

**OCS Study
MMS 2007-008**

**ASSESSING THE FATE OF JUVENILE ROCKFISH
AT OFFSHORE PETROLEUM PLATFORMS AND NATURAL REEFS
IN THE SANTA BARBARA CHANNEL**

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TECHNICAL SUMMARY

Study Title: Assessing the Fate of Juvenile Rockfish at Offshore Petroleum Platforms and Natural Reefs in the Santa Barbara Channel

Report Title: Assessing the Fate of Juvenile Rockfish at Offshore Petroleum Platforms and Natural Reefs in the Santa Barbara Channel

Contract Number: 1435-01-04-CA-35031

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Applicable Planning area: Central and Southern California

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Costs: \$249,613

Cumulative Project Cost: \$249,613

Principal Investigator: Milton Love

Key Words: oil platforms, California, Southern California Bight, rockfishes, *Sebastes*, recruitment, juvenile fish, platform decommissioning, bocaccio, *Sebastes paucispinis*, high frequency radar, ocean circulation, water masses, hydrography, coastal currents

Background and Objectives:

There are 27 oil and gas platforms in the waters off California. All platforms have a finite economic life, and the life spans of some California platforms may be nearing an end. Once oil and gas can no longer be produced from a platform, the platform must be removed, a process known as decommissioning. During the decommissioning process, the Minerals Management Service (MMS) conducts detailed environmental reviews of the proposed removal to evaluate the impacts on regional fish populations. The MMS

may consider waiving the removal requirement to accommodate an alternative reefing option such as leaving the platform completely or partially in the water. A major question in the platform reefing debate deals with the issue of whether existing platforms are important to rebuilding local fish stocks whose populations have been seriously depleted. Because fish populations are usually limited by recruitment, habitat, or available energy it is important to determine if platforms provide critical habitat for early life history stages, particularly species that remain at platforms from the time of recruitment through reproductive maturity.

Results from MMS funded research show that platforms uniquely serve as shallow, offshore habitat that is suitable for recruitment of a number of fish species, particularly rockfishes (genus *Sebastes*), that also recruit to nearshore natural reefs. Scuba and submersible surveys show that bocaccio, an over-fished, economically important species, recruit as juveniles to midwater depths at platforms, then descend to the bottom habitat of the structures. These fish remain at the deeper platforms through the age of reproductive maturity. Platforms tend to have higher abundances of adult bocaccio, and other larger species such as cowcod and lingcod, than natural reefs. Platform Gail, for example, has by far the highest densities of mature bocaccio of any natural or human – made habitat, and the potential larval production at Platform Gail is higher than at any other site surveyed. Given that offshore platforms may be quite valuable as fish habitat for recruitment and production, an understanding of processes that affect the temporal and spatial variability of rockfish recruitment at platforms and an assessment of the fate of juvenile rockfishes that settle on platforms and natural reefs are needed.

Knowledge of the potential importance of platforms to the recruitment and survival of depleted rockfish stocks includes an assessment of the connectivity among the platforms and natural reefs, or the degree to which a platform receives individuals from other populations or contributes individuals to other populations. For reef-dwelling species with sedentary adults (e.g., many rockfish species), dispersal of pelagic early life stages (e.g., larvae and pelagic juveniles) by ocean currents is the principal mechanism connecting geographically separated populations. The goals of this project were 1) to determine if the delivery of juvenile rockfishes settling on offshore platforms is linked to ocean currents; and 2) to estimate the proportion of young rockfishes that, if offshore platforms in the eastern Santa Barbara Channel had been removed, would survive to settle out at a natural reef.

Opponents of platform reefing have focused on one aspect of the connectivity scheme between platforms and natural reefs by stating that if the platforms did not exist, all of these young rockfishes would have found, and settled upon natural reefs. Previous MMS-funded research investigated this possibility by simulating drift pathways, derived from high frequency radar measurements of surface currents, from a platform off Point Conception and found that most pelagic juvenile rockfish, bocaccio in particular, settling on the platform would otherwise have been transported offshore by surface currents and perished in the absence of the platform. This project expanded the previous research approach into another important geographic area, the eastern Santa Barbara Channel, where juvenile bocaccio and other rockfishes recruit in high abundances.

Description:

Fish surveys using scuba and oceanographic observations were carried out at two oil/gas production platforms, Gilda and Gail, in the eastern Santa Barbara Channel from May through August 2004. This period corresponds with the season of much of the rockfish recruitment in this area. Platform Gilda (34° 10'N, 119° 25'W; 62 m depth) and Platform Gail (34° 10'N, 119° 25'W; 225 m depth), separated by 7 km, are in a dynamic area where ocean currents are variable over a scale of several days and where fronts and eddies are observed. The specific objectives were 1) to determine if the dynamic, local and regional ocean circulation can account for variation in juvenile rockfish recruitment at platforms; and 2) to identify transport pathways to the platform and to nearshore reefs during the time of recruitment using *in-situ* time-series of the vertical profile of subsurface currents and water mass characteristics at each platform, high-frequency radar to map surface currents, and simulated drifter trajectories from the radar-derived surface current measurements.

Significant Results:

The findings demonstrate that the spatial scale of connectivity for rockfish populations in the eastern Santa Barbara Channel is greater than the Channel itself. Water currents from the Southern California Bight rather than from central California delivered pelagic juvenile rockfishes to offshore platforms, Gilda and Gail, in the eastern Santa Barbara Channel. However, potential for recruitment from local sources (larvae originating from adult populations residing in the Santa Barbara Channel including natural reefs and platforms) is not discounted, since the reconstruction of transport pathways from natal origin to juvenile settlement habitat were beyond the aims of this study.

Some synchrony in the recruitment season occurred among the four most commonly observed taxa of juvenile rockfishes (family Sebastidae): Bocaccio (*Sebastes paucispinis*), treefish (*Sebastes serriceps*), the copper-kelp-gopher-black and yellow complex of rockfishes (*Sebastes caurinus*, *Sebastes atrovirens*, *Sebastes carnatus*, *Sebastes chrysomelas* herein referred to as the copper rockfish complex), and squarespot rockfish (*Sebastes hopkinsi*). The recruitment season for all four taxa commenced after a significant change in surface and subsurface currents and water mass properties at the platforms. Bocaccio and treefish, the only two rockfishes relatively abundant at both Platforms Gilda and Gail, showed two temporal patterns—the seasonality of recruitment and the episodic pulses of settlement within the recruitment season—that were synchronized between the two platforms.

From the analysis of calculated HF radar surface current trajectories from Platform Gilda and subsurface current measurements from ADCPs at both study sites, we estimate that the majority of juvenile rockfish recruits from the offshore eastern Channel platforms, had the habitat not been in place, would have been transported to the mainland coast east of Santa Barbara where rocky reef habitat is uncommon. Future studies with better surface and subsurface current monitoring would improve this estimation. High frequency radar mapping has greatly improved throughout the Channel and coverage will be expanding along the California Coast. High-resolution maps of rocky reef habitat in the Santa Barbara Channel will be available in the future. Our findings have considerable bearing on the issue of high densities of young-of-the-year rockfishes recruiting to oil platforms and the decommissioning options that must eventually be considered for each platform. We conclude that the survivorship of juvenile rockfishes would be

compromised in the absence of the platforms, because the time when the young fish are vulnerable in open water would be considerably extended. Nearshore rocky habitat for settlement is rare along the transport pathways from the platforms when westward currents from the Southern California Bight prevail during the recruitment season.