Status of Quillback Rockfish (*Sebastes maliger*) along the Oregon US West coast in 2021

by
Brian J. Langseth[1]
Chantel R. Wetzel[1]
Jason M. Cope[1]
Alison D. Whitman[2]

[1]Northwest Fisheries Science Center, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 2725 Montlake Boulevard East, Seattle, Washington 98112
[2]Oregon Department of Fish and Wildlife, 2040 Southeast Marine Science Drive, Newport, Oregon 97365

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1 Introduction

1.1 Basic Information

This assessment reports the status of quillback rockfish (*Sebastes maliger*) off the Oregon US West Coast using data through 2020. Quillback rockfish is a medium- to large-sized nearshore rockfish found from California to the Gulf of Alaska (**???**). Off the U.S. West Coast quillback rockfish are primarily located north of central California, with rare observations south of Point Conception.

1.2 Life History

Quillback rockfish are found in waters less than 274 meters in depth in nearshore kelp forests and rocky habitat (**???**). The diets of quillback rockfish consist primarily of crustaceans, mollusks, and fish (**???**; **???**). The body coloring or quillback rockfish varies across the coast with northern fish often exhibiting dark brown to olive with southern fish exhibiting yellow to olive-pink variations in color (**???**) which initially led to them being designated as two separate species (*S. caurinus* and *S. vexillaris*).

Limited studies have been performed looking for genetic variation in quillback rockfish across the U.S. West Coast. Genetic work has revealed significant differences between Puget Sound and coastal stocks of quillback rockfish (**???**; **???**), however (**???**) did not find significant differentiation in populations of quillback rockfish between Washington and Alaska when Puget Sound samples were excluded. Significant population sub-division along the U.S. West Coast has been detected for the similar, and more well-studied copper rockfish (*Sebastes caurinus*), indicating limited oceanographic exchange among geographically proximate locations (**???**; **???**; **???**). High site-fidelity (**???**) and relatively small home ranges (**???**) for quillback rockfish would suggest similar patterns of isolation-by-distance as found for other rockfish.

Talk about sexual dimorphism not very present.

Quillback rockfish are a long-lived rockfish and estimated to live at least 90 years (Love 1996), with estimates from Canadian waters as high as 95 years (**???**). Quillback rockfish was

determined to have a vulnerability (V = 2.22) of major concern in a productivity susceptibility analysis (**???**).

1.3 Ecosystem Considerations

Replace text.

1.4 Historical and Current Fishery Information

Replace text.

1.5 Summary of Management History and Performance

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1.6 Foreign Fisheries

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2 Data

A description of each data source is provided below (Figure 1).

2.1 Fishery-Dependent Data

2.2 Fishery-Independent Data

2.2.1 AFSC Slope Survey

The AFSC Slope Survey (Slope Survey) operated during the months of October to November aboard the R/V *Miller Freeman*. Partial survey coverage of the US west coast occurred during the years 1988-1996 and complete coverage (north of 34°30'S) during the years 1997 and 1999-2001. Typically, only these four years that are seen as complete surveys are included in assessments.

2.2.2 California Collaborative Fisheries Research Program

Since 2007, the California Collaborative Fisheries Research Program (CCFRP) has monitored several areas in California to evaluate the performance of Marine Protected Area (MPA)s and understand nearshore fish populations (Wendt and Starr 2009; Starr et al. 2015). In 2017, the survey expanded beyond the four MPAs in central California (Año Nuevo, Point Lobos, Point Buchon, and Piedras Blancas) to include the entire California coast. Fish are collected by volunteer anglers aboard Commercial passenger fishing vessel (CPFV)s guided by one of the following academic institutions based on proximity to fishing location: Humboldt State University; Bodega Marine Laboratories; Moss Landing Marine Laboratories; Cal Poly San Luis Obispo; University of California, Santa Barbara; and Scripps Institution of Oceanography.

Surveys consist of fishing with hook-and-line gear for 30-45 minutes within randomly chosen 500 by 500 m grid cells within and outside MPAs. Prior to 2017, all fish were measured for length and release or descended to depth; since then, some were sampled for otoliths and fin clips.

2.2.3 AFSC/NWFSC West Coast Triennial Shelf Survey

The AFSC/NWFSC West Coast Triennial Shelf Survey (Triennial Survey) was first conducted by the Alaska Fisheries Science Center (AFSC) in 1977, and the survey continued until 2004 (Weinberg et al. 2002). Its basic design was a series of equally-spaced east-to-west transects across the continential shelf from which searches for tows in a specific depth range were initiated. The survey design changed slightly over time. In general, all of the surveys were conducted in the mid summer through early fall. The 1977 survey was conducted from early July through late September. The surveys from 1980 through 1989 were conducted from mid-July to late September. The 1992 survey was conducted from mid July through early October. The 1995 survey was conducted from early June through late August. The 1998 survey was conducted from early June through early August. Finally, the 2001 and 2004 surveys were conducted from May to July.

