Monterey Bay Aquarium Seafood Watch®

Groundfish, California Groundfish Collective

California/Eastern Central Pacific

Set longlines, Bottom trawls, Traps (unspecified)

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Disclaimer

Seafood Watch® strives to have all Seafood Reports reviewed for accuracy and completeness by external scientists with expertise in ecology, fisheries science and aquaculture. Scientific review, however, does not constitute an endorsement of the Seafood Watch® program or its recommendations on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

Seafood Watch Standard used in this assessment: Standard for Fisheries vF2

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About Seafood Watch

Monterey Bay Aquarium's Seafood Watch® program evaluates the ecological sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch® defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. Seafood Watch® makes its science-based recommendations available to the public in the form of regional pocket guides that can be downloaded from www.seafoodwatch.org. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Report. Each report synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices," "Good Alternatives" or "Avoid." The detailed evaluation methodology is available upon request. In producing the Seafood Reports, Seafood Watch® seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch® Research Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch®'s sustainability recommendations and the underlying Seafood Reports will be updated to reflect these changes.

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Reports in any way they find useful. For more information about Seafood Watch® and Seafood Reports, please contact the Seafood Watch® program at Monterey Bay Aquarium by calling 1-877-229-9990.

Guiding Principles

Seafood Watch defines sustainable seafood as originating from sources, whether fished[1] or farmed, that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

Based on this principle, Seafood Watch had developed four sustainability **criteria** for evaluating wildcatch fisheries for consumers and businesses. These criteria are:

- How does fishing affect the species under assessment?
- How does the fishing affect other, target and non-target species?
- How effective is the fishery's management?
- How does the fishing affect habitats and the stability of the ecosystem?

Each criterion includes:

- Factors to evaluate and score
- Guidelines for integrating these factors to produce a numerical score and **rating**

Once a rating has been assigned to each criterion, we develop an overall recommendation. Criteria ratings and the overall recommendation are color-coded to correspond to the categories on the Seafood Watch pocket guide and online guide:

Best Choice/Green: Are well managed and caught in ways that cause little harm to habitats or other wildlife.

Good Alternative/Yellow: Buy, but be aware there are concerns with how they're caught.

Avoid/Red Take a pass on these for now. These items are overfished or caught in ways that harm other marine life or the environment.

[1] "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates

Summary

The subject of this analysis is the California Groundfish Collective (CGC) fishery (previously the California Risk Pool), and the main species caught in this fishery. Recommendations are generated for eight of the primary commercial species that are targeted and caught in this fishery. The use of additional gears to pursue sablefish results in a total of 10 species/gear combinations assessed in this report.

Six of the eight species assessed under Criterion 1 received a score of "green". The two species to receive a yellow ranking were petrale sole and sablefish. In general, the eight species assessed under Criterion 1 were characterized by low to very low concerns regarding stock status and fishing mortality.

Of the ten stocks assessed under Criterion 2, six received "green" scores and the remaining four received 'yellow' scores; none of the 2011 or 2012 CRP fishery's major species received a "red" ranking. The two lowest-scoring Criterion 2 species were bank rockfish and blackgill rockfish. The relatively low bank rockfish score was driven by a lack of species-specific information regarding current stock status and the appropriateness of current levels of fishing mortality, and the relatively low blackgill rockfish score was driven by concerns regarding current levels of coastwide fishing mortality, as well as concerns regarding a substantial increase in blackgill rockfish catch in the 2012 CRP fishery relative to the 2011 fishery. The remaining "yellow" species are all overfished or rebuilding species for which fishing mortality is a "very low" conservation concern.

The management of the CGC fishery's retained and bycatch species is strong, as it is generally characterized by access to up-to-date stock assessments, the use of biomass reference points and associated harvest control rules to determine harvest levels, 100% at-sea observer coverage, and enhanced management measures developed by the fishery's participants.

Groundfish fishing gears tend to contact the seafloor, and the gears used in the CGC fishery are no exception. The four gears that are used in this fishery include bottom longline, pot, bottom trawl, and Scottish seine (data for the latter are incorporated into the data for the bottom trawl component of the fishery). After reviewing GIS data for fishing intensity on different habitats, as well as GIS data for the protection of those habitats from these gears, the bottom trawl component of the CGC fishery received a score of "high concern" for Factor 4.1 (except for Dover sole, thornyheads, and sablefish, which were scored "moderate"). The trawl fishery received a score of "strong mitigation" for Factor 4.2. Conversely, the fixed gear componenet received a Factor 4.1 score of "moderate concern", due to the use of fixed gears on deep boulder habitat, and a score of "moderate mitigation" for Factor 4.2, due to relatively low protection of deep boulder habitat.

In summary, all 10 species/gear combinations assessed in this report receive overall "green" recommendations. In general, the CGC fishery is characterized by strong management, stock assessments that are generally up-to-date, and a wealth of fishery-specific information for the fishery's interactions with habitat. Concerns include the stock status and fishing mortality of sablefish, and the mortality of bank and blackgill rockfish in the CGC fishery.

