COMPOSITION OF THE ICHTHYOFAUNA INHABITING THE 110-M BATHYMETRIC CONTOUR OF THE GULF OF MEXICO, MISSISSIPPI RIVER TO THE RIO GRANDE

by

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July 1976

TAMU-SG-76-210

Partially supported through Institutional Grant 04-5-158-19
to Texas A&M University
by the National Oceanic and Atmospheric
Administration's Office of Sea Grant
Department of Commerce

$1.00

Order from:

Department of Marine Resources Information
Center for Marine Resources
Texas A&M University
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Abstract

The ichthyofauna inhabiting the 110-m bathymetric contour from the Mississippi River to the Rio Grande was very diverse, although species richness decreased off south Texas. A total of 69 species were identified, although only 3662 specimens were examined. Dominant taxa were the families Sparidae, Lutjanidae, Triglidae, Serranidae and Synodontidae with Stenotomus caprinus, Pristipomoides aquilonaris, Prionotus paralatus, Serranus atrobranchus, and Synodus foetens being the most important species. Faunal composition was very similar along the entire 110-m contour except for large changes in abundance of Stenotomus caprinus, Pristipomoides aquilonaris, and Serranus atrobranchus. Abundance of Stenotomus caprinus decreased greatly off south Texas whereas the converse was true for Pristipomoides aquilonaris and Serranus atrobranchus. The composition of the ichthyofauna at a depth of 110 m is similar to that found on the brown shrimp grounds.

Acknowledgements

A. Landry, J. McEachran and R. Stickney of Texas A&M University reviewed and criticized the manuscript. Financial support was provided, in part, by the Texas Agricultural Experiment Station, the National Marine Fisheries Service, and through Institutional Grant 04-5-158-19 to Texas A&M University by the National Oceanic and Atmospheric Administration's Office of Sea Grants, Department of Commerce.

Introduction

The continental shelf of the northwestern Gulf of Mexico supports a large, diverse ichthyofauna. However, the fish communities and the life histories of even the most common fishes are poorly known despite the many studies conducted in this area including Gunter (1938, 1941, 1945, 1958), Baughman (1950 a, b), Hildebrand (1954), Springer and Bullis (1956), Hoese (1958), McFarland (1963), Miller (1965), Bullis and Carpenter (1968), Hoese et al. (1968), Moore, Brusher and Trent (1970), and Bright and Cashman (1974). Knowledge is especially lacking for species that typically inhabit water deeper than about 27 m. This depth approximately represents the transition between two dominant and distinct fish communities in the northern Gulf: an inshore (3-27 m) white shrimp grounds fauna and an offshore (27-90 m) brown shrimp grounds fauna (Hildebrand, 1954; Chittenden and McEachran, 1976). Little is known about the brown shrimp grounds fish community, because only a few pertinent studies (Hildebrand, 1954; Springer and Bullis, 1956; Moore et al., 1970; Franks et al., 1972; and Chittenden and McEachran, 1976) have been conducted in water deeper than 27 m. Furthermore, the bathymetric limits of this community are not clear. The fish fauna inhabiting water deeper than 90 m has been described only in Springer and Bullis' (1956) data report, and little is known about the fauna found at 90 m.

This paper documents the ichthyofauna of the 110-m bathymetric contour of the northern Gulf from the Mississippi River to the Rio Grande. Implications of the present findings are largely discussed in Chittenden and McEachran (1976) which reviews the demersal fish communities on the

continental shelf of the entire Gulf. Analyses presented herein are based on trawl surveys conducted during 1962-1964 by the U.S. Bureau of Commercial Fisheries (now National Marine Fisheries Service). Moore et al. (1970) briefly described some findings of those surveys.

