Peninsula.

This beautiful silvery fish occurs at the surface, in midwater, or at or near the bottom, but it is classified as a midwater pelagic. Exploratory records and Caldwell's findings indicate that in the Gulf of Mexico butterflyfish are found in shallower waters more frequently than in the Atlantic. Table 1 shows distribution patterns by season and depth in zones 1 through 7, where no seasonal onshore-offshore movement is shown.

CHUB MACKEREL
(*Scomber japonicus*)

One of the smaller species of mackerels, it grows to a length of 35 cm, or about 14 inches. Bigelow and Schroeder (1953) agree that its appearance, schooling, and feeding habits are similar to that of the northern mackerel, *Scomber scombrus*. It occurs in warm and temperate parts of the Atlantic, north to the Gulf of St. Lawrence and south around the tip of Florida, and the Gulf Coast

to at least the Yucatan Peninsula. Chub mackerel have not been reported from south of the Yucatan Peninsula to the Venezuela coast (zones 10 to 12), but its distribution is continuous along the northern part of South America (zones 13 to 16). Before 1951, this species had never been reported south of Virginia, but Rivas (1951) recorded it as *S. colias* from Garden Key, Florida, and off Cuba, and Simpson and Griffiths (1967) off Venezuela.

The depth distribution of this species in the northern Gulf of Mexico is from about 5 to 200 fathoms (Figure 7). In faunal zone 6,

it appears to concentrate between 11 and 30 fathoms; in zone 7, it appears to concentrate between 11 and 50 fathoms.

Chub mackerel are occasionally caught in the Gulf of Maine, but sporadic occurrence in that area probably limits its commercial potential. Bigelow and Schroeder (1953) reported that in this area there have been times of great abundance followed by long periods of scarcity. It is not harvested in other parts of its range, except off Venezuela (Simpson and Griffiths, 1967).

Table 1 - Butterfish catch records of exploratory fishing with trawl by depth and season in faunal zones 1 through 7

Zone/season	Depth (fms.)						
	1-10	11-20	21-30	31-50	51-100	101-200	201 +
1 Jan.-Mar.	-	1	4	5	4	-	-
April-June	-	2	-	5	4	-	-
July-Sept.	-	-	-	-	3	2	-
Oct.-Dec.	-	-	-	-	-	-	-
2 Jan.-Mar.	32	13	-	5	6	6	-
April-June	9	3	1	6	3	1	-
July-Sept.	31	-	3	-	2	2	-
Oct.-Dec.	-	-	-	-	-	-	-
3 Jan.-Mar.	14	12	9	14	14	14	3
April-June	-	-	12	9	7	31	3
July-Sept.	4	9	2	5	5	10	2
Oct.-Dec.	10	4	2	4	10	13	2
4 Jan.-Mar.	22	11	27	28	8	2	-
April-June	-	1	7	6	-	-	-
July-Sept.	15	1	3	6	-	-	-
Oct.-Dec.	14	-	2	3	-	-	-
5 Jan.-Mar.	1	2	8	2	1	-	-
April-June	-	3	-	-	-	-	-
July-Sept.	-	-	1	2	-	-	-
Oct.-Dec.	-	-	-	-	-	-	-
6 Jan.-Mar.	41	43	53	35	6	1	-
April-June	15	5	3	7	3	6	-
July-Sept.	6	23	22	10	3	4	3
Oct.-Dec.	21	14	7	11	3	-	-
7 Jan.-Mar.	8	8	11	45	5	1	-
April-June	10	11	9	2	2	-	-
July-Sept.	49	44	23	75	10	-	-
Oct.-Dec.	1	-	2	4	1	-	-