Final Seafood Recommendations

SPECIES/FISHERY	CRITERION 1: IMPACTS ON THE SPECIES	CRITERION 2: IMPACTS ON OTHER SPECIES	CRITERION 3: MANAGEMENT EFFECTIVENESS	CRITERION 4: HABITAT AND ECOSYSTEM	OVERALL RECOMMENDATION
Sablefish California Eastern Central Pacific, Set longlines, United States of America	Yellow (2.64)	Green (5.00)	Green (4.00)	Yellow (3.16)	**Best Choice (3.60)**
Dover sole California Eastern Central Pacific, Bottom trawls, United States of America, soft substrate	Green (5.00)	Yellow (2.64)	Green (4.47)	Green (3.46)	**Best Choice (3.78)**
Longspine thornyhead California Eastern Central Pacific, Bottom trawls, United States of America, soft substrate	Green (5.00)	Yellow (2.64)	Green (4.47)	Green (3.46)	**Best Choice (3.78)**
Sablefish California Eastern Central Pacific, Bottom trawls, United States of America, soft substrate	Yellow (2.64)	Green (3.83)	Green (4.47)	Green (3.46)	**Best Choice (3.54)**
Shortspine thornyhead California Eastern Central Pacific, Bottom trawls, United States of America, soft substrate	Green (5.00)	Yellow (2.64)	Green (4.47)	Green (3.46)	**Best Choice (3.78)**
Chilipepper California Eastern Central Pacific, Bottom trawls, United States of America	Green (3.83)	Yellow (3.05)	Green (4.47)	Yellow (2.83)	**Best Choice (3.49)**
English sole California Eastern Central Pacific, Bottom trawls, United States of America	Green (5.00)	Yellow (3.05)	Green (4.47)	Yellow (2.83)	**Best Choice (3.73)**
Pacific sanddab California Eastern Central Pacific, Bottom trawls, United States of America	Green (5.00)	Yellow (3.05)	Green (4.47)	Yellow (2.83)	**Best Choice (3.73)**
Petrale sole California Eastern Central Pacific, Bottom trawls, United States of America	Yellow (3.05)	Yellow (3.05)	Green (4.47)	Yellow (2.83)	**Best Choice (3.29)**

Sablefish California Eastern Central Pacific, Traps (unspecified), United States of America	Yellow (2.64)	Green (5.00)	Green (4.00)	Yellow (3.16)	**Best Choice (3.60)**

Summary

All 10 species/gear combinations assessed in this report receive overall "green" recommendations. In general, the CGC fishery is characterized by strong management, stock assessments that are generally up-to-date, and a wealth of fishery-specific information for the fishery's interactions with habitat. Concerns include the stock status and fishing mortality of sablefish, and the mortality of bank and blackgill rockfish in the CGC fishery.

Scoring Guide

Scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

Final Score = geometric mean of the four Scores (Criterion 1, Criterion 2, Criterion 3, Criterion 4).

- **Best Choice/Green** = Final Score >3.2, and no Red Criteria, and no Critical scores
- **Good Alternative/Yellow** = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern[2], and no more than one Red Criterion, and no Critical scores
- **Avoid/Red** = Final Score ≤2.2, or either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern or two or more Red Criteria, or one or more Critical scores.

[2] Because effective management is an essential component of sustainable fisheries, Seafood Watch issues an Avoid recommendation for any fishery scored as a Very High Concern for either factor under Management (Criterion 3).

Introduction

Scope of the analysis and ensuing recommendation

The subject of this analysis is the California Groundfish Collective (CGC) fishery, and the main species caught in this fishery. Recommendations are generated for eight of the primary commercial species that are targeted and caught in this fishery. The use of additional gears to pursue sablefish results in a total of 10 species/gear combinations assessed in this report. The Seafood Watch criteria require that fishing mortality from the CGC fishery be scored the same as the cumulative (total) fishing mortality would be scored, and therefore information is presented for both CGC fishing mortality and total fishing mortality.

Species Overview

The CGC fishery is a subset of the Individual Fishing Quota (IFQ) groundfish fishery that takes place in the federal waters off of the coasts of Washington, Oregon, and California. The CGC fishery is composed of eleven fishing operations from the Fort Bragg Groundfish Association and the Central California Seafood Marketing Association, who have entered into an agreement to pool members' IFQs for overfished species (Labrum, K. & Oberhoff, D. 2013). Participants in the CGC fishery use bottom trawl, bottom longline, pot, and Scottish seine gears to pursue sablefish and several species of rockfish and flatfish.