Materials and Methods

Sampling stations, procedures in the field, and methods of processing the catch are described in detail by Moore et al. (1970). Briefly, samples were collected monthly January 1962-December 1964 from the Mississippi River to the Rio Grande using 14-m wide flat trawls equipped with rollers. The nets had 6-cm stretched mesh and were towed at a speed of three knots for about one hour during day or night whenever the vessel arrived on station. Each catch was emptied on deck, and a subsample of 1.8 kg in 1962 or 3.5 kg thereafter was taken to determine the average weight and relative abundance of each species.

Original data sheets describing the number and weight of each species in each subsample were made available by the National Marine Fisheries Service. Identifications were updated as possible to correspond with subsequent changes in nomenclature and generally follow Bailey et al. (1970). In the present analysis, the weights and numbers of each species were pooled over time in the following categories: 1) south Texas (Fig. 1, stations W-7, W-18, W-19, W-30), 2) north Texas - Louisiana (stations W-6, E-6, E-7, E-18, E-19, E-30), and 3) overall data based upon all stations occupied at 110 m. Data summarization in each of these categories (Table 1) includes relative biomass and relative abundance expressed as the percentages that each taxon constituted of the total weight and total numbers, respectively.

Results and Discussion

Data presented in this paper are based on only 3662 fishes collected in 109 tows, so that the average subsample included only about 34 fish. Therefore, biases due to non-random sampling from the complete catch could have caused large errors in the percentage compositions. However, the compositions reported herein do agree with findings of studies conducted in shallower water.

Species Richness:

The ichthyofauna at 110 m is extremely diverse, although species richness decreased off south Texas. Overall, at least 67 species representing 31 families were identified in only 3662 specimens examined (Table 1). In contrast, Chittenden and McEachran (1976) found only 83 species among 14,894 specimens collected on the brown shrimp grounds and only 63 species in 11,703 specimens captured on the white shrimp grounds. Within the south Texas area, only 45 species representing 23 families were identified in contrast to 64 species representing 30 families in the north Texas - Louisiana area.

Diversity expressed as Shannon-Wiener's $\underline{H}'$ (Krebs, 1972) was 2.616 overall, 2.542 off south Texas, and 2.518 in the north Texas - Louisiana area. These values are higher than the mean $\underline{H}'$ observed by Chittenden and McEachran (1976) on the brown shrimp grounds (2.251) or on the white shrimp grounds (1.825), and they are much higher than $\underline{H}'$ values that Bechtel and Copeland (1970) observed in Texas estuaries. Diversity in the northern Gulf, in general, apparently tends to increase with depth proceeding from the estuaries toward the edge of the continental shelf. This

may simply reflect an increase in environmental stability and habitat diversity with depth as Chittenden and McEachran (1976) suggested in comparing species diversity on the white and brown shrimp grounds.

Composition of the Fauna:

Percentage compositions were very similar for both biomass and numbers. Overall, 15 families made up about 97% of the biomass and 95% of the numbers of fishes (Table 1). The Sparidae (25%), Lutjanidae (20%), Triglidae (13%), Synodontidae (8%), and Serranidae (7%) constituted about 73% of the biomass. The Sparidae (30%), Triglidae (18%), Lutjanidae (12%), and Serranidae (11%) represented about 71% of the numbers of fishes. Stenotomus caprinus, the dominant species, made up about 25-30% of the catch by biomass or numbers and was followed in importance by Pristipomoides aquilonaris (12-20%) and Prionotus paralatus (8-12%). Only Synodus foetens and Serranus atrobranchus also made up 5% or more of the catch by biomass or numbers. A rich variety of less important families made up 1-4% of the catch. These families included Ogcocephalidae, Gadidae, Carangidae, Sciaenidae, Mullidae, Labridae, Stromateidae, Scorpaenidae and Bothidae. Species represented in this latter category included Halieutichthys aculeatus, Urophysis floridanus, Centropristis philadelphica, Trachurus lathami, Cynoscion arenarius, Mullus auratus, Upeneus parvus, Hemipteronotus novacula, Peprilus burti, Prionotus rubio, Prionotus stearnsi, and Trichopsetta ventralis.

