Pacific Coast Groundfish Fishery Management Plan

For the California, Oregon and Washington Groundfish Fishery

Appendix F Overfished Species Rebuilding Plans

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1.1 Introduction

This appendix provides the rebuilding plans for the overfished species managed through the Pacific Coast Groundfish Fishery Management Plan consistent with Section 4.6 (Ending Overfishing and Rebuilding). This appendix contains 3 sections: 1) current rebuilding plans, including the rebuilding strategy and parameters and management measures used to limit the catch of each species; 2) a summary of past rebuilding plan parameters; and 3) a summary of the status of each stock at the time it was declared overfished as well as a detailed description of the rebuilding strategy and the communities affected by rebuilding restrictions for each species.

As described in Section 4.6.3.4, if the numerical specification of the harvest control rule or target year for a given overfished species is changed, the new T_{TARGET} and the harvest control rule (type and numerical value) will be published in Federal groundfish regulations and revised in Section 1.2.1 of this appendix. In addition, subsequent SAFE documents or NEPA documents analyzing new harvest specifications and rebuilding plans may include updated values for the parameters listed in Section 4.6.3.3 and Table F-1 in this appendix.

Through each biennial specifications and management measures process the Council may consider changes to rebuilding plans as necessary to respond to the best scientific information available. Any revisions to the rebuilding periods must be consistent with the MSA; rebuilding time periods must be as short as possible, taking into account the status and biology of the depleted species, the socioeconomic needs of west coast fishing communities, and the interaction of the depleted stocks within the marine ecosystem.

Rebuilding plans were first addressed in this FMP through the implementation of Amendment 12 which established a framework for rebuilding plans. Amendment 16-1 was also implemented to address frameworking issues with rebuilding plans and Amendments 16-2 through 16-5 implemented the first rebuilding plans for overfished species.

1.2 Overfished Species Rebuilding Plans

1.2.1 Current Rebuilding Plan Parameters and ACLs

It is likely that over time the parameters listed in this section will change. Consistent with the specifications developed through the Council's biennial specifications and management measures process, the rebuilding parameters and ACLs in this section would be updated following final implementation by NMFS, usually through the publication of a final rule in the *Federal Register*. Further detail on ACLs can be found in the EA for 2019-2020 Harvest Specifications and Management Measures on the Council's website at http://www.pcouncil.org/, as well as the 2018 Stock Assessment and Fishery Evaluation document at https://www.pcouncil.org/wp-content/uploads/2019/01/SAFE_Nov2018_Final.pdf.

Table F-1. Current Rebuilding Parameters and ACLs for 2021 and beyond.

Species	B_0	B_{MSY}	T_{MIN}	$T_{F=0}$	T_{TARGET}	2021 Annual Catch Limit (ACL)	Harvest Control Rule Specification
Yelloweye	1,139 M eggs	508 M eggs	2026	2026	2029	50 mt	SPR 65%

1.2.2 Rebuilding Strategy

This section describes the rebuilding strategy for each species and the management measures used to attain rebuilding.

1.2.2.1 Bocaccio South of 40°10' N latitude

Bocaccio south of 40°10' N lat. was declared successfully rebuilt in 2017 based on a 2017 assessment (He and Field 2018) which indicated the stock was above the $B_{40\%}$ B_{MSY} threshold with a depletion of 48.6% at the start of 2017.

1.2.2.2 Canary Rockfish

Canary rockfish was declared successfully rebuilt in 2016 based on a 2015 assessment (Thorson and Wetzel 2015) which indicated the stock was above the $B_{40\%}$ B_{MSY} threshold with a depletion of 55.5% at the start of 2015.

1.2.2.3 Cowcod South of 40°10' N latitude

Cowcod south of 40°10' N lat. was declared successfully rebuilt in 2019 based on a 2019 assessment (Dick and He 2019) which indicated the stock was above the $B_{40\%}$ B_{MSY} threshold with a depletion of 57% at the start of 2019.

1.2.2.4 Darkblotched Rockfish

Darkblotched rockfish was declared successfully rebuilt in 2017 based on a 2017 assessment (Wallace and Gertseva 2018) which indicated the stock was above the $B_{40\%}$ B_{MSY} threshold with a depletion of 40.03% at the start of 2017.

1.2.2.5 Lingcod

The west coast lingcod stock was declared successfully rebuilt in 2005 after the 2005 assessment indicated the stock's spawning biomass was above the $B_{40\%}$ B_{MSY} threshold with a depletion of 64 percent of unfished biomass ($B_{64\%}$).