The non-hake groundfish fisheries of the U.S. west coast are multi-species fisheries that catch many species along with those that they target. As such, it can be challenging to define a fishery's 'main species' and, from those main species, to determine which should be considered 'bycatch' species. To select the 'main' species for this analysis, the Seafood Watch guidelines for selecting main species were followed. These guidelines define a 'main' species as:
• The catch of the species in the fishery under assessment composes >5% of that fishery's catch, or

• The species is >1% of that fishery's catch and the fishery causes >5% of the species' total mortality across all fisheries, or

• The species is <1% of that fishery's catch and the fishery causes >20% of species' total mortality across all fisheries, or

• The species is overfished, depleted, a stock of concern, endangered, threatened, IUCN Near Threatened, US MMPA strategic species, and/or subject to overfishing and the fishery causes >1% of species' total mortality across all fisheries.

• If there are no other "main species" (based on the above guidance) besides the one assessed under criterion 1, but the total catch of other discarded and retained species is >5% (i.e. catch of criterion 1 species is <95% of total), assess the top 3 species by volume of catch (if there are only 1-2 other species caught, assess those species).

For the purposes of this report, 'bycatch' species for the CGC fishery are those species that are overfished or rebuilding species, or 'main' species in the fishery that have retention rates of <50%. By this definition, there are six species that are caught in the CGC fishery that are bycatch species: bocaccio, canary rockfish, cowcod, darkblotched rockfish, splitnose rockfish, and stripetail rockfish.

Production Statistics

In 2011 and 2012, the CGC fishery's total catches were 1,350 and 1,663 t, respectively (Appendix II). With retention rates of 89% and 87% in those two years, the CGC fishery's 2011 and 2012 landings were 1,199 and

1,443 t, respectively (Appendix II). Sablefish, Dover sole, thornyheads, chilipepper rockfish, and petrale sole are the CGC fishery's primary species in terms of both landings and landed value (Figure 1).

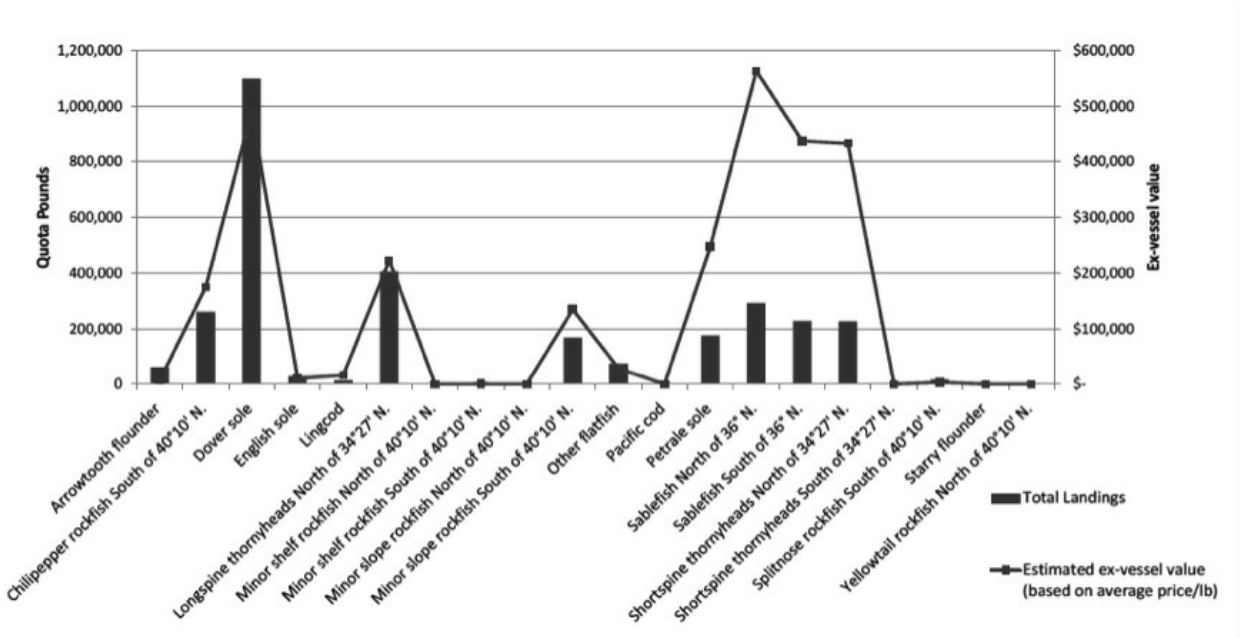

Figure 1 Figure 1. 2012 CRP fishery landings, and ex-vessel value of landings, for 20 species. Figure from Labrum, K. & Oberhoff, D., 2013.

Importance to the US/North American market.

The CGC fishery's main products enter into standard market channels for U.S. west coast groundfish (Labrum 2013). The CGC fishery's contributions to overall production vary from species to species, as it is a major contributor to the total catch of some species (e.g., chilipepper rockfish), and a relatively minor contributor to catches of others; this information is presented in the analysis of mortality for each species.