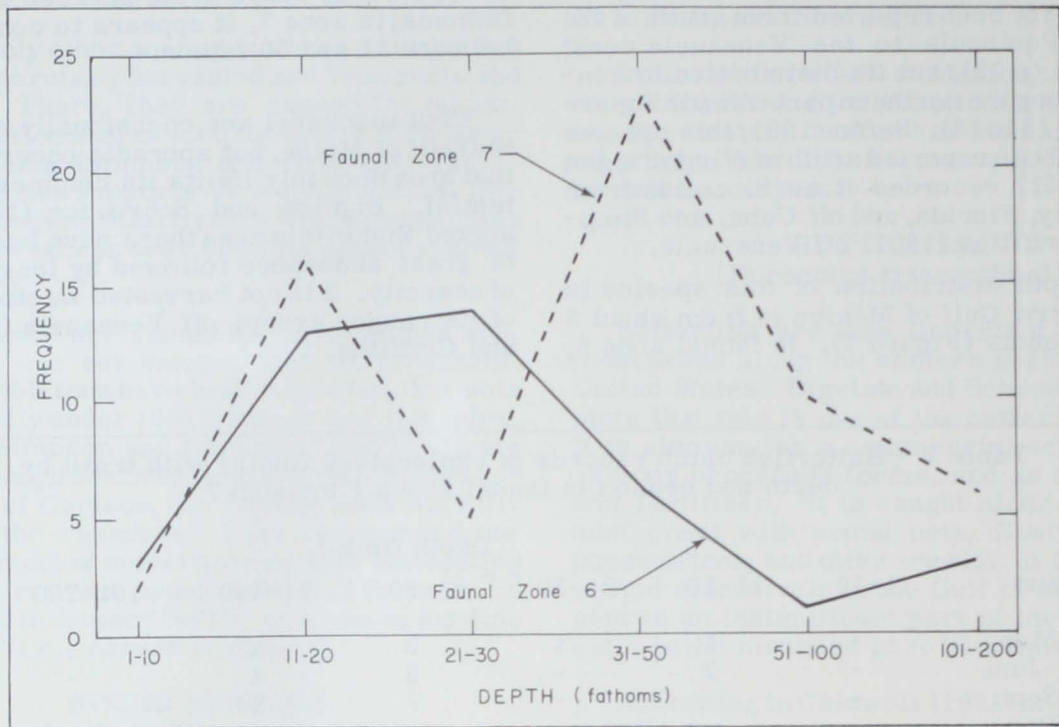


Fig. 7 - Depth distribution of chub mackerel in faunal zones 6 and 7.

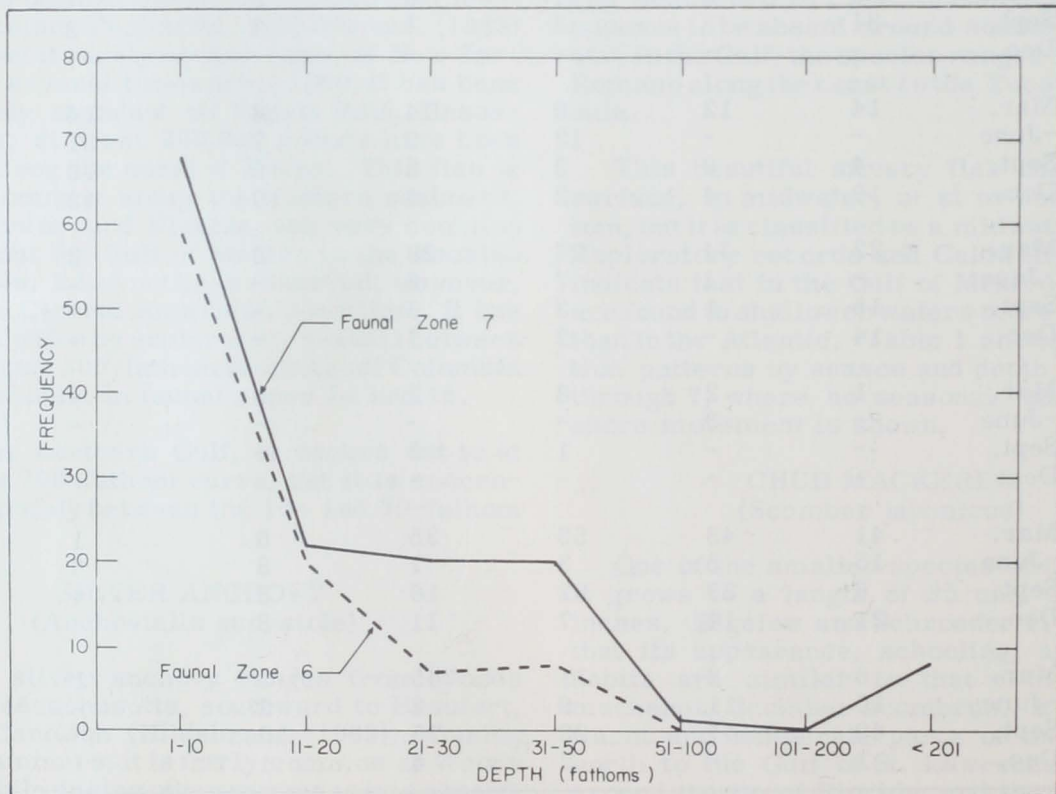


Fig. 8 - Depth distribution of bumpers in faunal zones 6 and 7.

