

TECHNICAL SUMMARY

Study Title: Spatial and Seasonal Variation in the Biomass and Size Distribution of Juvenile Fishes Associated with a Petroleum Platform off the California Coast, 2008-2010

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Sponsoring OCS Region: Pacific

Applicable Planning Area: Central and Southern California

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Cumulative Project Cost: \$460,000

Principal Investigator: Milton Love

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Background and Objectives

The BOEMRE defines decommissioning as the process of ending oil, gas, or sulfur operations and returning the lease or pipeline right-of-way to a condition that meets the requirements of the regulations. The BOEMRE will conduct detailed environmental reviews of any proposed decommissioning projects to evaluate the impacts from platform removal on regional fish populations. When a platform is disassembled, habitat is removed, and numerous fishes and invertebrates are killed. However, yet unknown are the impacts of platform removal on regional populations of coastal organisms, particularly the economically important rockfish species, on the Pacific Outer Continental Shelf (OCS). The assessment of the effects of platform activities and of the habitat created by the structure of platforms on marine populations greatly bears upon decommissioning issues, as questions about essential fish habitat and the ecological role of Pacific OCS platforms are still unresolved.

Platform decommissioning alternatives fall into four general categories: complete removal (the default option), toppling, partial removal, and leave-in-place. The suite of decommissioning alternatives that proposes to leave part or all of the abandoned platform structure in the marine environment is often collectively referred to as “rigs-to-reefs.” At this time there are several key issues in the Pacific OCS platform decommissioning and reefing debate. Because fish populations are usually limited by available habitat,

energy, or recruitment, it is important to determine if platforms provide critical habitat for early life history stages.

Previous BOEMRE-supported research has established that there can be extremely large numbers of young-of-the-year (YOY) rockfishes (of several species) inhabiting the midwater portions of oil platforms. This research documents that 1) Some rockfish species (such as bocaccio, *Sebastes paucispinis*) recruit at far higher densities to some platforms compared to most natural reefs, at densities that are large enough to later positively impact the abundance of the adult stock; 2) These juvenile rockfishes may be at least as healthy (as measured by growth rates) as similar fishes on natural reefs; 3) Subsurface currents likely deliver juvenile rockfishes to the platforms at 25 m or deeper; 4) The timing of settlement pulses is related to variability in current patterns, suggesting that the offshore location and the vertical structure of platforms serve an important function for recruitment (i.e., settlement) of juvenile rockfishes; 5) In the absence of a platform, many of the young-of-year rockfishes would not have been transported by currents to natural reefs and would have perished before finding settlement habitat.

However, in order to understand the environmental consequences of the various decommissioning alternatives on local and regional fish populations, there is a need to know the importance of the platform as depth-stratified fish habitat when compared to ad-

jacent natural reefs of comparable depths. Platforms are structurally similar to pinnacles that steeply rise from the deep to shallow waters. Such natural features, which have been shown to harbor high densities of juvenile fishes, are uncommon along the California coast. This study was designed to evaluate the importance of the vertical structure of the platform as settlement (i.e., recruitment) habitat for juvenile rockfishes, particularly in regard to a decommissioning alternative of cutting off the top of a platform and leaving a subsurface, vertical structure in place.

The primary goal of the present study is to fill gaps in information about the spatial and depth variability in recruitment of juvenile fishes to POCS platforms and natural reefs off of the California coast, particularly in order to analyze the environmental consequences of partial platform removal on local and regional fish populations.

Description

The purpose of this study is to provide BOEMRE with information that can be used to determine the potential importance of platforms to the recruitment and survival of depleted fish stocks. In the decommissioning process, it will be important to understand the role that platforms play as rockfish nursery grounds. BOEMRE defined the following questions:

- 1) What is the effect of depth on juvenile fish density, size distribution, and species composition along the vertical structure of platforms?
- 2) Do platforms provide critical habitat for early life history stages? What is the recruitment value of a platform?

To address these information needs of BOEMRE, we conducted scuba surveys of the fish assemblages around seven platforms that represent all of the various environmental parameters these structures encounter. California platforms are sited in a variety of water masses, bottom depths, and distances from shore. We also conducted scuba surveys on seven representative reefs and three shipwrecks that are in 25 to 30 m of water and that occupy the same water masses as surveyed platforms. Previous studies show that most rockfish recruitment at platforms occurs below 25 m; however, reefs of comparable depth had yet to be surveyed before our study commenced.