Common and market names.

Table 1. Common, market, and vernacular names of primary species caught in CGC fishery (FDA 2013).

Common name	Acceptable market names	Vernacular names
Chilipepper rockfish	Rockfish	Pacific red snapper
Dover sole	Sole	Slime sole, Slippery sole
English sole	Sole	Lemon sole
Pacific sanddab	Sanddab	Mottled sanddab, Soft flounder
Petrale sole	Sole or Flounder	California sole, Brill
Sablefish	Sablefish	Black cod, Butterfish, Skil, Skilfish, Coalfish

Longspine and shortspine thornyheads	Thornyhead	Longspine channel rockfish/spinycheek rockfish; Shortspine channel rockfish/spinycheek rockfish; Idiotfish

Primary product forms

For those products that enter the standard market channels, flatfish are processed as fillets and sold fresh or frozen, and sablefish are sold headed and gutted (Stevens 2013). In addition to the products that enter standard market channels, there is also some selling of live shortspine thornyhead and sablefish, and some selling of sablefish, petrale sole, and sanddabs directly off of the boats (Labrum 2013).

Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Criteria for Fisheries, available at http://www.seafoodwatch.org.

Criterion 1: Impacts on the species under assessment

This criterion evaluates the impact of fishing mortality on the species, given its current abundance. The inherent vulnerability to fishing rating influences how abundance is scored, when abundance is unknown.

The final Criterion 1 score is determined by taking the geometric mean of the abundance and fishing mortality scores. The Criterion 1 rating is determined as follows:

- *Score >3.2=Green or Low Concern*
- *Score >2.2 and ≤3.2=Yellow or Moderate Concern*
- *Score ≤2.2=Red or High Concern*

Rating is Critical if Factor 1.3 (Fishing Mortality) is Critical

Criterion 1 Summary

CHILIPEPPER				
Region | Method	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Score**
California/Eastern Central Pacific Bottom trawls | United States of America	2.00: Medium	4.00: Low Concern	3.67: Low Concern	Green (3.83)

DOVER SOLE				
Region | Method	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Score**
California/Eastern Central Pacific Bottom trawls | United States of America | soft substrate	2.00: Medium	5.00: Very Low Concern	5.00: Very Low Concern	Green (5.00)

ENGLISH SOLE				
Region | Method	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Score**
California/Eastern Central Pacific Bottom trawls | United States of America	2.00: Medium	5.00: Very Low Concern	5.00: Very Low Concern	Green (5.00)

LONGSPINE THORNYHEAD				
Region | Method	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Score**
California/Eastern Central Pacific Bottom trawls | United States of America | soft substrate	1.00: High	5.00: Very Low Concern	5.00: Very Low Concern	Green (5.00)

PACIFIC SANDDAB				
Region | Method	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Score**
California/Eastern Central Pacific Bottom trawls | United States of America	3.00: Low	5.00: Very Low Concern	5.00: Very Low Concern	Green (5.00)

PETRALE SOLE				
Region | Method	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Score**
California/Eastern Central Pacific Bottom trawls | United States of America	2.00: Medium	4.00: Low Concern	2.33: Moderate Concern	Yellow (3.05)

SABLEFISH				
Region | Method	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Score**
California/Eastern Central Pacific Set longlines | United States of America	1.00: High	3.00: Moderate Concern	2.33: Moderate Concern	Yellow (2.64)
California/Eastern Central Pacific Bottom trawls | United States of America | soft substrate	1.00: High	3.00: Moderate Concern	2.33: Moderate Concern	Yellow (2.64)
California/Eastern Central Pacific Traps (unspecified) | United States of America	1.00: High	3.00: Moderate Concern	2.33: Moderate Concern	Yellow (2.64)

SHORTSPINE THORNYHEAD				
Region | Method	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Score**
California/Eastern Central Pacific Bottom trawls | United States of America | soft substrate	1.00: High	5.00: Very Low Concern	5.00: Very Low Concern	Green (5.00)

Inherent Vulnerability

Seafood Watch fishery assessments typically rate the inherent vulnerability of each stock in the assessment based on the FishBase (www.fishbase.org) vulnerability score or, if a FishBase score is not available, on a set of pre-defined productivity attributes. This allows resilience to be rated consistently across all fisheries globally. For the present assessment, FishBase scores are supplemented with productivity data from the region-specific productivity-susceptibility analysis conducted for many West Coast groundfish species by Cope, J.M. et al. (2011). If a discrepancy occurred between the productivity scores and the FishBase vulnerability scores, the productivity scores were the final determinant of the inherent vulnerability score. The manner in which these productivity scores were interpreted is described below.

