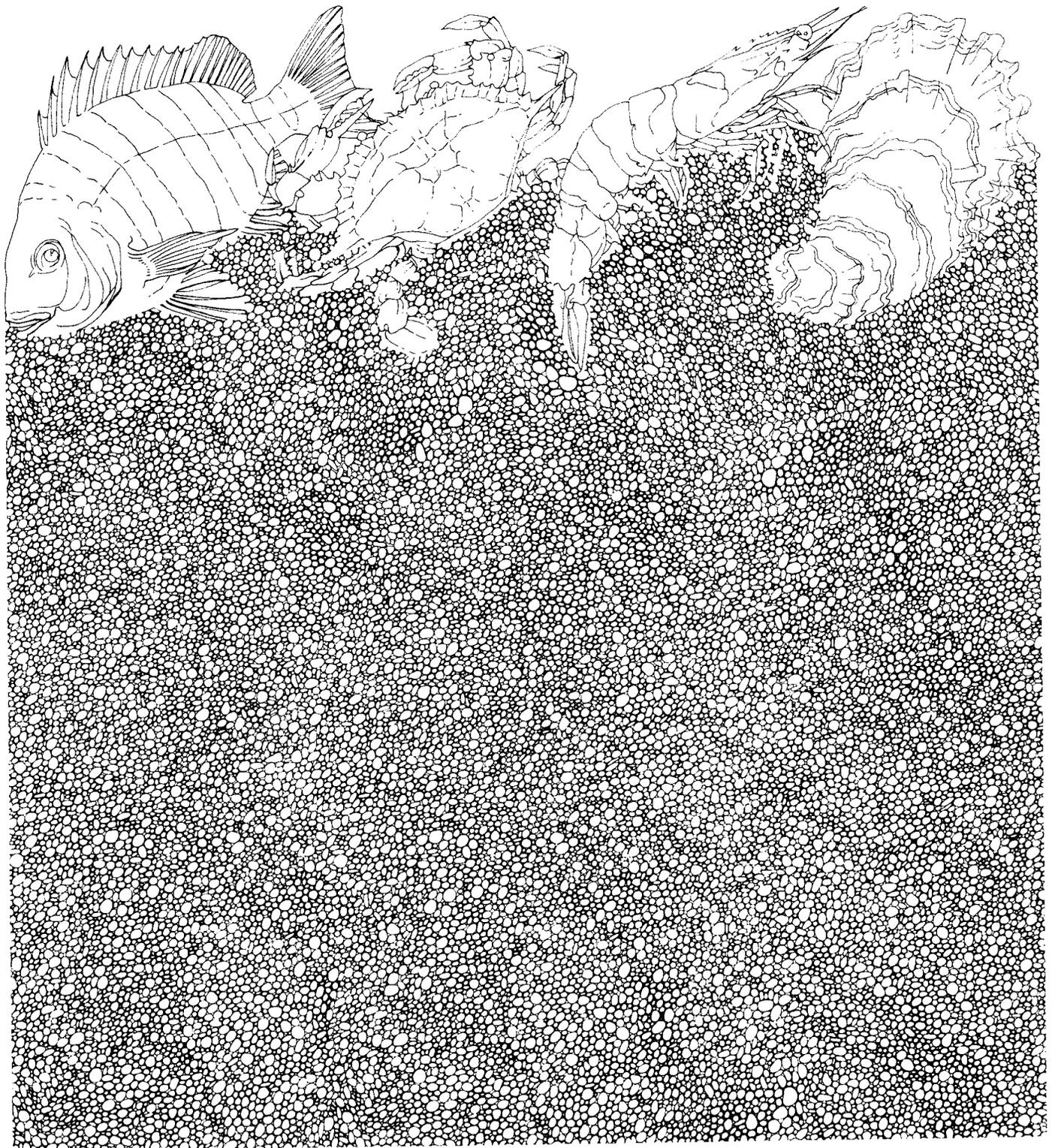


An Investigation of the Spanish Mackerel, *Scomberomorus Maculatus* (Mitchill), Along the Texas Coast by Kenneth Rice