This study addresses the first question in three ways: (a) the platform scuba surveys were conducted at three different depths to give some indication of what depth young fishes recruit from the plankton;

(b) fish recruitment to natural reefs whose crests are at depths of 20-35 m (the possible platform topping depths) were surveyed using scuba to characterize the recruiting fish assemblage that might be expected to settle on a topped platform.; and (c) a novel experiment employing fish aggregation devices (FADs) was designed to evaluate the importance of the shallow portion of platforms (<25 m) for recruitment.

Our specific tasks in regard to the second question were to identify (a) what species recruit to platforms and natural reefs, and (b) the differences and similarities of species composition, density, and recruitment timing among platforms and natural reefs. Our findings provide useful information for comparing platforms (and natural reefs) as habitat for young rockfishes.

Significant Results

Visual surveys of fishes were conducted by scuba at seven oil platforms, seven natural reefs, and three shipwrecks from Avila Beach, central California, to Long Beach, southern California, during summer of 2008 and 2009 as scheduled for this project. Sites were surveyed between one and five times in each year. After numerous reports of relatively high abundances of recruiting YOY rockfishes in the Santa Barbara Channel region in spring 2010, we revisited most of the platforms, reefs, and wrecks at least once through the summer. This study provides two lines of evidence that indicate that rockfishes likely will recruit to platforms topped to subsurface depths between 25 and 30 m (the partial removal decommissioning option). The evidence is that: (1) young-of-the-year (YOY) rockfishes are uncommon in shallow waters at platforms; and (2) YOY rockfishes recruit to natural reefs and artificial structures (wrecks) that crest at depths comparable to where decommissioned platforms would be topped. The implication from this study that rockfishes would recruit to a number of the topped platforms is in agreement with surveys of deeper-water reefs that note high, although localized, densities of YOY rockfishes.

Overall, 67 taxa were observed during the two scheduled survey seasons (2008 and 2009) and the supplemental survey season (2010) combined: 45 taxa were seen at platforms, 53 taxa at reefs, and 50 taxa at wrecks. At the platforms, 21 rockfish species were observed; the most abundant were bocaccio, shortbelly rockfish, squarespot rockfish, and widow rockfish. With only two exceptions, all rockfish species

with juvenile or adult representatives on platforms occurred as recently settled YOY in that habitat. Only five rockfish species did not occur at the platforms and were found at either or both reefs and wrecks. Among the 10 most abundant fish taxa at platforms in the two scheduled surveys combined, six were non-rockfishes: blacksmith, jack mackerel, jacksmelt (or topsmelt), Pacific sardine, sharpnose seaperch, and halfmoon. The shell mound at the Platform Hazel site was surveyed in November 2008 and only a few fish of four species (YOY calico rockfish, YOY vermilion rockfish, blackeye goby, and YOY sheephead) were observed. Species-specific summaries of habitat use by rockfishes and non-rockfishes that are numerically important at the platforms and their size distributions are reported.

A consistent pattern among the two scheduled survey seasons and the supplemental survey season was the rarity of YOY rockfishes at the shallowest level of the platforms. In 2008, only one YOY rockfish was observed at the shallowest level among all platforms; in 2009, only 89 YOY rockfishes were observed at the shallowest level of platforms. Moreover, YOY rockfishes predominated the assemblage at the deepest level of the platforms with bocaccio, shortbelly rockfish, squarespot rockfish, and widow rockfish as the most abundant of 21 rockfish taxa observed. YOY rockfish recruitment at the platforms generally was greater in 2009 than in 2008, and higher densities at the deepest level of the platforms accounted for the increase.

Other than the concentration of YOY rockfishes at the deeper levels of the structures, there was no consistent pattern in overall YOY rockfish densities among the platforms between years. In 2008, the average YOY rockfish density was two orders of magnitude higher at Platform Irene than at the other platforms due to a single observation of a very large school of widow rockfish at the middle and deep levels. Rockfish recruitment was weak among the other platforms in 2008 except for squarespot rockfish at Platform Ellen recruiting to the deepest level. In contrast, in 2009, YOY rockfish densities were highest at Platform Gilda. Average densities increased at least two orders of magnitude at this platform and at B, Grace, and Eureka from the previous year. In 2010, YOY rockfish densities at Gilda, Grace, and Gina, three platforms clustered with Gail near the eastern entrance of the Channel, far exceeded densities at all platforms in the two previous years. The increase in each year was primarily due to bocaccio recruitment to the deepest level of the platforms.