Cope and colleagues scored each species for 10 productivity attributes. Based on species-specific information for each attribute, a species was put into one of three "bins." Each bin had an associated score; the three bins were: low productivity (score of 1), medium (2), and high (3) (Table 2 in Cope, J.M. et al. 2011). The species' overall productivity score derived from its scores on these 10 attributes. Since a species' overall productivity score could range between 1.0 and 3.0 (i.e., no species could have an overall productivity score of less than 1 or more than 3), the "distance" over which a species' productivity score could range was 2. If this "distance" (i.e., 2) is divided equally between the three bins, then the "low" productivity bin includes productivity scores ranging from 1 to 1.67, the "medium" bin has scores from 1.68 to 2.33, and the "high" bin has scores from 2.34 to 3.0. To inform this report's assessment of inherent vulnerability (rather than resilience), these scores are reversed to reflect vulnerability:

- *high vulnerability is indicated by a productivity score of 1.0-1.67*
- *medium vulnerability is a score of 1.68-2.33*
- *low vulnerability is a score of 2.34-3.0.*

Management reference points

The amount of information available varies considerably from stock to stock, so fisheries management classifies West Coast groundfish stocks into one of three categories. Category 1 stocks have data-rich, quantitative stock assessments that support stock-specific estimates of overfishing level (OFL) and biomass reference points. Category 2 stocks have relatively less data available or more uncertainty. Category 2 stocks tend to lack biomass reference points and are managed with OFLs based on historical catches and at least one index of abundance, such as survey biomass trends (PFMC 2011a), but may incorporate more data. Category 3 stocks are more data-poor than Category 2 stocks. Because survey data are often lacking for them, Category 3 stocks are managed with OFLs derived from historical catch-based methods and life-history information (Cope, J.M. in press; PFMC 2011a).

Unless otherwise specified, the management target biomass reference point for non-flatfish species is 40% of unexploited equilibrium spawning biomass or spawning output, and the overfished/rebuilding threshold (a.k.a. the minimum stock size threshold, or MSST) is 25% of unexploited spawning biomass or output. For flatfish, the target and overfished reference points have recently been defined as 25% and 12.5% of unfished biomass,

respectively (PFMC 2011a). Care was taken in this report to properly differentiate between assessments of spawning output (SO) and spawning biomass (SB), since the former is more appropriate for species in which fecundity increases disproportionately to body mass (Taylor and Wetzel 2011).

For the Criterion 1 and 2 assessments, biomass reference points are defined as follows:

- *target reference point is $SB_{40\%}$ or $SO_{40\%}$ for non-flatfish species, depending on whether biomass or output is the unit; and $SB_{25\%}$ for flatfish species*
- *limit reference point (also called the overfished or rebuilding reference point) is $SB_{25\%}$ or $SO_{25\%}$ for non-flatfish, and $SB_{12.5\%}$ for flatfish*
- *unexploited equilibrium spawning biomass and spawning output are SB_0 and SO_0, respectively.*

Because the calculation of maximum sustainable yield (MSY) requires information that is often lacking for West Coast groundfish species, fisheries managers use proxy values for fishing mortality target/limit reference points; these are expressed as the mortality rate that will result in a specified spawning potential ratio ($SPR_{X\%}$). Overfishing is determined to be occurring if fishing mortality is greater than these target reference points.

- *Flatfish: $F_{MSY} = F_{SPR30\%}$*
- *Lingcod, spiny dogfish, sablefish: $F_{MSY} = F_{SPR45\%}$*
- *Rockfish and thornyheads: $F_{MSY} = F_{SPR50\%}$*

The Seafood Watch assessment criteria require a strong scientific rationale for target and limit reference points that are below $B_{30\%}$ and $B_{15\%}$, respectively, so a brief review of the flatfish reference points is necessary. The PFMC's recent adoption of the current flatfish reference points was driven by the 2009 petrale sole stock assessment, which showed that the stock had been below the old limit reference point ($SB_{25\%}$) since 1953, and since 1943 had been experiencing "chronic annual overfishing" (which was then defined as $F > F_{40\%}$) (PFMC 2011a). But this review also showed that the stock had maintained steady catches of greater than 2,000 t for several decades, and it was suggested that the proxy reference points of $F_{40\%}$ and $B_{25\%}$ were not appropriate for the productivity of the stock (PFMC 2011a). The assessment bodies therefore suggested the use of petrale sole stock-specific estimates of B_{MSY} ($SB_{19\%}$) and F_{MSY} ($F_{20\%}$) (PFMC 2011a). The discrepancy between these estimates and the established proxy values led to the development of new proxy values for all managed flatfish. A review of productivity information for several key West Coast flatfish led to the following conclusions (PFMC 2011a):

a) Steepness for the reviewed species was ≥0.80,

b) the F_{MSY} associated with a steepness of 0.80 was approximately $F_{30\%}$, and

c) the B_{MSY} associated with $F_{30\%}$ was $B_{25\%}$.