Management Data Series Number 3
1979

Texas Parks and Wildlife Department
Coastal Fisheries Branch



AN INVESTIGATION OF THE SPANISH MACKEREL,
SCOMBEROMORUS MACULATUS (MITCHILL),
ALONG THE TEXAS COAST

by

Kenneth Rice

MANAGEMENT DATA SERIES

NO. 3

1979

Texas Parks and Wildlife Department
Coastal Fisheries Branch

AN INVESTIGATION OF THE SPANISH MACKEREL,
SCOMBEROMORUS MACULATUS (MITCHILL),
ALONG THE TEXAS COAST

EXECUTIVE SUMMARY

The potential of a commercial Spanish mackerel (Scomberomorus maculatus, Mitchill) fishery in Texas was suggested as early as 1950 by Baughman. However, a need exists to assess the stock, obtain biological data on which to base management regulations and devise fishing gear suitable for use along the Texas coast. The Texas Parks and Wildlife Department in cooperation with the Gulf and South Atlantic Fisheries Development Foundation attempted to obtain these data.

During summer 1978 Spanish mackerel schools were located with a spotter plane and samples collected using: 1) a nylon modified purse seine 2100 ft long, 60 ft deep with a stretched mesh of 1-1/8 inches, 2) a nylon monofilament gill net 1800 ft long, 45 ft deep with a stretched mesh of 3 inches and 3) troll lines with "hooties" (feather jigs) and silver spoons. Samples were collected during daylight in water out to 50 ft depth. The use of the nets was not permitted within 1 nmi of natural passes or 3-10 nmi of jettied passes (depending on the specific pass).

Three purse seine sets yielded 5 (6.6 lbs), 9 (9.0 lb) and 310 (272.4 lb) of Spanish mackerel; one gill net set yielded 1 (0.4 lb); troll lines caught 80 (0.59 fish/hook-h). Bumper (Chloroscombrus chrysurus) and Atlantic thread herring (Opisthonema oglinum) dominated the purse seine by-catch. Spanish mackerel caught with the purse seine and troll lines ranged in size from 8 to 22 inches (averaging about 13 inches). Of the 208 Spanish mackerel tagged, none has been returned.

The most common food items observed in Spanish mackerel stomachs were bumper, silversides (Menidia sp.) and harvestfish (Peprilus paru).

Of the 58 Spanish mackerel examined, 40 (70%) were males; 72% of the 58 fish had developing or ripe gonads.

Although Spanish mackerel are most abundant off the Texas coast in summer, the summer sampling during this study was hampered by strong southeasterly winds which made deployment of the nets difficult. The extreme turbidity of the water made it difficult for the spotter pilot to locate mackerel schools. The inability to sample near passes and jetties where Spanish mackerel are known to concentrate prevented accurate stock assessment. Rough seas, turbid water and the prohibition of purse seines near passes probably preclude the development of a commercial Spanish mackerel fishery in Texas.

AN INVESTIGATION OF THE SPANISH MACKEREL,
SCOMBEROMORUS MACULATUS (MITCHILL),
ALONG THE TEXAS COAST

ABSTRACT

During June-September 1978 the Texas Parks and Wildlife Department in cooperation with the Gulf and South Atlantic Fisheries Development Foundation attempted to determine the commercial harvest potential of Spanish mackerel along the Texas coast using a modified purse seine, gill net and troll lines. Spanish mackerel life history data were also obtained. Few fish were located; rough seas and turbid water prevented extensive sampling with either the net or the purse seine. Most Spanish mackerel were observed in or near passes. The incidental catch of other game species in the modified purse seine was minor; the incidental catch was composed mainly of bait fish on which the mackerel were feeding. A total of 208 fish was tagged for growth and migration studies. Stomach analyses indicated that bumper (Chloroscombrus chrysurus) was the most common food item eaten by Spanish mackerel. During August and September, 72% of the 58 fish examined had developing or ripe gonads.