BUMPER
(*Chloroscombrus chrysurus*)

This very common fish occurs from Cape Cod southward throughout the Gulf of Mexico. Bumpers are also found in the Caribbean Sea to Brazil (Ginsburg, 1952). It is commonly caught with beach seines in northwest Florida, and with shrimp trawls throughout most of the Gulf of Mexico. Although most commonly found within 10 fathoms, it occurs offshore to at least the 1,000-fathom curve in the northern Gulf, and out to the 500-fathom curve off northeast Florida. Throughout the rest of its range, it is rarely found beyond the 50-fathom isobath (Figure 8).

ROUGH SCAD
(*Trachurus lathami*)

It is known from nearly all warm and temperate seas, and along our Atlantic coast from Cape Cod southward to Brazil. The rough scad is rare in the northern part of its range, but it is fairly common off the Florida Keys and in the northern Gulf of Mexico east of the Mississippi Delta.

It is generally found slightly farther offshore than other coastal pelagic species, most commonly between the 30- and 50-fathom contours (Figure 9).

ROUND SCAD
(*Decapterus punctatus*)

This fish is usually found in small schools along the Atlantic seaboard from Nova Scotia to Brazil, including the Gulf of Mexico, the West Indies, and Bermuda. Berry (1968) indicates that its distribution is continuous. Juveniles are pelagic and may prefer oceanic rather than coastal waters, but they do occur around oceanic islands. Throughout its range, it can be found from the shore out to the Continental Slope.

In faunal zones 6 and 7, in the northern Gulf of Mexico, its seasonal depth distribution is shown in Table 2 and Figure 10. During the winter, it is found mostly beyond the 20-fathom curve to 50 fathoms. In the spring, however, it is concentrated within the 10-fathom curve. In the summer, it appears to move farther offshore and concentrate, at least in faunal zone 6, between the 11- and 20-fathom contours. During the fall, it again moves inshore close to the beach, but it is more or less uniformly distributed from the shore line out to about the 100-fathom contour.

Caught For Bait

Rough scad are caught for bait with beach seines along the Florida panhandle from April to November. Since 1960, production and value have increased because of the increase in demand for bait fish (as mentioned with Spanish sardine). In 1967, more than $\frac{1}{2}$ million pounds worth slightly more than \$65,000 were landed (Figure 11). More than 60 percent of the annual yield is produced in June and July.

During the summer, this species schools off northwest Florida with the Spanish sardine and, to some extent, with the scaled sardine. Klima and Wickham (1971) have observed dense schools of mixed round scad and rainbow runner, *Elagatis bipinnulatus*, around submerged structures.

THREAD HERRING
(*Opisthonema oglinum*)

This tropical and subtropical fish occurs intermittently along the eastern seaboard from Cape Cod to southern Brazil. It is usually found from 4 to 50 fathoms. In the northeastern Gulf of Mexico, it is most commonly found within the 20-fathom curve (Figure 12). Bullis and Thompson (1967) estimate the density of thread herring in this area to be one school per square mile. Observations in the northern Gulf indicate that thread herring stocks are not as numerous there as off Florida's west coast.

Commercial interest in the thread herring stocks was stimulated by an off-season aerial survey for menhaden conducted by the Bureau of Commercial Fisheries during the winters of 1963-64, 1964-65, and 1965-66 (Thompson, 1968). During 15 monthly flights, 5 each winter season, over traditional menhaden grounds along the west coast of Florida, almost 1,800 schools were observed. Almost 900 schools of thread herring were observed south of 29° N latitude during these flights. Other schools were comprised of scaled sardine, Spanish sardine, and yellowfin menhaden. Species identification of the schools was made from coordinated gill-net samplings.