Faunal composition was very similar along the entire 110-m bathymetric contour from the Mississippi River delta to the Rio Grande except for large changes in the abundance of Stenotomus caprinus, Pristipomoides aquilonaris and Serranus atrobranchus. Stenotomus caprinus made up only

about 11-12% of the biomass and numbers off south Texas in contrast to about 30-37% in the north Texas - Louisiana area. The change in abundance of this species proceeding westerly may be real, because Hildebrand (1954) reported similar observations in 33-40 m: S. caprinus was very abundant off central Texas but uncommon 160 km to the west. Pristipomoides aquilonaris and Serranus atrobranchus greatly increased in biomass and numbers proceeding westerly and apparently replaced Stenotomus caprinus off south Texas. Pristipomoides aquilonaris constituted 20-33% of the fauna off south Texas but only 9-15% in the north Texas - Louisiana area. Similarly, Serranus atrobranchus made up 7-17% of the fauna off south Texas but only 2-5% off north Texas - Louisiana.

The fish community typical of the brown shrimp grounds apparently extends to at least 110 m. The ichthyofauna and the percentage compositions reported herein are very similar to the fauna that Chittenden and McEachran (1976) reported typical of the brown shrimp grounds. Stenotomus caprinus, the dominant species, made up 39% by number of the fishes on the brown shrimp grounds and 37% at 110 m in the north Texas - Louisiana area which is geographically closest to the locations where Chittenden and McEachran collected. Serranus atrobranchus constituted 2-3% of the fauna in these two areas, and the Triglidae made up 17-18%. Pristipomoides aquilonaris made up 9% by number of the fishes at 110 m in the north Texas - Louisiana area but only 1% on the brown shrimp grounds. Similarly, Compton (unpublished MS) found Pristipomoides aquilonaris abundant at 145-275 m in contrast to Hildebrand (1954) who captured only 76 specimens in water primarily about 18-44 m deep. Therefore, this species might occur primarily on the outer continental shelf and upper slope

The bathymetric limits of the brown shrimp grounds on the outer shelf are not clear, because the fauna deeper than 110 m has not been described. However, Chittenden and McEachran (1976) noted that only a narrow portion of the shelf lies between 110-182 m and suggested that this area may simply be a transition zone for the fish faunas of the brown shrimp grounds and the continental slope. The apparent bathymetric changes in abundance of Pristipomoides aquilonaris agree with that view.

Literature Cited

Bailey, R.M., J.E. Fitch, E.S. Herald, E.A. Lachner, C.C. Lindsay, C.R. Robins, and W.B. Scott. 1970. A list of common and scientific names of fishes from the United States and Canada. Amer. Fish. Soc., Spec. Pub. No. 6. 149 p.

Baughman, J.L. 1950a. Random notes on Texas fishes. Part I. Tex. J. Sci. 2:117-138.

Baughman, J.L. 1950b. Random notes on Texas fishes. Part II. Tex. J. Sci. 2:242-263.

Bechtel, T.J. and B.J. Copeland. 1970. Fish species diversity indices as indicators of pollution in Galveston Bay, Texas. Contrib. Mar. Sci. Univ. Tex. 15:103-132.

Bright, T.J. and C. Cashman. 1974. Fishes, p. 339-409. In: T.J. Bright and L.H. Pequegnat (Eds.). Biota of the West Flower Garden Bank. Gulf. Publ. Co., Houston, Tex. 435 p.

Bullis, H.R., Jr. and J.S. Carpenter. 1968. Latent fishery resources of the central West Atlantic region, p. 61-64. In: The future of the fishing industry of the United States. Univ. Wash. Pub. Fish. New. Ser. Vol. 4. 101 p.

Chittenden, M.E., Jr. and J.D. McEachran. 1976. Composition, ecology, and dynamics of demersal fish communities on the northwestern Gulf of Mexico continental shelf, with a similar synopsis for the entire Gulf. Sea Grant Pub. No. TAMU-SG-76-208. 104 p.