INTRODUCTION

Spanish mackerel, Scomberomorus maculatus (Mitchill), is a migratory pelagic fish which ranges from Maine to Brazil including the Gulf of Mexico (Klima 1959). Gunter (1945) reported that Spanish mackerel were abundant along the Texas coast from April through September (peaking in August) but that < 1% of the available supply was being exploited commercially. The largest annual commercial harvest of Spanish mackerel during the last 30 years in Texas was only 3538 kg (U.S. Department of Interior 1948). Baughman (1950) realized the potential of a Spanish mackerel fishery in Texas but also saw a need to assess the stock, obtain biological data on which to base sound management practices and devise fishing gear suitable for use along the Texas coast.

In an effort to utilize this potential natural resource and to alleviate increasing pressure on the shrimp and developed bay fisheries in Texas, the Texas Parks and Wildlife Department in cooperation with the Gulf and South Atlantic Fisheries Development Foundation initiated an investigation of the Spanish mackerel commercial potential on the Texas coast. The objectives of this study were: 1) to assess the Spanish mackerel stock in Texas to determine its commercial potential, 2) to evaluate various harvesting methods used in the Florida Spanish mackerel fishery and 3) to obtain Spanish mackerel life history data for management purposes.

MATERIALS AND METHODS

The study area included the entire Texas coast from Sabine Pass to the Rio Grande River, although most samples were collected off four major ports-- Sabine, Freeport, Port Aransas and Port Isabel. Samples were taken from August through September 1978 with three additional days of tagging in June.

A 9.8-m charter boat was used during the three days of tagging in June. During August-September sampling was done aboard the Capt. Carl, an 18.9-m fiberglass commercial fishing vessel owned and operated by Raffield Fisheries of Port St. Joe, Florida. Aerial observations were made with a single engine spotter plane which accompanied the vessel. All samples were collected during daylight in water out to 13.7 m depth. Sampling with nets was not permitted within 1.9 km of natural passes nor within 5.6-18.5 km of jettied passes (depending on the specific pass).

The gear to be evaluated and used to sample Spanish mackerel included: 1) a nylon modified purse seine 640 m long, 18.3 m deep with a stretched mesh of 28.5 mm; 2) a combination nylon monofilament gill net 548 m long, 13.7 m deep with a stretched mesh of 78.2 mm and 3) troll lines with "hooties" (feather jigs) and silver spoons.

When schools of Spanish mackerel were located by the spotter pilot or by the fishing vessel, the vessel circled the school at high speed while one of the nets was pulled off its stern by a 4.9-m "kicker" boat. When the circle was closed, the net was "pursed" close to the vessel and the fish were removed

for sampling and tagging. The purse seine was pursed from the lead line; the gill net from the cork line. When Spanish mackerel were known to be in the area but water turbidity prevented fish location, troll lines were put out until enough fish were caught to warrant a blind set with a net. These sampling techniques are similar to those used in the commercial Spanish mackerel fishery in Florida where gill netting and trolling are the means of harvesting Spanish mackerel and where bait fish are caught with modified purse seines.

Fish captured for tagging were collected with troll lines using "hooties" during June and with modified purse seines in August-September. Gill nets were not used to capture fish for tagging. Fish captured in good condition were tagged with internal anchor tags, measured to the nearest 0.5 cm fork length (FL) and released. Fish taken in poor condition were retained for life history studies.

When large numbers of fish were caught, a subsample of at least 30 fish was retained for life history studies. These fish were measured to the nearest 0.5 cm total (TL) and fork length and weighed to the nearest 0.25 lb. Stomachs and gonads were removed, wrapped in cheesecloth and preserved in 10% buffered formalin for later observation. Sex and gonadal development were determined macroscopically according to the method of Klima (1959). Otoliths were removed from 18 randomly selected fish and placed in glycerin for age determination.

Hydrological and meteorological data (water depth, surface water temperature, sea condition, wind speed and direction, cloud cover, precipitation) were recorded during the sampling period. These data are found in Appendix A.

RESULTS

The results of three modified purse seine sets and one gill net set are shown in Table 1. The largest Spanish mackerel catch included 310 fish; the remaining sets captured < 10 fish each. Incidental catches of game fish included only one kingfish (*Scomberomorus cavalla*) and 15 juvenile lane snapper (*Lutjanus synagris*). Bumper (*Chloroscombrus chrysurus*) and Atlantic thread herring (*Opisthonema oglinum*) dominated the Spanish mackerel by catch. Trolling lines were used on 14 occasions for a total of 136 hook-h in June-September. The 80 Spanish mackerel caught resulted in a catch rate of 0.59 fish/hook-h. A random sample of 273 Spanish mackerel caught with the purse seine and troll lines ranged in size from 20 to 55 cm (FL) (Figure 1 and 2).