1.2.2.6 Pacific Ocean Perch (POP)

Pacific ocean perch was declared successfully rebuilt in 2017 based on a 2017 assessment (Wetzel, *et al.* 2017) which indicated the stock was above the $B_{40\%}$ B_{MSY} threshold with a depletion of 76.6% at the start of 2017.

1.2.2.7 Petrale Sole

Petrale sole was declared successfully rebuilt in 2016 based on a 2015 update assessment (Stawitz, *et al.* 2015), which indicated the coastwide petrale sole stock was successfully rebuilt with a depletion of 31% at the start of 2015.

1.2.2.8 Widow Rockfish

The west coast widow rockfish stock was declared successfully rebuilt in 2011 after the 2011 assessment indicated the stock's spawning biomass was above the $B_{40\%}$ B_{MSY} threshold with a depletion of 51 percent of unfished biomass ($B_{51\%}$).

1.2.2.9 Yelloweye Rockfish

The rebuilding strategy for yelloweye rockfish is a constant SPR harvest rate. A new yelloweye rebuilding plan was adopted in 2018 based on a new assessment (Gertseva and Cope 2017b) and rebuilding analysis (Gertseva and Cope 2017a) indicating stock rebuilding was proceeding faster than expected. The new target year top rebuild is 2029 and the rebuilding harvest control rule is a constant SPR harvest rate of 65 percent (Table F-1). Management measures used to limit the catch of yelloweye rockfish, such that projected impacts to the stock attain rebuilding objectives, include depth-based closed areas where bycatch of overfished species is most likely to occur, based on information retrieved from logbooks, the at-sea observer program, surveys, and other sources. The boundaries vary by season and fishery sector, and may be modified in response to new information about the geographic and seasonal distribution of bycatch.

Yelloweye rockfish impacts in commercial fisheries are managed by implementation of gear- and sector-specific GCAs. Also, trawl IFQ allocations and accumulation limits are structured to minimize the incidental bycatch of yelloweye rockfish in the groundfish bottom trawl fishery.

In addition to the more general measures described above, which are intended to reduce bycatch of all overfished species, several Yelloweye Rockfish Conservation Areas (YRCAs) are in place that prevent recreational groundfish and halibut anglers from targeting this species in areas where they are concentrated. Recreational bag and size limits are also used to manage total yelloweye rockfish fishing mortality.

Given the particular life history characteristics of yelloweye rockfish, the Council will continue to use a species-specific area closure or closures to protect yelloweye rockfish. As new information becomes available on yelloweye rockfish behavior and fisheries interactions with yelloweye rockfish, the boundaries or related regulations concerning the current YRCAs may change, and additional YRCAs may be established by regulation.

1.3 Rebuilding Plan History and Background

This section contains previous rebuilding plan parameters as well as more detailed information on the history of each rebuilding plan since implementation.

1.3.1 Previous Rebuilding Plan Parameters

Table F-2. Specified rebuilding plan parameters at the time of plan adoption under Amendments 16-2 and 16-3.

Species	Year Stock Declared Overfished	Year Rebuilding Plan Adopted	B_0	B_{MSY}	T_{MIN}	T_{MAX}	P_{MAX}	T_{TARGET}	Harvest Control Rule
Bocaccio a/	1999	2004	13,387 B eggs in 2003	5,355 B eggs	2018	2032	70%	2023	F=0.0498
Canary	2000	2003	31,550 mt	12,620 mt	2057	2076	60%	2074	F=0.022
Cowcod	2000	2004	3,367 mt	1,350 mt	2062	2099	60%	2090	F=0.009
Darkblotched	2000	2003	29,044 mt	11,618 mt	2014	2047	80%	2030	F=0.027
Lingcod	1999	2003	28,882 mt N; 20,971 mt S	9,153 mt N; 8,389 mt S	2007	2009	60%	2009	F=0.0531 N; F=0.061 S
POP	1999	2003	60,212 units of spawning output	24,084 units of spawning output	2012	2042	70%	2027	F=0.0082
Widow b/	2001	2004	43,580 M eggs	17,432 M eggs	2026	2042	60%	2038	F=0.0093
Yelloweye	2002	2004	3,875 mt	1,550 mt	2027	2071	80%	2058	F=0.0153

a/ Based on the STATc base model in MacCall (MacCall 2003b).
b/ Based on the Model 8 base model in He, *et al.* (He, *et al.* 2003b).

