

STUDY TITLE: Importance of Zooplankton in the Diets of Blue Runner (*Caranx crysos*) Near Offshore Petroleum Platforms in the Northern Gulf of Mexico

REPORT TITLE: Importance of Zooplankton in the Diets of Blue Runner (*Caranx crysos*) Near Offshore Petroleum Platforms in the Northern Gulf of Mexico.

CONTRACT NUMBER: 30951-17802

SPONSORING OCS REGION: Gulf of Mexico

APPLICABLE PLANNING AREA: Central Gulf of Mexico

FISCAL YEAR(S) OF PROJECT FUNDING: 2000; 2001; 2002

COMPLETION DATE OF REPORT: February 2003

COST(S):

PROJECT MANAGER(S): M.C. Benfield, S.F. Keenan

AFFILIATION: Louisiana State University, Coastal Fisheries Institute

ADDRESS: Wetland Resources Building, Baton Rouge, LA 70803

PRINCIPAL INVESTIGATOR(S): M.C. Benfield, S.F. Keenan

KEY WORDS: Zooplankton; diet; blue runner; *Caranx crysos*; offshore petroleum platforms; northern Gulf; acoustic techniques; acoustic Doppler current profiler; biology; artificial reef; stomach contents.

BACKGROUND: There are over 4000 offshore petroleum platforms in the northern Gulf of Mexico. Large numbers of reef-associated and pelagic fish species are associated with these structures, but little is known about the relationships between platforms and fish communities. A preliminary study by our group indicated that zooplankton were important in the diets of a pelagic fish (*Caranx crysos*) commonly found around Gulf platforms in the summer months. Related research has indicated that zooplankton densities may be elevated near platforms, which may provide a trophic subsidy to these fish populations. This project was initiated to examine the role of zooplankton in the diets of blue runner and evaluate zooplankton spatial and temporal distribution near platforms through traditional (net collections) and acoustic techniques.

OBJECTIVES: (1) To quantify the diets of platform-associated and open water adult blue runner; (2) To evaluate the diel feeding periodicity, diel shifts in prey selection, and prey size selection of platform-associated blue runner; (3) To evaluate zooplankton composition and abundance near two petroleum platforms; and (4) To demonstrate the

utility of high-frequency acoustics to visualize the spatial patterns of sound scattering particles near platforms.

DESCRIPTION: The study was conducted on or near mid-shelf platforms located in the north-central Gulf of Mexico. The project consisted of platform-based trips (summer 1996 and 1999) and research cruises (summer 2000) to evaluate the feeding habits of blue runner and distribution of zooplankton in waters near platforms. During 1996 and 1999, sampling was conducted from the Grand Isle 94B (GI94B) platform and the Main Pass 259A (MP259A) platform, respectively. Platform-based sampling consisted of collecting blue runner by hook and line angling using artificial lures. Stomach contents were harvested from each fish and the contents were identified in our Louisiana State University laboratory. Number and wet mass of the contents were used to calculate dietary indices. A limited number of plankton samples were collected to examine prey size selectivity.

In the summer of 2000, research cruises were made aboard a charter fishing vessel to the Viosca Knoll 203A (VK203A) and Main Pass 140A (MP140A) platforms. This vessel was equipped with a 1 m² plankton net and an acoustic Doppler current profiler (ADCP). The use of this vessel provided mobility for sampling in close proximity to the platform as well as far field collections of fish and zooplankton. A total of seven trips were made, which are summarized in the following table:

Date	Destinatio	Objective
30May-1	VK203A	Preliminary cruise, test equipment, identify suitable platforms
5-8 June	VK203A	Plankton net tows (1 day set, 1 night set), blue runner
12-16 June	MP140A	Plankton net tows (2 day, 2 night sets), blue runner
26-29 June	MP140A	Plankton net tows (2 day, 2 night sets), blue runner
17-20 July	VK203A	Plankton net tows (2 day, 2 night sets), blue runner
1-3 August	VK203A	Diel feeding study (n=117), open water blue runner
6-9 August	Open	Open water blue runner trip (n=13)

Blue runner were collected for dietary analysis using identical methods as previous sampling and one trip (1-3 August) was dedicated to evaluating the feeding periodicity of these fish near platforms. Plankton samples were collected during the day and night to examine the distribution of zooplankton in relation to the platforms and examine the relative abundance of zooplankton prey available to blue runner. Acoustic surveys were conducted around each platform following plankton collections. The ADCP provided a qualitative view of the distribution of sound scattering particles (ie. zooplankton) near the platforms.