Of the 208 Spanish mackerel tagged (Table 2), none has been returned.

Of the 58 Spanish mackerel stomachs examined, 35 (60%) contained no food (Table 3); 7 contained unidentified fish. Bumper was the most common food item observed, followed by silversides (*Menidia* sp.) and harvestfish (*Peprilus paru*).

Of the 58 Spanish mackerel examined, 40 (70%) were males (Table 4); 72% of the 58 fish had developing or ripe gonads.

Otoliths have not yet been analyzed since they must have time to clear before age determinations can be made.

DISCUSSION

The fishing gear and techniques used in the Spanish mackerel study were similar to those used in the Florida commercial fishery. The success of the gear depends heavily on favorable weather conditions since the modified purse seine and gill net can only be used if the seas are < 1.2 m. Such conditions did not prevail along the Texas coast during the sampling period. Strong southeasterly winds brought about by tropical depressions in the Gulf greatly hampered sampling. Water turbidity was also a factor since Spanish mackerel schools had to be located by the spotter plane or the vessel before the net could be set. The fine silt sediment on the Texas coast took several days to settle out of the water after the sea calmed; this further hampered sampling. The vessel, crew and spotter plane were in Texas for 37 days; however, only 18 days were spent sampling because of poor weather and engine breakdown.

Of the three modified purse seine sets, only one yielded a substantial number (310) of Spanish mackerel. The incidental catch with the modified purse seine was minor, composed mainly of bumper on which the Spanish mackerel were feeding.

Only one Spanish mackerel was caught with the gill net. Therefore, little information was obtained about this gear type.

The largest concentrations of Spanish mackerel observed in August and September were in and around natural passes and apron areas of jettied passes. Of the four schools sighted by the spotter pilot, three were within 1.6 km of a pass. Approximately 75% of the Florida commercial catch of Spanish mackerel is taken in or near passes (Raffield, personal communication). Most of the sport catch of Spanish mackerel in Texas is caught near passes. Because of the turbid Texas water, the only way to find Spanish mackerel was to observe them feeding at the water surface; the food on which they feed is also known to be concentrated in passes. During this study sampling with nets was not permitted near passes, a restriction detrimental to the project since sampling could not take place in areas where Spanish mackerel were known to school.

That none of the 208 tagged fish has been returned is probably due to both the limited number of fish tagged and to the lack of an active sport or commercial fishery for Spanish mackerel in Texas. In a previous study, one Spanish mackerel tagged at Port Aransas by NMFS in September 1975 was recaptured in January 1976 near Vera Cruz, Mexico. If western Gulf Spanish mackerel are more heavily exploited in Mexico than in Texas, some of the tagged mackerel of this study may show up in this winter's Mexican fishery.

Bumper was the most common food item found during this study. Carson (1944) reported that menhaden was the principal food of Spanish mackerel but that they fed on any available species. No menhaden were observed during this study but Kemp's (1950) examination of 611 stomachs from Spanish mackerel taken from the Port Aransas area revealed that 82 stomachs contained shrimp, 53 contained ribbonfish, 30 contained squid, 6 contained menhaden and 4 contained other species. The differences between food habits in these studies may reflect different food availability near to and farther away from passes or at different times (1949 vs. 1978).

Spanish mackerel are most abundant in Texas from April through September (Gunter 1945). The full extent of their spawning period is unknown. Beaumariage (1970) suggested that spawning is probably limited to water of > 25.5 C. Inshore water temperatures along the Texas coast are > 25.5 C from May through September; therefore, spawning should occur in Texas when Spanish mackerel are most abundant. Spanish mackerel might best be harvested during their spawning period but this may not be biologically wise. A more extensive sampling period encompassing the entire time that Spanish mackerel are abundant in Texas would be necessary to confirm these possibilities.