Haul depths ranged from 91-457 m during the 1977 survey with no hauls shallower than 91 m. Due to haul performance issues and truncated sampling with respect to depth, the data from 1977 were omitted from this analysis. The surveys in 1980, 1983, and 1986 covered the US West Coast south to 36.8°N latitude and a depth range of 55-366 m. The surveys in 1989 and 1992 covered the same depth range but extended the southern range to 34.5°N (near Point Conception). From 1995 through 2004, the surveys covered the depth range 55-500 m and surveyed south to 34.5°N. In 2004, the final year of the Triennial Survey series, the Northwest Fisheries Science Center (NWFSC) Fishery Resource and Monitoring division (FRAM) conducted the survey following similar protocols to earlier years.

2.2.4 NWFSC West Coast Groundfish Bottom Trawl Survey

The NWFSC West Coast Groundfish Bottom Trawl Survey (WCGBTS) is based on a random-grid design; covering the coastal waters from a depth of 55-1,280 m (Bradburn, Keller, and Horness 2011). This design generally uses four industry-chartered vessels per year assigned to a roughly equal number of randomly selected grid cells and divided into two 'passes' of the coast. Two vessels fish from north to south during each pass between late May to early October. This design therefore incorporates both vessel-to-vessel differences in catchability, as well as variance associated with selecting a relatively small number (approximately 700) of possible cells from a very large set of possible cells spread from the Mexican to the Canadian borders.

2.3 Biological Data

2.3.1 Natural Mortality

2.3.2 Maturation and Fecundity

2.3.3 Sex Ratio

2.3.4 Length-Weight Relationship

2.3.5 Growth (Length-at-Age)

2.3.6 Ageing Precision and Bias

2.4 Environmental and Ecosystem Data

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3.1.2 Most Recent STAR Panel and SSC Recommendations (not required for an update assessment)

3.1.3 Response to Groundfish Subcommittee Requests (not required in draft)

3.2 Model Structure and Assumptions

3.2.1 Model Changes from the Last Assessment (not required for an update assessment)

3.2.2 Modeling Platform and Structure

General model specifications (e.g., executable version, model structure, definition of fleets and areas)

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Describe estimated vs. fixed parameters, priors

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Describe all diagnostics

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4.4 Evaluation of Scientific Uncertainty

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5 Acknowledgments

Here are all the mad props!

6 References

Bradburn, M. J., A. A Keller, and B. H. Horness. 2011. "The 2003 to 2008 US West Coast Bottom Trawl Surveys of Groundfish Resources Off Washington, Oregon, and California: Estimates of Distribution, Abundance, Length, and Age Composition." US Department of Commerce, National Oceanic; Atmospheric Administration, National Marine Fisheries Service.

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7 Tables

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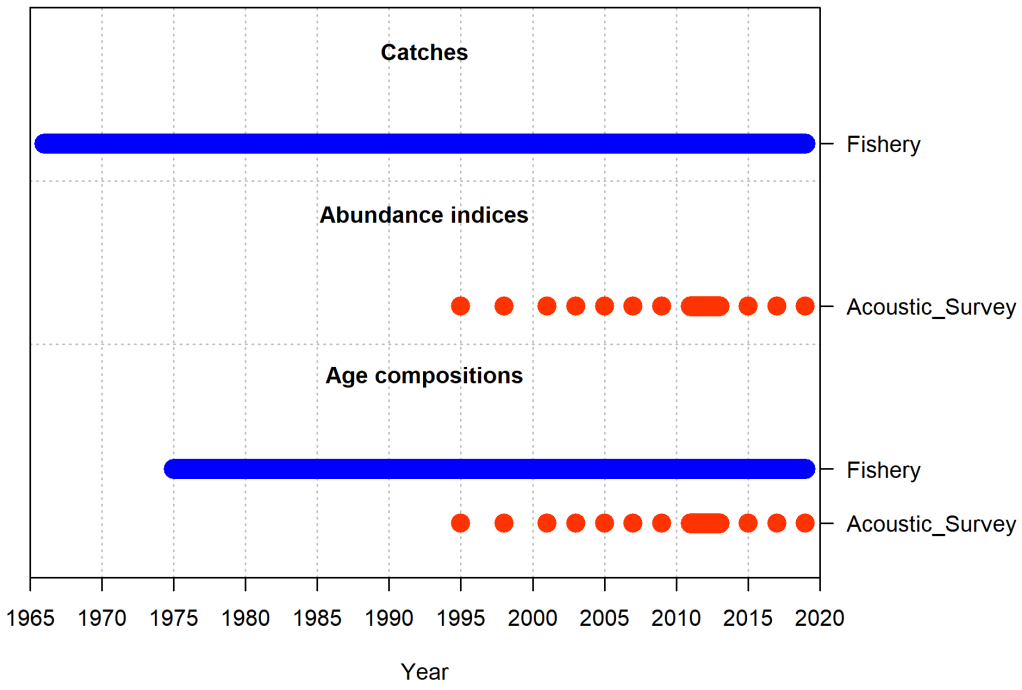

Figure 1: Summary of data sources used in the base model.