Compton, H.W., Jr. Northwestern Gulf of Mexico Marine Fisheries Investigation. Tex. Parks Wildl. Dep., Compl. Rep. Comm. Fish. Res. Develop. Act. 1970. 23 p. Unpublished MS.

Franks, J.S., J.Y. Christmas, W.L. Siler, R. Combs, R. Waller, and C. Burns. 1972. A study of the nektonic and benthic faunas of the shallow Gulf of Mexico off the state of Mississippi. Gulf. Res. Rep. 4:1-148.

Gunter, G. 1938. Seasonal variations in abundance of certain estuarine and marine fishes in Louisiana, with particular reference to life histories. Ecol. Monogr. 8:313-346.

Gunter, G. 1941. Relative number of shallow water fishes of the northern Gulf of Mexico, with some records of rare fishes from the Texas coast. Amer. Midl. Nat. 26:194-200.

Gunter, G. 1945. Studies on marine fishes of Texas. Pub. Inst. Mar. Sci. Univ. Tex. 1:1-190.

Gunter, G. 1958. Population studies of the shallow water fishes of an outer beach in south Texas. Pub. Inst. Mar. Sci. Univ. Tex. 5:186-193.

Hildebrand, H.H. 1954. A study of the fauna of the brown shrimp (Penaeus aztecus Ives) grounds in the western Gulf of Mexico. Pub. Inst. Mar. Sci. Univ. Tex. 3:229-366.

Hoese, H.D. 1958. A partially annotated checklist of the marine fishes of Texas. Pub. Inst. Mar. Sci. Univ. Tex. 5:312-352.

Hoese, H.D., B.J. Copeland, F.N. Moseley and E.D. Lane. 1968. Fauna of the Aransas Pass Inlet, Texas. III. Diel and seasonal variations in trawlable organisms of the adjacent area. Tex. J. Sci. 20:33-60.

Krebs, C.J. 1972. Ecology. Harper Row Publ. New York. 694 p.

McFarland, W.N. 1963. Seasonal change in the number and the biomass of fishes from the surf at Mustang Island, Texas. Pub. Inst. Mar. Sci. Univ. Tex. 9:91-105.

Miller, J.M. 1965. A trawl study of the shallow Gulf fishes near Port Aransas, Texas. Pub. Inst. Mar. Sci. Univ. Tex. 10:80-108.

Moore, D., H.A. Brusher, and L. Trent. 1970. Relative abundance, seasonal distribution and species composition of demersal fishes off Louisiana and Texas, 1962-1964. Contrib. Mar. Sci. Univ. Tex. 15:45-70.

Springer, S. and H. Bullis, Jr. 1956. Collections by the Oregon in the Gulf of Mexico. U.S. Fish. Wildl. Serv., Spec. Sci. Rep. Fish. No. 196. 134 p.

Table 1. Percentage compositions of the fish fauna collected at a depth of 110 m. Weight is in grams.

Taxon	ALL STATIONS		OFF SOUTH TEXAS		OFF NORTH TEXAS-LOUISIANA	
	By Weight	By Number	By Weight	By Number	By Weight	By Number
Rajidae	.29	.11	.10	.10	.35	.12
Raja olseni	.08	.03	0	0	.11	.04
Raja texana	.18	.05	.10	.10	.20	.04
Raja sp.	.03	.03	0	0	.04	.04
Congridae	.04	.14	.07	.10	.03	.16
Neoconger mucronatus	.01	.03	.07	.10	.01	.04
Neoconger sp.	.03	.08	0	0	.02	.08
Uroconger syringinus	0	.03	0	0	0	.04
Synodontidae	8.37	2.87	6.18	2.44	9.18	3.03
Synodus foetens	8.37	2.87	6.18	2.44	9.18	3.03
Ariidae	.19	.08	0	0	.26	.11
Arius felis	.19	.08	0	0	.26	.11
Batrachoididae	.14	.38	.18	.49	.13	.34
Porichthys porosissimus	.14	.38	.18	.49	.13	.34
Antennariidae	.04	.03	0	0	.06	.04
Antennarius radiosus	.04	.03	0	0	.06	.04
Ogcocephalidae	.73	3.17	.50	3.12	.82	3.19
Halieutichthys aculeatus	.33	2.43	.36	2.44	.32	2.43
Ogcocephalus sp.	.40	.74	.14	.68	.50	.76
Gadidae	2.96	1.61	4.65	2.64	2.35	1.22
Urophycis cirratus	.89	.49	.83	.59	.91	.46
U. floridanus	1.41	.76	2.29	1.37	1.09	.53
U. sp.	.66	.36	1.53	.68	.35	.23