SUMMARY

1. An investigation of Spanish mackerel along the Texas coast was conducted during June-September 1978. The objectives of the study were: a) to assess the Spanish mackerel stock in Texas to determine its commercial potential, b) to evaluate various harvesting methods used in the Florida Spanish mackerel fishery and c) to obtain Spanish mackerel life history information.
2. Few Spanish mackerel were caught; however, the sampling covered only a limited portion of the time the fish are known to occur in Texas waters. Not being permitted to sample with nets in or near passes, where Spanish mackerel are known to be most abundant, also hampered stock assessment. In August-September 1978 Spanish mackerel did not appear to be abundant enough to support a commercial fishery; however, more extensive sampling is required to confirm this.
3. Rough seas and turbid water, common along the Texas coast, permitted the use of the modified purse seine only three times and the gill net once. It appears that these nets and fishing techniques could not be used often enough in Texas waters to make a commercial harvest of Spanish mackerel feasible.
4. None of the 208 Spanish mackerel tagged has been returned.
5. Of the 58 Spanish mackerel stomachs examined, 35 (60%) were empty. Bumper was the most common food item observed, followed by silversides and harvestfish; however Spanish mackerel probably feed on any available food source.
6. In August-September, 72% of the Spanish mackerel examined were in the developing or ripe stage of maturity.
7. Spanish mackerel appear to be most abundant in Texas during their spawning period; the commercial harvest of Spanish mackerel during this time may not be biologically wise.

LITERATURE CITED

- Baughman, J. L. 1950. Potentialities of the Gulf of Mexico fisheries and recommendations for their realization. Proc. Gulf. Caribb. Fish. Inst., 2nd Ann. Session: 118-126.
- Beaumariage, D. S. 1970. Current status of biological investigations of Florida's mackerel fisheries. Proc. Gulf Caribb. Fish. Inst., 22nd Ann. Session: 79-86.
- Carson, R. L. 1944. Fish and shellfish of the South Atlantic and Gulf coasts. U. S. Fish Wild. Serv., Conserv. Bull. No. 37: 45 p.
- Gunter, G. 1945. Studies on marine fishes of Texas. Publ. Inst. mar. Sci., Univ. Texas 1:1-190.
- Kemp, R. J. 1950. Report on stomach analysis from June 1, 1949 through August 31, 1949. Report of the Marine Laboratory, Texas Game, Fish and Oyster Commission for the fiscal year 1948-49: 101-127.
- Klima, E. F. 1959. Aspects of the biology and the fishery for Spanish mackerel, Scomberomorus maculatus (Mitchill), of southern Florida. Fla. Board Conserv., Mar. Res. Lab., Tech. Ser. No. 27: 39 p.
- U. S. Department of Interior. 1948. Gulf Fisheries. Annual Summary Fish and Wildl. Serv., C.F.S., No. 563: 4 p.

Table 1. Catches of Spanish mackerel and incidental species taken in net sets along the Texas coast in August and September 1978.

Date	Location	Gear type	Water depth (m)	Spanish mackerel catch		Incidental catch								
				Number	Weight (kg)	Common name	Number	Weight (kg)						
9 Aug.	Sabine Bank	Modified purse seine	9.14	5	3.0	Bumper	1580	45.0						
						Lane snapper	15	0.7						
						Sea catfish	7	1.1						
						Blue runner	9	1.4						
21 Aug.	Freeport	Modified purse seine	7.92	9	4.1	Bumper	1333	40.0						
						King mackerel	1	4.0						
						Silver seatrout	3	0.5						
						Ocellated flounder	2	0.2						
						Atlantic needlefish	2	0.5						
						Bighead sea robin	1	0.3						
						Atlantic thread herring	6	0.3						
						Ballyhoo	2	0.1						
						21 Aug.	Freeport	Modified purse seine	10.67	310	123.8	Atlantic thread herring	538	21.9
												Bumper	340	10.2
Atlantic needlefish	10	1.7												
5 Sept.	Port Isabel	Gill net	7.92	1	0.2		0	--						

Table 2. Number of Spanish mackerel tagged, by location, from June through September 1978.