Possibly Million Tons

Based on average catch rates of commercial sets, an extrapolation indicates a possible thread herring stock of about one million tons (Bullis and Thompson, 1967). During the Bureau's exploratory fishing, thread herring

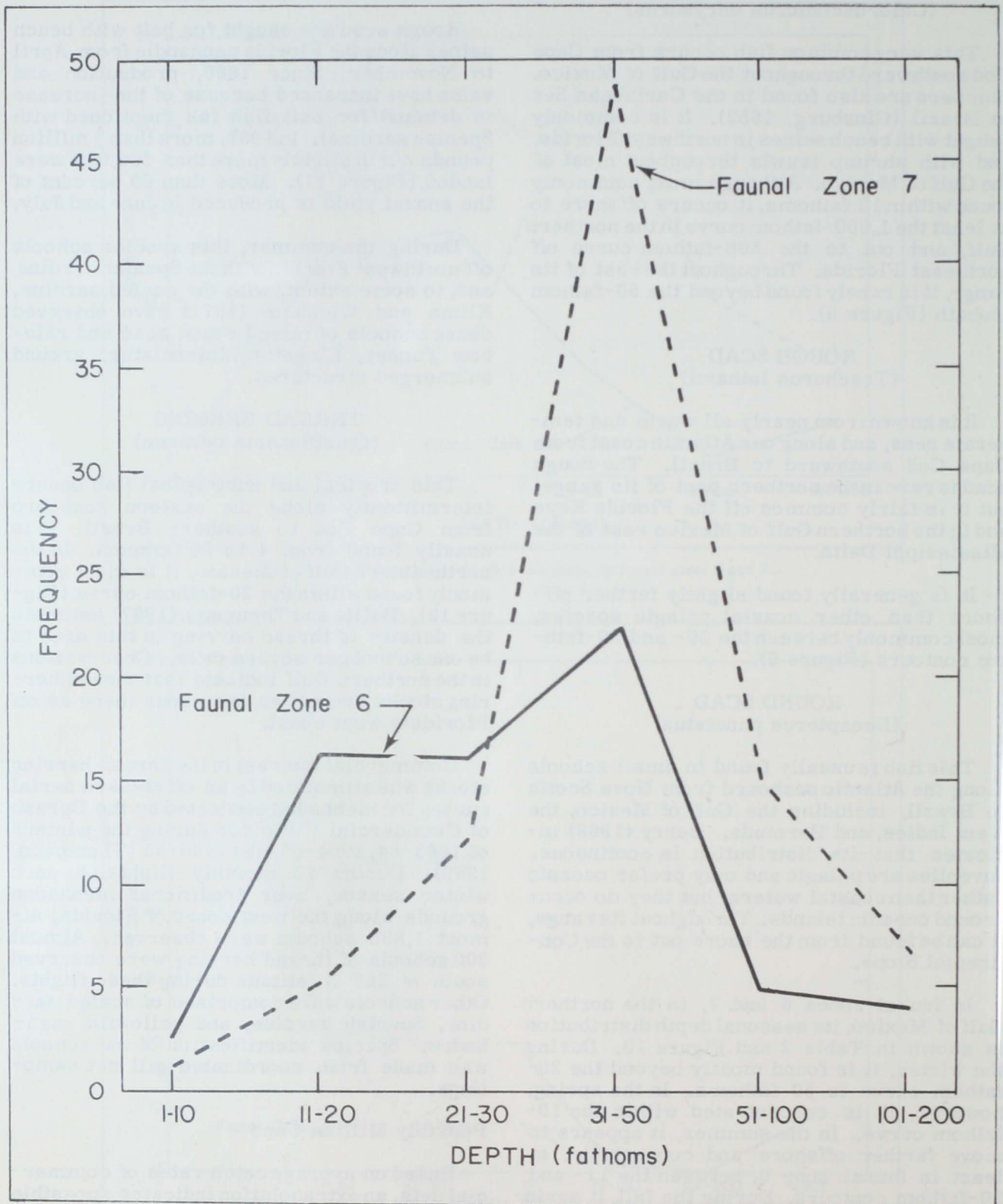


Fig. 9 - Depth distribution of rough scad in faunal zones 6 and 7.