After subsequent reviews and recommendations, the PFMC adopted the following proxy values for all managed flatfish species: a proxy B_{MSY} of $B_{25\%}$, a proxy limit reference point of ½ B_{MSY} ($B_{12.5\%}$), and a proxy F_{MSY} of $F_{30\%}$ (PFMC 2011a). For the purposes of this assessment, the scientific rationale for the revised flatfish reference points is considered to be strong.

Throughout this assessment, "total catch" refers to estimates of all removals (including those associated with recreational fisheries and research activities), whereas "commercial" refers to the catch in non-tribal, non-hake

commercial groundfish fisheries on the U.S. West Coast.

Criterion 1 Assessment

SCORING GUIDELINES

Factor 1.1 - Inherent Vulnerability

- *Low—The FishBase vulnerability score for species is 0-35, OR species exhibits life history characteristics that make it resilient to fishing, (e.g., early maturing).*
- *Medium—The FishBase vulnerability score for species is 36-55, OR species exhibits life history characteristics that make it neither particularly vulnerable nor resilient to fishing, (e.g., moderate age at sexual maturity (5-15 years), moderate maximum age (10-25 years), moderate maximum size, and middle of food chain).*
- *High—The FishBase vulnerability score for species is 56-100, OR species exhibits life history characteristics that make is particularly vulnerable to fishing, (e.g., long-lived (>25 years), late maturing (>15 years), low reproduction rate, large body size, and top-predator). Note: The FishBase vulnerability scores is an index of the inherent vulnerability of marine fishes to fishing based on life history parameters: maximum length, age at first maturity, longevity, growth rate, natural mortality rate, fecundity, spatial behaviors (e.g., schooling, aggregating for breeding, or consistently returning to the same sites for feeding or reproduction) and geographic range.*

Factor 1.2 - Abundance

- *5 (Very Low Concern)—Strong evidence exists that the population is above target abundance level (e.g., biomass at maximum sustainable yield, BMSY) or near virgin biomass.*
- *4 (Low Concern)—Population may be below target abundance level, but it is considered not overfished*
- *3 (Moderate Concern) —Abundance level is unknown and the species has a low or medium inherent vulnerability to fishing.*
- *2 (High Concern)—Population is overfished, depleted, or a species of concern, OR abundance is unknown and the species has a high inherent vulnerability to fishing.*
- *1 (Very High Concern)—Population is listed as threatened or endangered.*

Factor 1.3 - Fishing Mortality

- *5 (Very Low Concern)—Highly likely that fishing mortality is below a sustainable level (e.g., below fishing mortality at maximum sustainable yield, FMSY), OR fishery does not target species and its contribution to the mortality of species is negligible (≤ 5% of a sustainable level of fishing mortality).*
- *3.67 (Low Concern)—Probable (>50%) chance that fishing mortality is at or below a sustainable level, but some uncertainty exists, OR fishery does not target species and does not adversely affect species, but its contribution to mortality is not negligible, OR fishing mortality is unknown, but the population is healthy and the species has a low susceptibility to the fishery (low chance of being caught).*
- *2.33 (Moderate Concern)—Fishing mortality is fluctuating around sustainable levels, OR fishing mortality is unknown and species has a moderate-high susceptibility to the fishery and, if species is depleted, reasonable management is in place.*
- *1 (High Concern)—Overfishing is occurring, but management is in place to curtail overfishing, OR fishing mortality is unknown, species is depleted, and no management is in place.*
- *0 (Critical)—Overfishing is known to be occurring and no reasonable management is in place to curtail overfishing.*

CHILIPEPPER

Factor 1.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Medium

The Fishbase vulnerability score for chilipepper rockfish is 52, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.83.

Factor 1.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Low Concern

At the time of the most recent stock assessment (2007), the spawning biomass of chilipepper rockfish off of the coasts of California and Oregon was 70% of SB_0 (95% C.I.= 0.5-0.89% of SB_0), which exceeded the target for rockfish ($SB_{40\%}$) (Field, J.C. 2007). For 2011 and 2012, chilipepper rockfish spawning biomass was projected to be greater than $SB_{40\%}$ (63 and 64% of SB_0, respectively) (Table 3-6, Chapter 3 in (PFMC 2011)). For 2013, based on the 2007 stock assessment, the stock was classified as 'not overfished' by NMFS ($B:B_{MSY}$ proxy ratio of 1.78) (NMFS 2013).

Factor 1.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Low Concern

As chilipepper rockfish are a target of the CRP fishery, the Seafood Watch criteria require that fishing mortality from the CRP fishery be scored the same as the cumulative (total) fishing mortality would be scored. At the time of the last assessment, exploitation rates for chilipepper rockfish were low relative to historic levels. Total chilipepper rockfish mortality was well below catch limits in 2012, with the non-hake IFQ sector responsible for nearly all mortality. The stock was classified as not experincing overfishing in 2013; however, the stock does not have a recent assessment.

