

STUDY TITLE: Eastern Gulf of Mexico OCS Ichthyoplankton Study, FY 1977

REPORT TITLE: Ichthyoplankton Abundance and Diversity in the Eastern Gulf of Mexico

CONTRACT NUMBERS: BLM: CT7-28

SPONSORING OCS REGION: Gulf of Mexico

APPLICABLE PLANNING AREAS: Eastern Gulf of Mexico

FISCAL YEAR OF PROJECT FUNDING: 1977

COMPLETION DATE OF REPORT: June 1979

COSTS: FY 1977: \$88,851

CUMULATIVE PROJECT COST: \$88,851

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KEY WORDS: Eastern Gulf; biology; fish; ichthyoplankton; abundance; distribution; spawning; Loop Current; hydrography

BACKGROUND: Information concerning the early life stages of fishes is important for management of commercial and recreational fisheries. Early life stages of fishes are subject to high mortality and may serve as indicators of spawning period and recruitment strength. To augment environmental baseline information for the Gulf of Mexico, the U.S. Department of the Interior supported a four-year survey of ichthyoplankton abundance and distribution in the eastern Gulf of Mexico.

OBJECTIVES: (1) To determine kinds and abundances of fish larvae that occurs in the eastern Gulf of Mexico; (2) to elucidate spatial and temporal spawning patterns of ecologically and economically important fishes; and (3) to determine environmental variables correlated with species success.

DESCRIPTION: The survey area extended from 24°45'N to 30°15'N lat, and west off Florida to 88°W long. Seventeen cruises were conducted from 1971 to 1974 and a total of 869 stations were sampled. Sampling stations were spaced at 28-km intervals and were parallel to latitude lines. Data recorded included position, depth of tow, volume filtered, surface temperature, surface salinity, zooplankton volume, total eggs, and total

fish larvae. Collections were made using a 61-cm bongo net and a 1-m diameter plankton net. Oblique tows were made to within 5 m of the bottom or to 200 m depth at deep stations. All ichthyoplankton samples were preserved in 10% formalin in the field, then sorted, counted, measured, and transferred to 5% buffered formalin in the laboratory. Various statistical and numerical techniques were used in data analysis, including index of abundance, estimated total abundance, estimated biomass, and species diversity (Shannon-Weaver), evenness, species richness (Simpson's), and mortality estimates. Bivariate correlation analysis was used to examine associations between \log^{10} abundance of selected larval species and environmental variables.

SIGNIFICANT CONCLUSIONS: Eastern Gulf of Mexico ichthyoplanktonic assemblages were abundant and diverse. Spawning seasons for many species were discerned. There was no positive correlation between environmental variables and larval species abundances. Some species had affinities for the Loop Current.

STUDY RESULTS: A total of 143,034 larvae and 304,620 eggs were collected. Ninety-one families represented by 161 genera and 173 species were recorded. The 10 most common families, ranked in order of abundance, were Clupeidae (sardines and herrings), Gobiidae (gobies), Bothidae (left-eyed flounders), Myctophidae (lanternfishes), Serranidae (seabasses, groupers, and sand perches), Carangidae (jacks and pompanos), Synodontidae (lizardfishes), Ophidiidae (cusk eels, brotulas), Bregmacerotidae (codlets), and Labridae (wrasses). Clupeids and gobiids were most common, contributing 35.6 and 15.6%, respectively, to the total catch in waters <100 m deep. Myctophids were the predominant larval family in waters >100 m. In this study, 59,701 larvae were identified to species, which is 41.7% of all larvae that were collected. Ten species accounted for 46,637 larvae, which is 78.1% of all larvae identified to species. Most common species were the Spanish sardine *Sardinella anchovia*, Atlantic thread herring *Opisthonema oglinum*, round scad *Decapterus punctatus*, and the sand perch *Diplectrum formosum*.

Annual abundances of some common species varied considerably from year-to-year. Mortality estimates were lowest for short-lived species (clupeids) with higher growth rates, and highest for robust perciforms (lutjanids, haemulids, and carangids). Biomass estimates indicate that *O. oglinum*, *S. anchovia*, and *D. punctatus* exceeded 100,000 MT. Bluefin tuna *Thunnus thynnus* biomass was estimated between 25,000 and 48,000 MT. Total biomass for pelagic fishes was between 1.5 and 3.0 x 10⁶ MT while total demersal species biomass was below 1.0 x 10⁶ MT.

The largest catches of larval fishes were taken during spring and summer, indicating a peak spawning period. Spring and summer spawners included *O. oglinum*, *D. punctatus*, *S. anchovia*, and dusky flounder *Syacium papillosum*. Occurrences of *D. formosum* indicated year-round spawning while another serranid, the black sea bass *Centropristis striata*, spawned from fall to spring. Snappers (*Rhomboplites aurorubens*, *Lutjanus* spp., and *Ocyurus chrysurus*), and grouper (*Epinephelus morio*) were spring and summer spawners. Mackerels (*Scomberomorus cavalla* and *S. maculatus*) were not common in collections and probably do not spawn much in the eastern Gulf. Bregmacerotids spawn year-round with some depth segregation between species.

Diversity estimates did not show appreciable seasonal or north-south differences. Onshore vs. offshore diversities were different with ichthyoplankton diversity highest in the offshore zone (>100 m). Evenness was higher at depths >50 m. From the 94 species employed in the calculations, a mean of 49.8 species per cruise was observed. Diversity estimates could change if more of the unidentified species (i.e., gobiids) were incorporated. Numerical dominance by relatively few species of clupeids caused inshore diversity estimates to be low.

Correlations between abundance of larval fishes and various environmental variables were generally not significant. Sampling artifacts and temperature and salinity measurement procedures may have contributed to the lack of correlation. Species exhibiting positive affinity for the Loop Current included the myctophids *Myctophum nitidulum* and *Diogenichthys atlanticus*, gonostomatids *Gonostoma elongatum* and *Vinciguerrria nimbaria*, and bregmacerotids *Bregmaceros atlanticus* and *Bregmaceros* Type A.

STUDY PRODUCT: Houde, E. D., J. C. Leak, C. E. Dowd, S. A. Berkeley, and W. J. Richards. 1979. Ichthyoplankton Abundance and Diversity in the Eastern Gulf of Mexico. A final report by Rosenstiel School of Marine and Atmospheric Science, University of Miami and National Marine Fisheries Service for the U.S. Department of the Interior, Bureau of Land Management Gulf of Mexico OCS Office, New Orleans, LA. NTIS No. PB299-839/AS. Contract No. AA550-CT7-28. 546 pp.