Table F-3. Specified rebuilding plan parameters revised under Amendment 16-4.

Species	B_0	B_{MSY}	T_{MIN} a/	T_{MAX}	$T_{F=0}$ a/	P_{MAX}	T_{TARGET}	Harvest Control Rule (SPR Harvest Rate)
Bocaccio	13,402 B eggs in 2005	5,361 B eggs	2018	2032	2021	77.7%	2026	77.7%
Canary	34,155 mt	13,662 mt	2048	2071	2053	55.4%	2063	88.7%
Cowcod	3,045 mt	1,218 mt	2035	2074	2035	90.6%	2039	90.0%
Darkblotched	26,650 M eggs	10,660 M eggs	2009	2033	2010	100%	2011	60.7%
POP	37,838 units of spawning output	15,135 units of spawning output	2015	2043	2015	92.9%	2017	86.4%
Widow	49,678 M eggs	19,871 M eggs	2013	2033	2013	95.2%	2015	95.0%
Yelloweye	3,322 mt	1,328 mt	2046	2096	2048	80%	2084	71.9% b/

a/ T_{MIN} is the shortest time to rebuild from the onset of the rebuilding plan or from the first year of a rebuilding plan, which is usually the year after the stock was declared overfished. The shortest possible time to rebuild the stocks with rebuilding plans under consideration in Amendment 16-4 is $T_{F=0}$, which is the median time to rebuild the stock if all fishing-related mortality were eliminated beginning in 2007.

b/ The yelloweye rebuilding plan specified a harvest rate ramp-down strategy before resuming a constant harvest rate in 2011. $F_{71.9\%}$ was the constant harvest rate beginning in 2011.

Table F-4. Specified rebuilding plan parameters revised under Amendment 16-5.

Species	B_0	B_{MSY}	T_{MIN}	$T_{F=0}$	T_{MAX}	T_{TARGET}	2013 Annual Catch Limit (ACL)	Harvest Control Rule Specification
Bocaccio	7,946 B eggs	3,178 B eggs	2018	2018	2031	2022	320 mt	SPR 77.7%
Canary	25,993 mt	10,397 mt	2024	2024	2050	2030	116 mt	SPR 88.7%
Cowcod	2,183 mt	873 mt	2059	2060	2097	2068	3 mt	SPR 82.7%
Darkblotched	32,800 mt	13,112 mt	2012	2016	2037	2025	317 mt	SPR 64.9%
POP	37,780 mt	15,112 mt	2017	2018	2071	2051	150 mt	SPR 86.4%
Petrale sole	25,334 mt	6,334 mt	2014	2014	2021	2016	2,592 mt	25-5 Rule
Yelloweye	994 M eggs	389 M eggs	2044	2047	2083	2074	18 mt	SPR 76%

1.3.2 Rebuilding Plan Background

1.3.2.1 Yelloweye Rockfish

Status of the Yelloweye Rockfish Stock and Fisheries Affected by Stock Rebuilding Measures at the Time of Rebuilding Plan Adoption (April 2004)

Yelloweye rockfish are common from Central California northward to the Gulf of Alaska. They are bottom-dwelling, generally solitary, rocky reef fish, found either on or just over reefs (Eschmeyer, *et al.* 1983; Love 1991; Miller and Lea 1972; O'Connell and Funk 1986). Boulder areas in deep water (>180 m) are the most densely populated habitat type, and juveniles prefer shallow-zone broken-rock habitat (O'Connell and Carlile 1993). They also reportedly occur around steep cliffs and offshore pinnacles (Rosenthal, *et al.* 1982). The presence of refuge spaces is an important factor affecting their occurrence (O'Connell and Carlile 1993). Yelloweye rockfish are potentially caught in a range of both commercial and recreational fisheries. Because of their preference for rocky habitat, they are more vulnerable to hook-and-line gear.

