

**STUDY TITLE:** Across-Shelf Larval, Postlarval, and Juvenile Fish Collected at Offshore Oil and Gas Platforms and a Coastal Rock Jetty West of the Mississippi River Delta

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**BACKGROUND:** Oil and gas platforms can enhance fisheries by providing attachment substrate for habitat-limited sessile invertebrates, thereby creating food and habitat for reef-dependent species that are trophically-dependent on sessile and motile invertebrates associated with reefs. Since reef fish assemblages are among the most diverse and taxonomically rich in the aquatic biosphere, platform communities may significantly enhance biodiversity. In addition, oil and gas structures may offer refugia for species that are trophically-independent of the biofouling community, but are ecologically-important resident, seasonal, or transient members of the hard substrate fish community. The extensive range of this artificial substrate may also serve as migratory routes for tropical and subtropical species.

**OBJECTIVES:** (1) To provide information on the role that oil and gas platforms may play as nursery/recruitment grounds and/or refugia for postlarval and juvenile fish, which could contribute to fish production. (2) To respond to specific requests for more basic

biological information on reef fish, e.g., larval, postlarval, and juvenile taxonomy, seasonality, lunar periodicity, distribution, and relative abundance. (3) To evaluate the ecological significance that this artificial habitat building, which has occurred on an unprecedented scale in the north central Gulf, may have had on the early life history stages of fish.

**DESCRIPTION:** Ichthyoplankton and juvenile fish assemblages were sampled at three petroleum platforms and a coastal rock jetty, which served as a low salinity, artificial habitat end-member. Mobil's Green Canyon (GC) 18 was sampled monthly during new moon phases over a 2-3 night period during July 1995-June 1996. Mobil's Grand Isle (GI) 94B was sampled twice monthly during new and full moon phases over a three-night period during April-August 1996. Exxon's South Trimbalier (ST) 54G was sampled twice monthly during new and full moon periods during April-September 1997. The stone rubble jetties at the terminus of Belle Pass near Fourchon, Louisiana were also sampled over a two night period in 1997 simultaneously with the sampling of ST 54. At the platforms, fish larvae and juveniles were collected within the platform structure using passive plankton nets and light traps fished at depth (approximately 20 meters) and near-surface, and about 20 meters downstream of the platforms with a light-trap floated downstream on the surface. At Belle Pass, fish larvae and juveniles were collected with light-traps deployed at the surface within two meters of the rock walls and with a bow-mounted plankton pushnet fished along the length of the jetty.

**SIGNIFICANT CONCLUSIONS:** This study represents the first comprehensive look at the ichthyoplankton and juvenile fish assemblages collected within oil and gas platforms in the northern Gulf of Mexico. It is also a first attempt at comparing such assemblages across different depth zones and geographical regions. It is apparent that a diverse larval and juvenile fish community is supplied to, and/or inhabits the waters near the platforms and that these structures may be important to reef fish feeding or population dynamics. From a management perspective, fish early life history data from a cross-shelf study of petroleum platforms could provide useful information in deciding the future placement of artificial structures and in determining whether or not the platforms serve as nursery areas/refugia for reef species. Based on our results, two obvious conclusions stand out, the peak in taxonomic richness and diversity at the mid-shelf platform (GI 94) and the relatively low abundance of reef-associated and reef-dependent postlarvae and juveniles present at the platform.

**STUDY RESULTS:** In general, while reef-associated and reef-dependent taxa were collected at all platform sites, taxonomic richness and diversity was highest at GI 94 (mid-shelf). Due to the pelagic nature of most reef-dependent eggs and larvae, dispersal in the oceanic environment plays a large role in the eventual settlement and recruitment of postlarvae and juveniles to adult environments. While some studies have determined mechanisms of larval retention in reef environments, it is widely believed that recruitment is variable and dependent, in part, on the supply from nearby reefs. Off the coast of Louisiana most oil and gas platforms are concentrated along the inner and mid-shelf within the 200-meter isobath. At GI 94, the intermediate location, depth, and proximity to a high density surrounding platforms may create generally

favorable conditions for the recruitment of reef taxa. The presence and proximity of upstream reefs and spawning habitats, therefore, may play an important role in the eventual makeup of the pre-adult assemblages.

The fact that we collected relatively few individuals of reef-dependent and reef-associated taxa, particularly lutjanid and serranid specimens, is not surprising for several reasons. First of all, due to the high mortality rates experienced by pelagic larvae prior to settlement, reef-dependent juveniles are relatively rare in general. This, coupled with potentially high predation rates at the settlement site itself, may result in a very low abundance of juveniles available for capture. Secondly, recruitment events for these taxa can be extremely episodic, with most reef fish replenishing over the course of 1-3 nights. Although we targeted peak times of settlement and recruitment (new and full moon periods), it is still very possible that we missed settlement peaks through the course of the study.

The abundance of postlarval and juvenile synodontids and scombrids near the platform suggests that predation pressure is high. This may also contribute to the relatively low numbers of reef-dependent juveniles collected, since most synodontids and scombrids are piscivorous as early as the postlarval stage. The high numbers of piscivorous juveniles collected in our study, primarily with light-traps, indicate that predation is important in determining local reef assemblages.

While oil and gas platforms may be very suitable habitat for adult fishes, the physical structure of these artificial reefs may not be ideal for settling postlarvae and juveniles. Previous studies have shown that smaller reefs tend to hold a greater cumulative number of total and resident species, higher fish densities, and more settlers. The higher carrying capacity and settlement success of smaller reefs is probably a function of their: 1) greater edge effect (higher ratio of perimeter to reef area); 2) lower vertical relief which often favors juvenile over adult reef fish; and 3) greater availability of small shelter holes, or porosity, which has been repeatedly shown to be important for post-settlement survival. Petroleum platforms, in contrast, are large reefs and are generally characterized as having a higher profile (high vertical relief), less complexity, and lower porosity than natural reefs.

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