Table 2 - Round scad catch records of exploratory fishing with trawl by depths and season in faunal zones 6 and 7

Zones	Depth (fms.)						Total
	1-10	11-20	21-30	31-50	51-100	101-200	
6							
Jan.-Mar.	2	25	32	34	6	1	100
April-June	11	4	1	1	2	1	20
July-Sept.	1	19	12	5	1	-	38
Oct.-Dec.	10	16	8	11	6	-	51
7							
Jan.-Mar.	-	4	4	27	2	-	37
April-June	3	5	5	3	1	-	17
July-Sept.	1	25	13	57	12	-	108
Oct.-Dec.	13	12	11	13	-	-	49

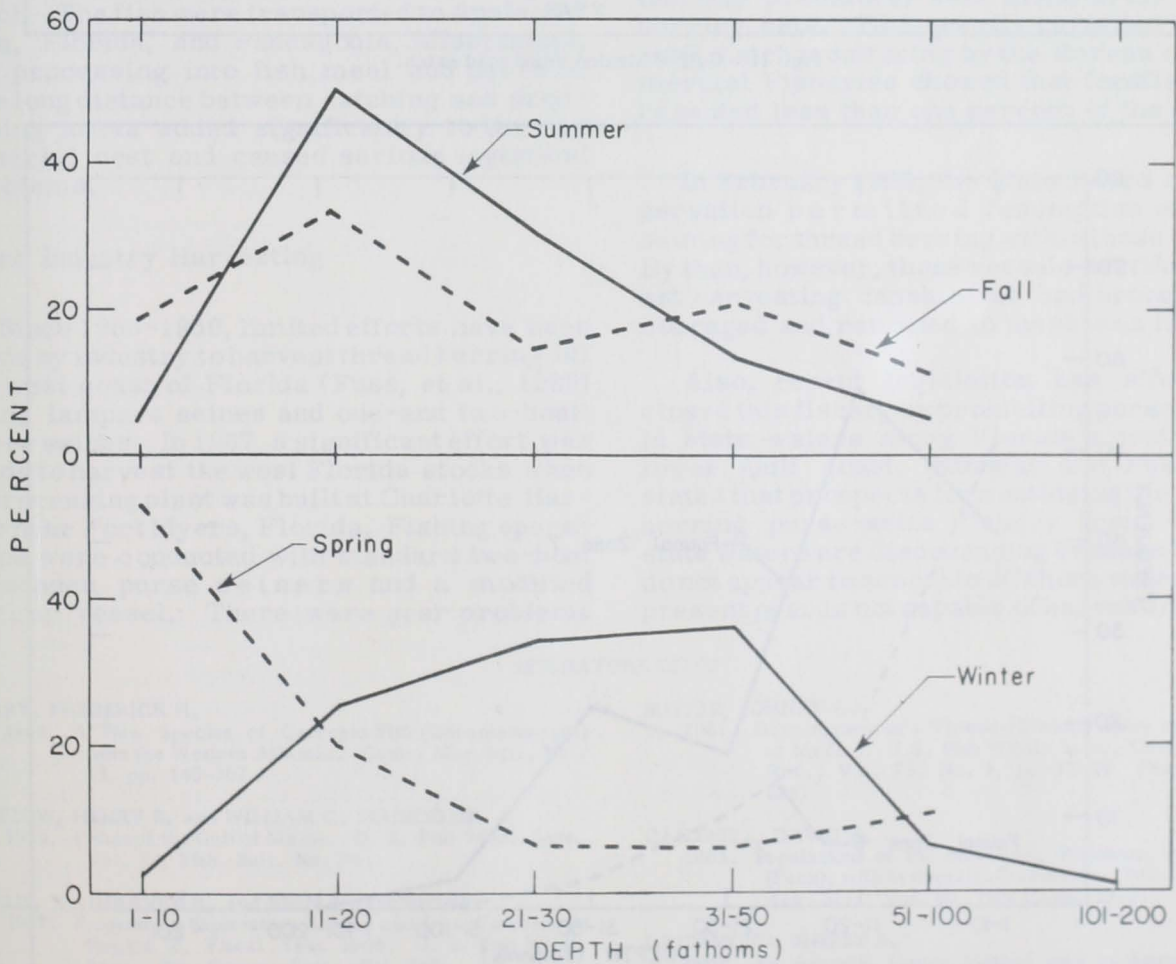


Fig. 10 - Depth distribution of round scad by season in faunal zone 6.

