Proposal #: 20WCR010-020

Project Title: Toward a More Sustainable and Data-driven Management Paradigm for the Vermilion Rockfish Complex

Applicant: Pacific States Marine Fisheries Commission

Priority Addressed Priority #2 – Science or Technology that Promotes Sustainable U.S. Seafood Production and Harvesting

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Abstract: Stock assessments generate essential scientific information necessary to inform the conservation and management of fish stocks. The Page 1 of 19 Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires using the best scientific information available to manage U.S. commercial and recreational fisheries, preferably managing individual stocks as a taxonomic unit throughout their range to the extent practicable (National Standard 3). For rockfish species within the genus Sebastes, the ability to provide the best scientific information available is challenging due to taxonomic issues. Recent research has revealed that historically-defined taxonomic units have obscured species-level genetic heterogeneity which may be expressed through different distributional and/or biological characteristics of the component groups. Of particular concern is the vermilion rockfish (S. miniatus) stock along the west coast and its virtually indistinguishable cryptic pair – the sunset rockfish (S. crocotulus). The complex supports one of the most valuable recreational fisheries on the west coast, and two previous attempts to assess the assemblage were not endorsed for setting harvest guidelines by the Pacific Fishery Management Council (PFMC) in part because of these species-level differences.

Initial efforts to separate the species using assays targeting mitochondrial DNA (mtDNA) markers had limited success due to mitochondrial introgression (i.e., the entry or introduction of a gene from one gene complex into another [as by hybridization]) from vermilion into sunset. Although nuclear markers such as microsatellites are able to definitively separate the species, associated lab techniques are costly, time-consuming and not appropriate for the production-level analysis needed to process specimens into usable data for stock assessments.

The proposed project will conduct a genomic analysis to distinguish the vermilion rockfish stock along the west coast from sunset rockfish using tissue samples previously collected during fishery-independent resource surveys. Specifically, we propose to use high-throughput sequencing technologies to identify and incorporate nuclear markers known as single nucleotide polymorphisms (SNPs) into an assay that definitively separates the two species. Such an analysis would then enable species-specific demographic and biological analyses to be undertaken, as well as separate samples for the purpose of developing species-specific indices of abundance. This project will leverage a large, existing collection of DNA samples compiled from multiple sources including fishery-independent research surveys, prior genetics research projects, and collections made opportunistically by sport and commercial fishing industry partners. The majority of specimens were obtained from NOAA/NWFSC's Southern California Shelf Rockfish Hook and Line Survey (HLS) and date back to 2004. The HLS was developed in the early 2000s in collaboration with the local commercial passenger fishing vessel (CPFV) industry as a means of improving the information available for stock assessments for groundfish species associated with untrawlable habitat. All HLS specimen and data collections to date are a result of this partnership

between scientists and industry. This includes the efforts of CPFV captains Mike Thompson (project co-PI) and Joe Villareal (project collaborator) who have been involved with the HLS since its inception.

Summary of potential commercial benefits to the fishing community of the research results: The expected outputs from this proposed project will be available for future vermilion rockfish stock assessments, and preliminary results will be shared as they become available with the assessment community to inform discussions related to the timing and prioritization of future stock assessments. Expected benefits of this research include important catch, index, and biological composition data inputs to support a stock assessment for this important species complex and demonstrating how genetic advances can be explicitly and successfully integrated into fishery management. Benefits of a successful stock assessment include the provision of greatly improved scientific advice to the PFMC to determine species-specific sustainable harvest levels with less uncertainty and less risk.