SIGNIFICANT CONCLUSIONS: Adult blue runner in proximity to offshore petroleum platforms feed primarily on meso- and macro-zooplankton during the day and macro-zooplankton and fish at night. Blue runner in open waters appeared to forage on similar organisms as platform-associated fish, however the sample size (n=14) was limited. Feeding periodicity results showed blue runner around platforms fed after dark, which may be due to the light field produced from the platform. This nocturnal feeding

represents a potential energy subsidy available to fishes near platforms. Plankton sampling did not indicate elevated (or reduced) densities of zooplankton near the structure, however sampling was conducted at distances over 100m from the structure, which may not be close enough to perceive a platform effect. Acoustic surveys indicated sound scattering was greater at night than during the day and scattering was elevated near the platform (<100m) during some surveys.

STUDY RESULTS: A total of 323 platform-associated and 14 open-water adult and sub-adult blue runner were collected over the course of this study, which is the most comprehensive examination of the diets of this species. Adult blue runner were previously considered to be piscivorous, however our findings indicate that zooplankton (e.g. larval and adult decapods, larval stomatopods, hyperiid amphipods, and larval fish) comprise a large proportion of their diet. Feeding periodicity results found the blue runner were capable of feeding throughout the night at the same intensity as the day. Size selectivity results indicated that blue runner consumed larger prey such as fish during the night and smaller decapod crustaceans were consumed during the day.

A total of 168 plankton net tows were conducted; 84 during the day and 84 at night. All plankton tows were conducted between 100–1000m of the respective platform. Although certain zooplankton taxa exhibited increased densities near the platform during some cruises, plankton net sampling did not demonstrate consistently elevated densities of zooplankton in proximity to petroleum platforms. Zooplankton density was generally greater during the night samples, however a significant platform enhancement effect was not observed.

Within each cruise, positive relationships existed between volume scattering strength and zooplankton density and wet mass for many taxa indicating that zooplankton was the primary source of sound scattering recorded by the ADCP. Results of four acoustic surveys were completed for this report. These surveys demonstrated the utility of an ADCP to examine small-scale patterns in sound scattering layers in surface waters around platforms, however preliminary analysis did not establish that elevated (or reduced) levels of scattering existed near platforms.

STUDY PRODUCT(S): Keenan, S.F. 2002. The Importance of Zooplankton in the Diets of Blue Runner (*Caranx crysos*) Near Offshore Petroleum Platforms in the Northern Gulf of Mexico. Master's Thesis. Louisiana State University. Baton Rouge.

Keenan, S.F. and M.C. Benfield, 2002. Zooplanktivory by Blue Runner: An Energetic Subsidy to Gulf of Mexico Fish Populations at Petroleum Platforms. Pages 499-513 *in* M. McKay, J. Nides and D. Vigil editors, Proceedings: Gulf of Mexico Fish and Fisheries: Bringing Together New and Recent Research, October 2001 U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, La.

Keenan, S.F., M.C. Benfield, R.F. Shaw and H.L. Haas, 2000. Importance of Zooplankton to Platform Productivity. Pages 33-41 *in* M. McKay and J. Nides editors,

Proceedings: eighteenth annual Gulf of Mexico information transfer meeting, December 1998. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, La. OCS Study MMS 2000-030.

Keenan, S.F., M.C. Benfield, and R.F. Shaw. In press. Zooplanktivory by blue runner: an energetic subsidy to Gulf of Mexico fish populations at petroleum platforms. Transactions of the American Fisheries Society special publication.