Table 1 continued

Taxon	ALL STATIONS		OFF SOUTH TEXAS		OFF NORTH TEXAS-LOUISIANA	
	By Weight	By Number	By Weight	By Number	By Weight	By Number
Ophidiidae	.28	.25	.56	.39	.18	.19
Lepophidium sp.	.28	.25	.56	.39	.18	.19
Macrouridae	.28	.93	0	0	.39	1.29
Nezumia bairdi	.28	.93	0	0	.39	1.29
Serranidae	6.74	11.03	9.44	18.86	5.72	8.00
Centropristis philadelphica	3.51	2.27	2.45	1.57	3.89	2.54
Centropristis sp.	.04	.03	0	0	.05	.04
Diplectrum bivittatum	.01	.03	0	0	.01	.04
Diplectrum formosum	.08	.05	.30	.20	0	0
Epinephelus flavolimbatus	.02	.03	0	0	.03	.04
Pikea mexicana	.09	.16	.03	.10	.11	.19
Serranus atrobranchus	2.99	8.46	6.66	16.99	1.63	5.15
Priacanthidae	.28	.11	0	0	.38	.15
Priacanthus arenatus	.28	.11	0	0	.38	.15
Branchiostegidae	.87	.46	1.09	.59	.78	.42
Caulolatilis cyanops	.38	.16	.16	.10	.46	.19
Caulolatilis sp.	.49	.30	.93	.49	.32	.23
Carangidae	1.64	1.48	.75	.49	1.97	1.86
Chloroscombrus chrysurus	.28	.19	0	0	.38	.27
Trachurus lathami	1.31	1.26	.75	.49	1.52	1.55
Vomer setapinnis	.05	.03	0	0	.07	.04

Table 1 continued

Taxon	ALL STATIONS		OFF SOUTH TEXAS		OFF NORTH TEXAS-LOUISIANA	
	By Weight	By Number	By Weight	By Number	By Weight	By Number
Lutjanidae	19.89	11.93	33.51	20.04	14.84	8.79
Lutjanus campechanus	.25	.14	.42	.20	.18	.11
Ocyurus chrysurus	.05	.03	0	0	.07	.04
Pristipomoides aquilonaris	19.59	11.76	33.09	19.84	14.59	8.64
Sparidae	25.15	30.11	10.98	12.21	30.39	37.06
Stenotomus caprinus	25.15	30.11	10.98	12.21	30.39	37.06
Pomadasyidae	.02	.03	.09	.10	0	0
Orthopristis chrysoptera	.02	.03	.09	.10	0	0
Sciaenidae	4.00	1.74	5.35	3.23	3.54	1.18
Cynoscion arenarius	2.57	.68	3.10	1.07	2.41	.53
Cynoscion nothus	.24	.08	.33	.20	.21	.04
Equetus acuminatus	.13	.14	.36	.39	.04	.04
Equetus umbrosus	.11	.05	.42	.20	0	0
Equetus sp.	.18	.16	.52	.39	.06	.08
Leiostomus xanthurus	.14	.08	0	0	.19	.11
Menticirrhus americanus	.13	.05	0	0	.18	.08
Micropogon undulatus	.50	.50	.62	.98	.45	.30
Mullidae	2.06	2.89	2.71	2.93	1.83	2.88
Mullus auratus	1.09	1.01	1.64	1.56	.89	.80
Upeneus parvus	.97	1.88	1.07	1.37	.94	2.08
Labridae	1.11	.49	1.28	.79	1.05	.38
Hemipteronotus novacula	1.11	.49	1.28	.79	1.05	.38