Justification:

In the years immediately preceding the last stock assessment (2007), exploitation rates for chilipepper rockfish were at their lowest point since 1950 (Figure E4 in (Field, J.C. 2007)). Chilipepper rockfish catch did not exceed the overfishing limit between 1987 and 2006 (Table 1 in (Field, J.C. 2007)). Total mortality of chilipepper rockfish across all fisheries was well under catch limits in 2012 (16% of OFL and 17% of both ABC and ACL; Table 15 in Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013); the non-hake IFQ sector was responsible for approximately 95% of total mortality (Table 15 in Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013}. The stock was classified as not experiencing overfishing in 2013 (NMFS 2013). Finally, in a productivity-sensitivity analysis of west coast groundfish, chilipepper rockfish have the 2nd-lowest vulnerability-to-overfishing score of any rockfish, and the 12th–lowest vulnerability score of all west coast groundfish (Table 4-4 in (PFMC 2011)). It is therefore probable that fishing mortality is below a sustainable level but there is uncertainty due to the age of the stock assessment.
The CRP fishery's catches of chilipepper rockfish in 2011 and 2012 were 149.0 and 135.3 t, respectively (Table 2). These catches were 47.7% and 46.5% of the non-hake IFQ sector's chilipepper rockfish catches in those years, respectively, but were only 10.1% and 10.2% of the total chilipepper rockfish allocations in those years (Table 2).

DOVER SOLE

Factor 1.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Medium

The Fishbase vulnerability score for Dover sole is 42, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.80.

Factor 1.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Very Low Concern

Dover sole spawning biomass was estimated to be 84% of SB_0 for 2011, which was well above the target (95% C.I.=67-100% of SB_0; Tables b and e in (Hicks, A.C., & Wetzel, C. 2011)). For 2013, Dover sole was classified as 'not overfished', with B/B_{MSY} estimated to be 3.35 (NMFS 2013).

Factor 1.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Very Low Concern

For 2012, total mortality of Dover sole across all fisheries was less than the catch limits (16% of OFL, 17% of ABC, and 29% of ACL; Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). Mortality in the non-hake IFQ sector represented approxiately 98% of the total Dover sole fishing mortality in 2012 (Table 15 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). The stock was classified as not undergoing overfishing in 2013 (NMFS 2013). The 2011 and 2012 CRP fishery's catches of Dover sole were 6.1% and 6.9% of the non-hake IFQ sector's total Dover sole catches, respectively, and represented 2.2% and 2.3% of the available TAC, respectively (Appendix II).

ENGLISH SOLE

Factor 1.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Medium

The Fishbase vulnerability score for English sole is 43, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 2.25.

Factor 1.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

English sole spawning biomass sharply declined between 1900 and the 1930s and declined again during the 1950s and 1960s; spawning biomass is estimated to have been below the $SB_{25\%}$ target reference point through the 1960s, 1970s, and 1980s (Figure 103 in (Cope, J., Dick, E.J., MacCall, A., Monk, M., Soper, B. & Wetzel, C. 2013)). Spawning biomass has increased in the years since, however, and in the latest assessment, estimated SB_{2013}:SB_0 is 0.88 (95% C.I. = 0.77-0.96; Table ES1 in (Cope, J., Dick, E.J., MacCall, A., Monk, M., Soper, B. & Wetzel, C. 2013)). English sole was classified as 'not overfished' for 2013 (NMFS 2013).

Factor 1.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

The total mortality of English sole across all fisheries in 2012 was very small relative to catch limits (2% of OFL, ABC, and ACL; Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). Estimated F_{2012}:F_{MSY} was 0.02 (Table ES1 in (Cope, J., Dick, E.J., MacCall, A., Monk, M., Soper, B. & Wetzel, C. 2013)), and the continuation of recent catch levels is projected to allow spawning biomass to increase (Table 73 in (Cope, J., Dick, E.J., MacCall, A., Monk, M., Soper, B. & Wetzel, C. 2013)). In 2011 and 2012, the CRP fishery's catches of English sole were 11.8% and 11.9% of the non-hake IFQ fishery's total English sole catches, respectively, and represented <0.2% of the available English sole TAC for those years (Appendix II).

LONGSPINE THORNYHEAD

Factor 1.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

High

The Fishbase vulnerability score for longspine thornyhead is 60, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.47.

Factor 1.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Very Low Concern

After declining from the 1970s through the end of the 1990s, longspine thornyhead spawning biomass has steadily increased since the late 1990s (Figure d in (Stephens, A. & Taylor, I.G. 2013)). Longspine thornyhead SB_{2013} was estimated to be 75.2% of SB_0 (95% C.I. = 53.5%-96.9%), which was well above the target reference point of $SB_{40\%}$ (Stephens, A. & Taylor, I.G. 2013).