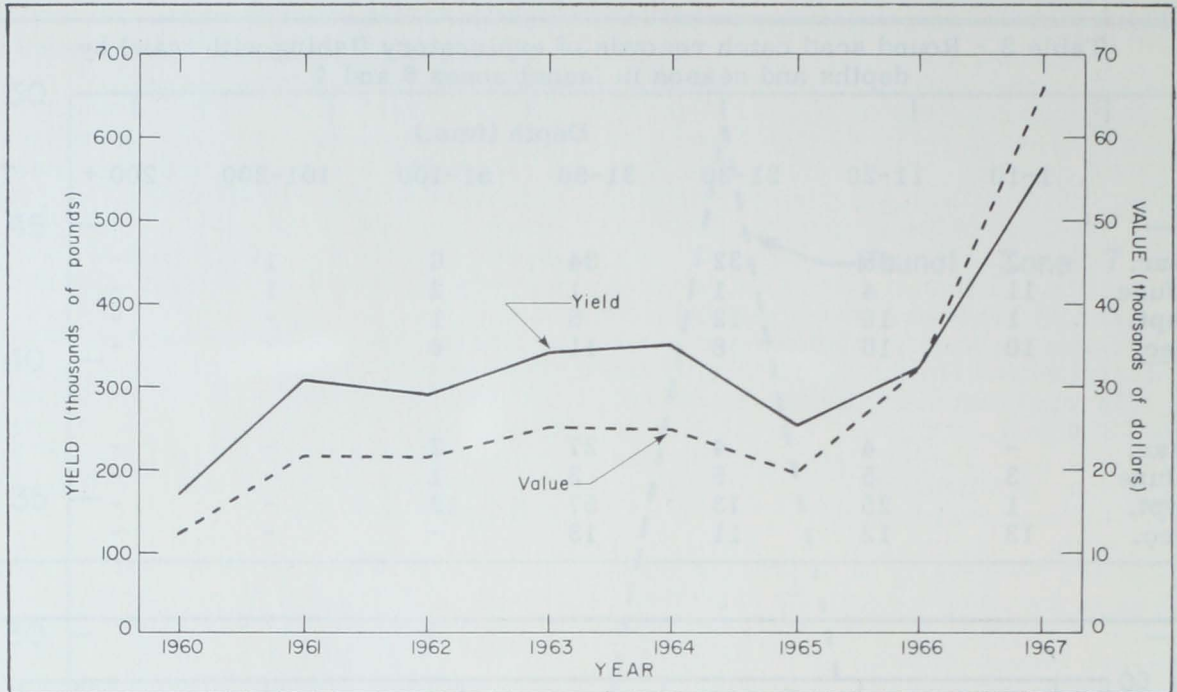


Fig. 11 - Gulf of Mexico round scad catch.