Date	Location	Gear fished	Number tagged
28 June	Port Aransas	Troll lines	8
29 June	Port Aransas	Troll lines	51
3 July	Port Aransas	Troll lines	3
21 Aug.	Freeport	Modified purse seine	<u>146</u>
		TOTAL	208

Table 3. Food items found in stomachs of 58 Spanish mackerel examined in August and September 1978.

Common name	Scientific name	Number
Bumper	<u>Chloroscombrus chrysurus</u>	10
Harvestfish	<u>Peprilus paru</u>	2
Silverside	<u>Menidia</u> sp.	4
Unidentified fish		7
Empty stomachs		35

Table 4. Maturity stages and sex ratio of Spanish mackerel observed along the Texas coast in August and September 1978.

	I (Immature)	II (Recovery)	III (Developing)	IV (Ripe)	V (Spent)	Total
Female	2	1	4	10	1	18
Male	4	6	11	17	2	40
Total	6	7	15	27	3	N = 58

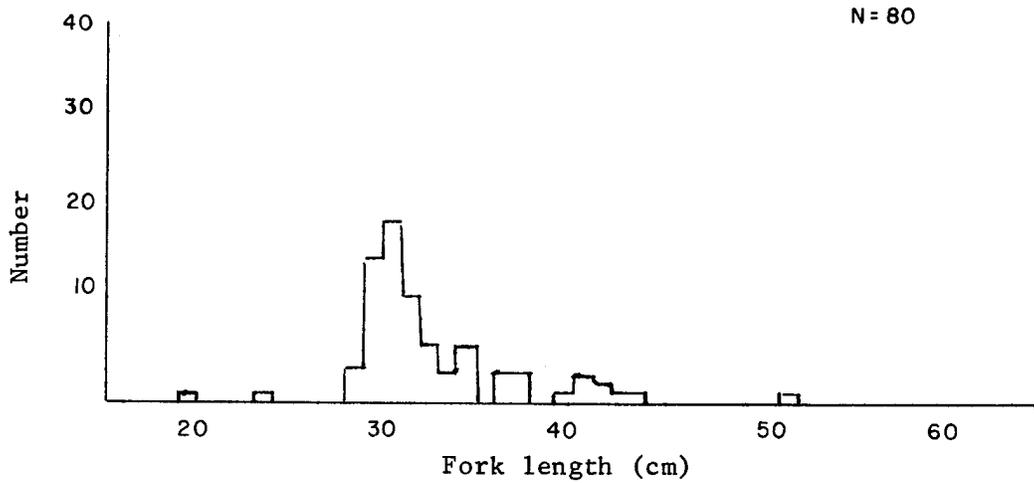


Figure 1. Length-frequency distribution of Spanish mackerel collected during June-Sept. 1978 using troll lines on the Texas coast.