The first ever yelloweye rockfish stock assessment was conducted in 2001 (Wallace 2002). This assessment incorporated two area assessments: one from Northern California using CPUE indices constructed from Marine Recreational Fisheries Statistical Survey (MRFSS) sample data and California Department of Fish and Game (CDFG) data collected onboard commercial passenger fishing vessels, and the other from Oregon using Oregon Department of Fish and Wildlife (ODFW) sampling data. The assessment concluded current yelloweye rockfish stock biomass is about 7 percent of unexploited biomass in Northern California and 13 percent of unexploited biomass in Oregon. The assessment revealed a 30-year declining biomass trend in both areas with the last above average recruitment occurring in the late 1980s. The assessment's conclusion that yelloweye rockfish biomass was well below the 25 percent of unexploited biomass threshold for overfished stocks led to this stock being separated from the rockfish complexes in which it was previously listed. Until 2002, when yelloweye rockfish were declared overfished, they were listed in the remaining rockfish complex on the shelf in the Vancouver, Columbia, and Eureka management areas and the "other rockfish" complex on the shelf in the Monterey and Conception areas. As with the other overfished stocks,

yelloweye rockfish harvest is now tracked separately.

In June 2002 the SSC recommended that managers should conduct a new assessment incorporating Washington catch and age data. This recommendation was based on evidence that the biomass distribution of yelloweye rockfish on the west coast was centered in waters off Washington and that useable data from Washington were available. Based on that testimony, the Council recommended completing a new assessment in the summer of 2002, before a final decision was made on 2003 management measures. Methot et al. (Methot and Piner 2002b) did the assessment, which was reviewed by a STAR Panel in August 2002. The assessment result was much more optimistic than the one prepared by Wallace (Wallace 2002), largely due to the incorporation of Washington fishery data. While the overfished status of the stock was confirmed (24 percent of unfished biomass), Methot et al. (Methot and Piner 2002b) provided evidence of higher stock productivity than originally assumed. The assessment also treated the stock as a coastwide assemblage. This assessment was reviewed and approved by the SSC and the Council at the September 2002 Council meeting. Methot and Piner (2002) prepared a rebuilding analysis based on this assessment.

The Council adopted a rebuilding plan for yelloweye rockfish at its April 2004 meeting, as described by the parameter values listed in Table F-2. These values are based on a rebuilding analysis conducted by Methot and Piner (Methot and Piner 2002a).

Amendment 16-4, adopted by the Council at its June 2006 meeting, revised the rebuilding parameters for yelloweye rockfish, as listed in Table F-3. These values are based on a rebuilding analysis conducted by Tsou and Wallace (2006) which had determined that the yelloweye rockfish stock was at 17.7 percent of its unfished level in 2006.

Because yelloweye rockfish prefer rocky reef habitat on the continental shelf, they are most vulnerable to recreational and commercial fixed gear fisheries. In the past, the groundfish trawl sector has accounted for a large proportion of the catch: from 1990 to 1997, trawlers took an average of 46 percent of the catch coastwide (although most catches occur in Washington and Oregon waters). (This discussion is based on data in the table on page 3 of Methot, *et al.* 2003). Trip limit reductions after 1997 and the imposition of restrictions on large footrope trawl gear in 2000 have substantially diminished the amount of yelloweye rockfish caught by the trawl sector. (Large footrope gear had made it possible for trawlers to access the rocky habitat where yelloweye live.) Trawl vessels accounted for only 14 percent of the catch on average from 1998 to 2001. Commercial fixed gear catches have also taken a significant share of the catch, 38 percent in the years 1990-1997. However, the implementation of the non-trawl RCA, which encloses much yelloweye habitat, has resulted in their share falling also. Open access directed groundfish fisheries and the Pacific halibut longline fleet also catch small amounts of yelloweye rockfish. Recreational catches have become more significant with the reduction in commercial catches. Comparing the 1990-1997 and 1998-2001 periods, their share of the total coastwide catch almost doubled to 30 percent, although actual average catches declined slightly. Most recreational catches occur in Washington State waters.

Methods Used to Calculate Stock Rebuilding Parameters

The methods used in the rebuilding analysis (Methot and Piner 2002a) upon which the original rebuilding plan was based, and those used for the rebuilding plan revision under Amendment 16-4 (Tsou and Wallace 2006), do not differ substantially from the approach described in Section 4.6.2.

Rebuilding Parameter Values at the Time of Rebuilding Plan Adoption

Table F-2 lists the numerical values for B_0, B_{MSY}, T_{MIN}, T_{MAX}, P_{MAX}, T_{TARGET}, and F. The values of B_0, B_{MSY}, T_{MIN}, and T_{MAX} are derived from the rebuilding analysis used in formulating the rebuilding plan (Methot and Piner 2002a). The Council chose a value of 80 percent for P_{MAX}, based on a harvest control

rule of F = 0.0153. This results in a target year of 2058.