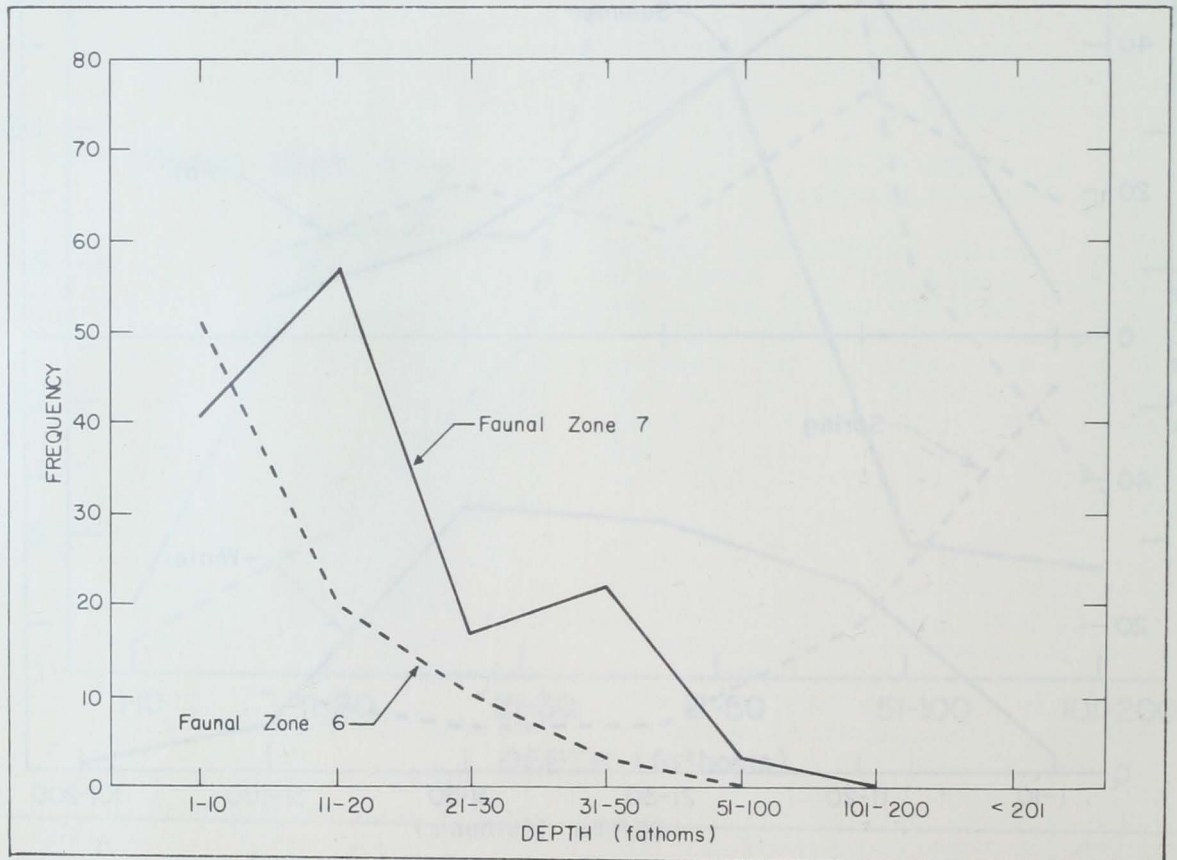


Fig. 12 - Depth distribution of thread herring in faunal zones 6 and 7.

were caught in all areas of the Atlantic south of Cape Hatteras, and throughout the entire Gulf of Mexico. Catches occurred throughout every season from the Mississippi Delta to the east coast of Florida, and off Louisiana and Texas in every month except June, July, and December. Thread herring are most numerous in the summer and fall in the latter area.

Thread herring has perhaps the best immediate commercial potential because moderate amounts already have been harvested along Atlantic coast, off Fernandina Beach, Florida, and off Fort Myers in the Gulf by menhaden fishermen. Accurate catch statistics are not available since small catches and/or catches mixed with menhaden are usually recorded as menhaden (Butler, 1961).

In addition to gear problems, perhaps the greatest were the problems of disposing the catch. The fish were transported to Apalachicola, Florida, and Pascagoula, Mississippi, for processing into fish meal and pet food. The long distance between catching and processing areas added significantly to the raw material cost and caused serious logistical problems.

Some Industry Harvesting

Since 1958-1959, limited efforts have been made by industry to harvest thread herring off the west coast of Florida (Fuss, et al., 1969) using lampara seines and one-and two-boat purse seines. In 1967, a significant effort was made to harvest the west Florida stocks when a processing plant was built at Charlotte Harbor near Fort Myers, Florida. Fishing operations were conducted with standard two-boat menhaden purse seiners and a modified shrimp vessel. There were gear problems

and fishing was limited to small, smooth-bottom areas close inshore from Gasparilla to Sanibel Islands.

In 1967 and 1968, the vessels of three different companies produced about 15,000 tons of thread herring. The limited-capacity plant at Charlotte Harbor handled a good part, and plants at Dulac, Louisiana, and Apalachicola, Florida, also processed part. Catches were transported to the two distant plants in large (up to 500-ton capacity) refrigerated menhaden vessels.

Legal Restrictions & Weather

Legal restrictions and weather also limited production in the area during 1967 and 1968. Florida laws prohibit catching of foodfish by purse seines within Florida's 10.5 mile jurisdiction, and insignificant catches of these (usually predators) were made in the thread herring sets. This greatly curtailed fishing until catch monitoring by the Bureau of Commercial Fisheries showed that foodfish represented less than one percent of the catch.

In February 1968, the State Board of Conservation permitted resumption of purse seining for thread herring within those limits. By then, however, those vessels with the largest harvesting capabilities had become discouraged and returned to menhaden fishing.

Also, recent legislation has effectively closed this fishery by prohibiting purse seines in state waters along Florida's central and lower Gulf coast. Kinnear and Fuss (MS) stated that prospects for continuing the thread herring purse-seine fishery from outside state waters are discouraging because the fish do not appear to school in offshore waters, and present gear is not capable of harvesting them.