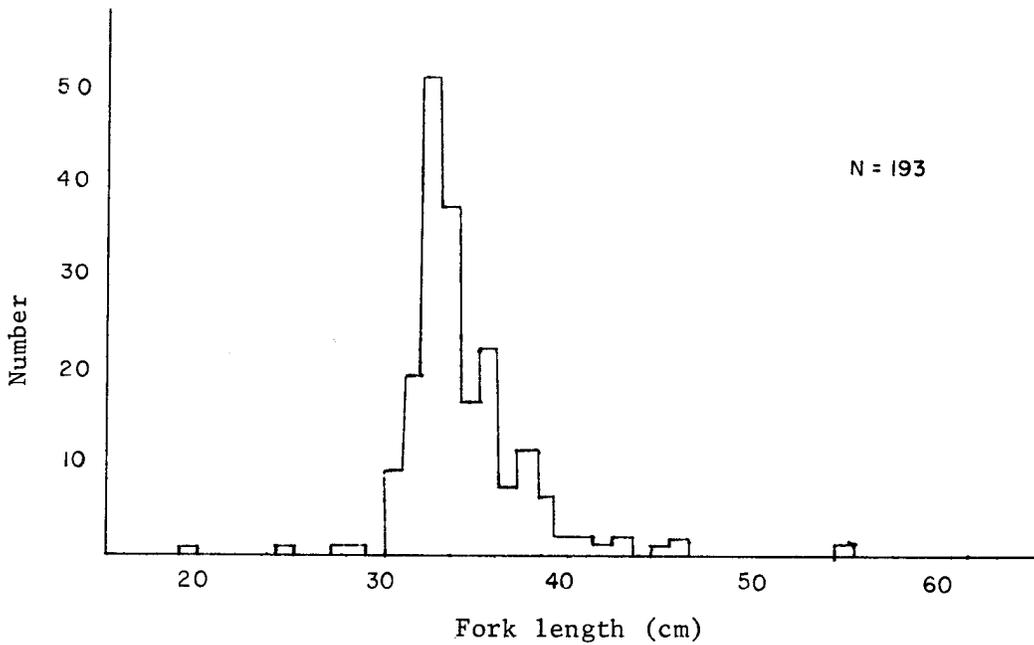


Figure 2. Length-frequency distribution of Spanish mackerel collected during Aug.-Sept. 1978 using a modified purse seine on the Texas coast.

Appendix A. Hydrological and meteorological data

Table 1. Summary of hydrological and meteorological data collected at each sample site (ND = No data).

Date	Time (CST) of initiating sample	Location	Surface water temperature (C)	Water depth (m)	Wave height range (m)	Sea condition ^a	Wind speed range (km/h)	Wind direction	Cloud cover (%)	Precipitation ^b
6/28/78	1735	Port Aransas South Jetty	31.0	9.1	0.9-1.5	2	19.3-24.1	SE	20	1
6/29/78	1830	Port Aransas North Jetty	29.5	9.1	0.6-1.2	1	8.0-12.9	SE	5	1
7/03/78	0920	Port Aransas South Jetty	29.5	9.1	1.2-2.4	3	24.1-32.2	SE	25	1
8/09/78	0925	Sabine Bank	30.2	9.1	0.6-1.2	1	6.4-9.7	SE	100	2
8/10/78	1030	Sabine Bank	30.5	9.1	0.3-0.9	1	8.0-11.3	W	1	2
8/11/78	0755	Sabine Bank 2.4 km E of	30.2	9.1	0.6-1.2	2	12.9-19.3	SW	30	1
8/19/78	0845	San Luis Pass 35.4 km S of	30.0	12.2	0.9-1.5	2	12.9-16.1	SE	20	1
8/20/78	0800	Freeport 4.0 km E of	30.3	7.6	0.9-1.5	2	8.0-12.9	NE	10	1
8/21/78	0900	San Luis Pass 5.6 km E of	30.2	13.4	0.6-1.2	1	4.8-8.0	NE	10	1
8/21/78	1115	San Luis Pass 40.2 km S of	31.0	14.0	0.6-1.2	1	4.8-8.0	NE	10	1
8/26/78	0800	Port Aransas 48.3 km N of	31.0	7.6	0.9-1.5	2	16.1-24.1	SE	40	1
8/27/78	1200	Port Aransas 48.3 km S of	31.2	6.1	0.6-1.2	1	6.4-12.9	SE	50	1

Table 1. (Cont'd).

Date	Time (GST) of initiating sample	Location	Surface water temperature (C)	Water depth (m)	Wave height range (m)	Sea condition ^a	Wind speed range (km/h)	Wind direction	Cloud cover (%)	Precipitation ^b
8/29/78	0905	Port Aransas 4.8 km S of	31.0	12.2	0.9-1.5	2	12.9-19.3	SE	30	1
8/30/78	0900	Port Aransas 19.3 km N of	31.0	9.1	0.6-1.2	1	8.0-16.1	NE	75	2
8/31/78	0730	Port Aransas 40.2 km N of	31.0	6.1	1.2-1.8	3	16.1-24.1	NE	90	2
9/02/78	0920	Port Isabel 4.8 km S of	29.2	4.6	0.9-1.5	ND	16.1-24.1	SE	75	2
9/05/78	0700	Port Isabel	29.1	7.9	0.6-1.2	1	6.4-12.9	SE	40	1

^a1 = Calm, 2 = Choppy, 3 = Rough

^b1 = None, 2 = Slight, 3 = Heavy