Non-rockfishes, in contrast with rockfishes, generally were most abundant at the two shallower levels of the platforms during the two scheduled survey seasons and the supplemental survey season. Jack mackerel, a schooling pelagic species, and blacksmith, a schooling nearshore reef species, were the predominant non-rockfish taxa. Also numerous on occasion were other schooling species: jacksmelt (or topsmelt) and halfmoon. All of these schooling species have warm water affinities. Rockfishes and cabezon, species with cold water affinities, tended to be found at the deep 30-m level of platforms. Non-rockfishes 12 cm TL and less were more abundant by an order of magnitude at platforms off San Pedro than platforms in the Santa Barbara Channel during the two scheduled survey years; in contrast in 2010, the smaller size class of non-rockfishes was uncommon at Ellen and Eureka. Conspicuously rare were non-rockfishes at the northernmost platform, Irene; and like rockfishes, non-rockfishes were absent from the shallowest level. Irene is located off Point Conception, where wind-induced upwelling occurs through much of the year with strong currents directed offshore and turbulent wave surges in surface waters.

The relative abundance of total YOY rockfishes among platforms reefs and wrecks differed between the two scheduled survey seasons. In 2008 the density of YOY rockfishes at reefs and wrecks was no greater than the density at the middle and deep levels of the platforms. In contrast, in 2009, rockfish densities at the deepest level of platforms exceeded the densities at reefs and wrecks. YOY rockfish assemblages at platforms changed between years due to the recruitment of different YOY species; whereas, in contrast, the composition of the YOY rockfish assemblage at reefs and wrecks were more consistent between years and similar among sites. The assemblages from the two deeper levels of the platforms, reefs and wrecks were more similar in 2008 than in 2009. In 2009, the assemblages of the two deeper platform habitats differed from reef habitat; the relatively high density of YOY bocaccio at the two deeper platform level habitats and squarespot rockfish at reef habitat primarily accounted for the dissimilarity.

The supplemental surveys in 2010 documented a strong recruitment year for rockfishes. Clearly, YOY rockfish densities increased at platforms, reefs, and wrecks in 2010 from the previous years. Moreover, YOY rockfish densities at reefs in 2010 increased by an order of magnitude from the previous year to

exceed YOY densities at platforms in 2010. In the two previous years combined, jackmackerel and blacksmith dominated the reef assemblage by total count. In contrast, in 2010, YOY shortbelly rockfish and bocaccio each outnumbered all non-rockfishes counted in the two previous years. YOY squarespot rockfish also were far more abundant in 2010. Similarly at the wrecks in 2010, rockfishes, namely YOY bocaccio, squarespot rockfish, and blue rockfish, were more abundant than all non-rockfishes combined. Strong recruitment of YOY rockfishes in 2010 clearly contributed to the decline in the importance of non-rockfishes from the previous two years and changes in the relative importance of species in the rockfish assemblage at all habitats.

In summary, the findings from this study show that YOY rockfish densities typically are concentrated below the shallow portion of the platform that would be removed should a platform be partially left in place when decommissioned. Additionally, YOY rockfish recruit to reefs and wrecks and these assemblages do not necessarily differ from the assemblage found between 25 and 30 m at platforms. Thus, it is plausible that the environmental consequences on local and regional rockfish populations from the partial removal of any of the platforms in this study will not be significant. However, to complicate the matter, the YOY rockfish assemblage and the abundance of YOY vary spatially and temporally among platforms. If the consequences of full removal of platforms, on a rig-by-rig basis, must be evaluated, then it is particularly important to determine the contribution of each platform to the fish stock in the region.

STUDY PRODUCTS

Report

Love, M. S. and M. M. Nishimoto. 2009. Spatial and seasonal variation in the biomass and size distribution of juvenile fishes associated with a petroleum platform off the California coast, 2008 Annual Report. (U. S. Department of the Interior, Minerals Management Service, Camarillo, CA, 93010, OCS Study MMS)

Poster

Nishimoto, M. M. and M. S. Love. The vertical distribution of young-of-year rockfishes at platforms: the lowdown on partial removal for rig-to-reef conversion. 16th Western Groundfish Conference, April 26 – 30, 2010, Juneau, AK.