LITERATURE CITED

- BERRY, FREDERICK H.
1968. A New Species of Carangid Fish (*Decapterus tabl*) from the Western Atlantic. *Contr. Mar. Sci.*, Vol. 13, pp. 145-167.
- BIGELOW, HENRY B. and WILLIAM C. SCHROEDER
1953. *Fishes of the Gulf of Maine*. U. S. Fish Wildl. Serv., Vol. 53, Fish. Bull. No. 74.
- BULLIS, Jr., HARVEY R. and JOHN R. THOMPSON
1967. Progress in Exploratory Fishing and Gear Research in Region 2, Fiscal Year 1966. U. S. Fish Wildl. Serv., Bur. Comm. Fish., Cir. 265.
- BUTLER, JOHNNY A.
1961. Development of a Thread-Herring Fishery in the Gulf of Mexico. U.S. Fish Wildl. Serv., *Comm. Fish. Rev.*, Vol. 23, No. 9, pp. 12-16. (Reprint No. 628)
- CALDWELL, DAVID K.
1961. Populations of the Butterfish, *Poronotus triacanthus* (Peck), with Systematic Comments. *Bull. So. Cal. Aca. Sci.*, Vol. 60, Part 1, pp. 19-31.
- DRUMMOND, SHELBY B.
(MS) An Acoustic Survey Method used in Assessing Fish Stocks along the Southeastern United States.

LITERATURE CITED (Contd.)

- FUSS, Jr., CHARLES M., JOHN A. KELLY, Jr., and KENNETH W. PREST, Jr.
1969. Gulf Thread Herring: Aspects of the Developing Fishery and Biological Research. Proc. Gulf. Carib. Fish. Inst., 21st Ann. Sess., pp. 111-125.
- GINSBURG, ISAAC
1952. Fishes of the Family Carangidae of the Northern Gulf of Mexico and Three Related Species. Inst. Mar. Sci., Vol. II, No. 2, pp. 48-117.
- HAEDRICH, RICHARD L.
1967. The Stromateoid Fishes: Systematics and a Classification. Bull. Mus. Comp. Zool., 135(2): 31-139.
- HILDEBRAND, SAMUEL F.
1963. Suborder Clupeoidea Characters and Key to Families. Fishes of the Western North Atlantic, Part III, pp. 152-249.
- KINNEAR, B. S. and C. M. FUSS, Jr.
(MS) The Distribution of Thread Herring (*Opisthonema oglinum*) off the West Coast of Florida.
- KLIMA, EDWARD F.
1959. Aspects of the Biology and the Fishery for Spanish Mackerel, *Scomberomorus maculatus* (Mitchill), of Southern Florida. Fla. St. Bd. Cons. Tech. Serv. No. 27.
- _____ and DONALD A. WICKHAM
1971. Attraction of Coastal Pelagic Fishes with Artificial Structures. Trans. Amer. Fish. Soc., Vol. 100, No. 1, pp. 86-99.
- RIVAS, LUIS RENE
1951. A Preliminary Review of the Western North Atlantic Fishes of the Family Scombridae. Bull. Mar. Sci. of Gulf and Carib., Vol. 1, No. 3, pp. 209-230.
- ROITHMAYR, CHARLES M.
(MS) Contribution to the Taxonomy of the Western Atlantic Spanish sardine of the Genus *Sardinella*.
1965. Industrial Bottomfish Fishery of the Northern Gulf of Mexico, 1959-63. U. S. Fish Wildl. Serv., Bur. of Comm. Fish. Spe. Sci. Rep. Fish. No. 518.
- SIMPSON, JOHN G. and GERMAN GONZALEZ G.
1967. Some Aspects of the Early Life History and Environment of the Sardine, *Sardinella anchovia*, in Eastern Venezuela. Serie Recursos y Explotacion Pesqueros, Volumen 1 - Numero 2, Republica de Venezuela, Ministerior de Agricultura y Cria. Investigaciones Pesqueras, 1967, pp. 39-84 Spanish, pp. 85-93 English.
- _____ and RAYMOND C. GRIFFITHS
1967. The Fishery Resources of Venezuela and Their Exploitation. Serie Recursos y Explotacion Pesqueros, Volumen 1, No. 5, Republica de Venezuela, Ministerior de Agricultura y Cria, Investigaciones, Pesqueras, 1967, pp. 175-189 Spanish, pp. 191-204 English.
- THOMPSON, JOHN R.
1968. Progress in Exploratory Fishing and Gear Research in Region 2 Fiscal Year 1967. U. S. Fish. Wildl. Serv., Bur Comm. Fish., Cir. 267.