Rebuilding Parameter Values from the Amendment 16-4 Rebuilding Plan Update

Table F-3 lists the numerical values for B_0, B_{MSY}, T_{MIN}, T_{MAX}, $T_{F=0}$, P_{MAX}, T_{TARGET} and an SPR harvest rate. The values of B_0, B_{MSY}, T_{MIN}, $T_{F=0}$, and T_{MAX} are derived from the rebuilding analysis used in formulating the rebuilding plan (Tsou and Wallace 2006). The Council chose a target rebuilding year of 2084.

Yelloweye Rockfish Fishing Communities

Amendment 16-4 revised the Council's approach to rebuilding plans, requiring an analysis of the needs of fishing communities in relation to overfished species rebuilding times, in addition to the traditional analysis of rebuilding times in relation to the status and biology of the stock. For Amendment 16-4 and the 2007-2008 fisheries, fishing community needs are described and analyzed in an EIS (PFMC 2006). Chapter 7 of that EIS discusses the communities that make up the socio-economic environment of the Pacific Coast groundfish fisheries. In general, yelloweye rockfish is a site-loyal continental shelf species that is most frequently taken in recreational and commercial hook-and-line fisheries north of 40°10' N. latitude. Measures to rebuild yelloweye rockfish by eliminating its directed harvest and preventing its incidental catch affect all hook-and-line groundfish fishing off the northern U.S. west coast.

Yelloweye Rockfish Rebuilding Strategy

As shown in Table F-2, at the inception of the rebuilding plan the harvest control rule for canary rockfish was a fishing mortality rate of 0.0153. Based on the 2002 rebuilding analysis (Methot and Piner 2002), this harvest rate is likely to rebuild the stock by the target year of 2058. This value is likely to change over time as stock size and structure changes. Any updated value will be published in Federal groundfish regulations. The fishing mortality rate is applied to the exploitable biomass estimate to determine the OY for a given fishing period.

Management measures are implemented through the biennial harvest specification and management process described in Chapter 5. The types of management measures that may be implemented through this process are described in Chapter 6. In 2004, at the time of rebuilding plan adoption, measures intended to limit bycatch of overfished species included prohibiting retention of certain overfished species during some parts of the year, reducing landing limits (cumulative trip limits) on co-occurring species, establishing extensive time/area closures, and restricting the use of trawl nets equipped with large footropes. (By using large footropes with heavy roller gear, bottom trawlers can access rocky habitat on the continental shelf. This is the preferred habitat for some overfished species.)

Beginning in 2002, time/area closures known as GCAs came into use as a way of decreasing bycatch of overfished species. GCAs enclose depth ranges where bycatch of overfished species is most likely to occur, based on information retrieved from logbooks and the at-sea observer program. The boundaries vary by season and fishery sector, and may be modified in response to new information about the geographic and seasonal distribution of bycatch.

In addition to the more general measures described above, which are intended to reduce bycatch of all overfished species, the Yelloweye Rockfish Conservation Area (YRCA), a C-shaped closed area off the Washington coast, near Cape Flattery, prevents recreational groundfish and halibut anglers from targeting this species in an area where they are concentrated. Recreational bag and size limits are also used to manage total yelloweye rockfish fishing mortality.

Given the particular life history characteristics of yelloweye rockfish, the Council will continue to use a

species-specific area closure or closures to protect yelloweye rockfish. As new information becomes available on yelloweye rockfish behavior and fisheries interactions with yelloweye rockfish, the boundaries or related regulations concerning the current YRCA may change, and additional YRCAs may be established by regulation.

The Council's rebuilding measures for 2007-2008, adopted at the same time as the Council's adoption of Amendment 16-4, continue the Council's strategy of constraining yelloweye rockfish total mortality by restricting fishing on co-occurring healthy stocks and preventing fishing in areas where yelloweye rockfish may be taken incidentally. Additionally, the Council has adopted yelloweye rockfish rebuilding measures in the Pacific halibut fisheries and new YRCAs for the commercial groundfish and salmon fisheries operating off the northern U.S. west coast.

The Council recognized the need to restrict the fisheries based on the new yelloweye rockfish assessment, but also took into account the potentially widespread negative effects of an immediate reduction in OY and recommended an OY ramp-down strategy over a 5-year period (see the footnote to Table F-3). The ramp-down strategy provides time to collect much-needed additional data that could better inform new management measures for greater yelloweye rockfish protection, and reduces the immediate adverse impacts to fishing communities while altering the rebuilding period by less than one year.

1.4 Literature Cited

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