Table 1 continued

Taxon	ALL STATIONS		OFF SOUTH TEXAS		OFF NORTH TEXAS-LOUISIANA	
	By Weight	By Number	By Weight	By Number	By Weight	By Number
Percophididae	.03	.03	0	0	.04	.04
Bembrops gobiodes	.03	.03	0	0	.04	.04
Uranoscopidae	.12	.11	.15	.20	.11	.08
Kathetostoma albigutta	.12	.11	.15	.20	.11	.08
Trichiuridae	.18	.08	0	0	.24	.11
Trichiurus lepturus	.18	.08	0	0	.24	.11
Stromateidae	2.36	1.31	1.88	1.37	2.54	1.29
Peprilus paru	.66	.22	0	0	.90	.30
Peprilus burti	1.70	1.09	1.88	1.37	1.64	.99
Scorpaenidae	.99	1.64	.76	1.28	1.07	1.79
Scorpaena calcarata	.18	.33	.10	.20	.20	.38
Scorpaena sp.	.19	.36	.22	.59	.18	.27
Pontinus longispinis	.60	.90	.44	.49	.66	1.06
Pontinus sp.	.02	.05	0	0	.03	.08
Triglidae	13.43	18.33	13.55	19.93	13.40	17.70
Bellator militaris	.29	.38	.80	.98	.10	.15
Peristedion miniatum	.31	.52	0	0	.43	.72
Peristedion sp.	.24	.44	0	0	.33	.61
Prionotus martis	.01	.03	.03	.10	0	0
Prionotus paralatus	8.20	11.85	12.44	18.26	6.63	9.36
Prionotus salmonicolor	.01	.03	.05	.10	0	0
Prionotus rubio	3.98	3.28	.18	.29	5.39	4.43
Prionotus stearnsi	.39	1.80	.05	.20	.52	2.43

Table 1 continued

Taxon	ALL STATIONS		OFF SOUTH TEXAS		OFF NORTH TEXAS-LOUISIANA	
	By Weight	By Number	By Weight	By Number	By Weight	By Number
Bothidae	4.03	5.49	4.96	6.57	3.70	5.09
Ancylopsetta dilecta	.80	.60	.97	.68	.73	.57
Ancylopsetta quadrocellata	.14	.05	0	0	.19	.08
Cyclopsetta chittendeni	.90	.30	1.34	.39	.74	.27
Etropus crossotus	.13	.25	.29	.59	.06	.11
Syacium gunteri	.29	.60	.49	1.00	.22	.46
Trichopsetta ventralis	1.77	3.69	1.87	3.91	1.76	3.60
Soleidae	.03	.08	.07	.20	.01	.04
Achirus lineatus	.03	.08	.07	.20	.01	.04
Cynoglossidae	.05	.11	0	0	.06	.15
Symphurus diomedianus	.02	.03	0	0	.02	.04
Symphurus plagiusa	.03	.08	0	0	.04	.11
Balistidae	.06	.08	0	0	.08	.12
Balistes capriscus	.03	.03	0	0	.04	.04
Monacanthus hispidus	.03	.05	0	0	.04	.08
Tetraodontidae	.28	.25	.39	.40	.23	.19
Lagocephalus laevigatus	.21	.14	.26	.20	.18	.11
Sphoeroides dorsalis	.07	.11	.13	.20	.05	.08
Unidentified	3.37	2.65	.93	1.66	4.27	3.03
TOTALS	100	100	100	100	100	100

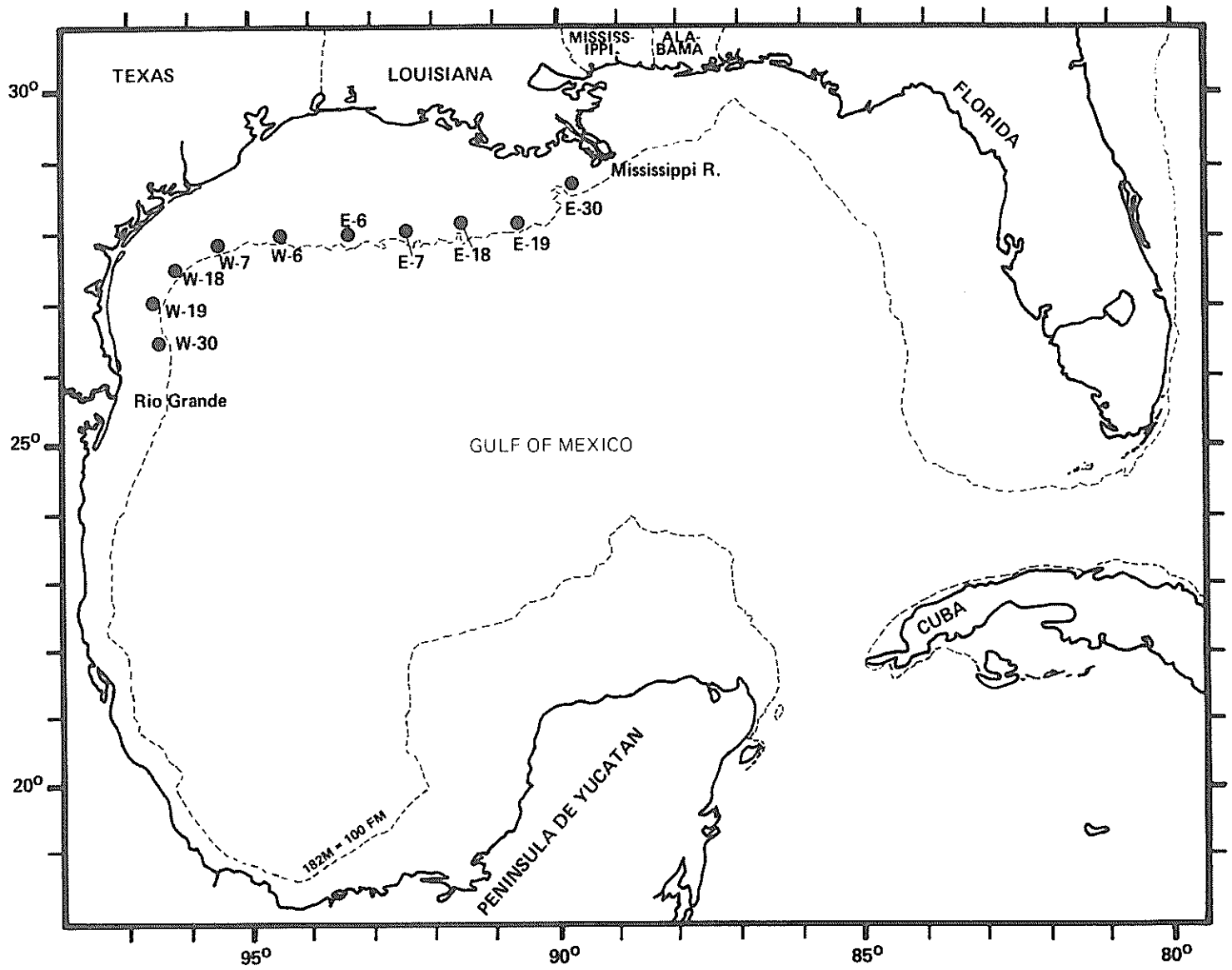

Figure 1. The Gulf of Mexico showing locations sampled. Station designations correspond to those of Moore et al. (1970).