Factor 1.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Very Low Concern

The most recent catch data show that total fishing mortality of longspine thornyhead in 2012 was below catch limits (27% of coastwide OFL and 32% of coastwide ABC; Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). Estimated SPR for 2012 was well above $SPR_{50\%}$ (Figure f in (Stephens, A. & Taylor, I.G. 2013)). The CRP fishery is a substantial contributor to overall longspine thornyhead fishing mortality, as longspine thornyhead catches in the CRP fishery represented 14.0% and 20.6% of the total longspine thornyhead catch taken in the non-hake IFQ sector in 2011 and 2012, respectively (Appendix II). The catch of longspine thornyhead in the CRP fishery increased by 39.1% from 2011 to 2012, but the 2012 catch was still <10% of the total longspine thornyhead TAC (Appendix II).

PACIFIC SANDDAB

Factor 1.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Low

The Fishbase vulnerability scores for Pacific sanddab is 35, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 2.40.

Factor 1.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

An assessment of the Pacific sanddab stock was recently completed. While the results of that assessment were not considered to be sufficiently reliable to serve as a basis for harvest specifications, the weight of the evidence presented in that assessment was sufficient for the PFMC's Scientific and Statistical Committee to conclude that the stock's status was "well above" the flatfish target reference point ($SB_{25\%}$;(SSC 2013)). Furthermore, that assessment indicated that Pacific sanddab spawning biomass has never been lower than $SB_{25\%}$ (Figure d in (He, X., Pearson, D.E., Field, J.C., Lefebvre, L., & Key, M. 2013)).

Factor 1.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

Catches of Pacific sanddab reached their highest point in 1995, and have generally declined from 2000-2012 (Table 1 in (He, X., Pearson, D.E., Field, J.C., Lefebvre, L., & Key, M. 2013). In 2012, the catch of Pacific sanddab in the non-hake IFQ trawl sector (215.4 t) was approximately 72% of the stock's total mortality across all fisheries (Table 15 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). While the recent stock assessment was not considered to be suitable for supporting harvest specifications (SSC 2013), it does indicate that Pacific sanddab SPR_{2012} was well above $SPR_{30\%}$ (Table d in (He, X., Pearson, D.E., Field, J.C., Lefebvre, L., & Key, M. 2013). Furthermore, a productivity-susceptibility analysis suggests that Pacific sanddab have one of the lowest vulnerability-to-overfishing scores of all west coast groundfish (PFMC 2011). In 2011, the CRP trawl fishery's catch of Pacific sanddabs and unidentified sanddabs were 6.1% and

0.5% of these stocks' total coastwide catches, respectively (Appendix II).

PETRALE SOLE

Factor 1.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Medium

The Fishbase vulnerability score for Petrale sole is 55, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.70.

Factor 1.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Low Concern

Petrale sole spawning biomass declined sharply from the late 1930s to the early 1960s, declined again in the 1970s and 1980s, and remained under the limit reference point during the 1980s, 1990s, and into the 2000s (Figure d in (Haltuch, M.A., Ono, K., & Valero, J. 2013)). After a brief period of rebuilding, spawning biomass is estimated to have declined from 2005-2010, reaching a minimum of 10.4% of SB_0 in 2010 before increasing from 2010 to 2013 (Table b in (Haltuch, M.A., Ono, K., & Valero, J. 2013)). In the latest assessment, SB_{2013} is estimated to be 22.3% of SB_0 (95% C.I. = 15.1%-29.5%) (Table b in (Haltuch, M.A., Ono, K., & Valero, J. 2013)). This is above the limit reference point, but less than the target reference point (Figure d in (Haltuch, M.A., Ono, K., & Valero, J. 2013)). Petrale sole is classified as a "rebuilding" stock by NMFS (NMFS 2013).

Factor 1.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Moderate Concern

Coastwide fishing mortality of petrale sole exceeded the current proxy for F_{MSY} for the last half of the 20th century and into the 2000s, and again as recently as 2010. Estimates of SPR for recent years are very close to $SPR_{30\%}$, and total fishing mortality of petrale sole in 2011 was >90% of the OFL. In 2011 and 2012, the catches of petrale sole in the CRP fishery were <10% of both petrale sole TACs and total petrale sole catches in the non-hake IFQ sector.

Justification:

In 2012, total fishing mortality of petrale sole (1,110.7 t) was near catch limits (87% of OFL, 91% of ABC, and 96% of ACL; Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). The non-hake IFQ sector was responsible for approximately 93% of the 2012 mortality (Table 15 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)).
Petrale sole SPR values were less than $SPR_{30\%}$ from the 1950s through 2010 (Figure 3 in (Haltuch, M.A., Ono, K., & Valero, J. 2013)). Estimates of recent SPR are very close to $SPR_{30\%}$ (Figure e in (Haltuch, M.A., Ono, K., & Valero, J. 2013)).

In 2011 and 2012, the CRP fishery's catches of petrale sole were 9.9% and 7.6% of the non-hake IFQ sector's total petrale sole catches, respectively, and were 9.2% and 7.5% of the total TACs (Table 3). While the 2012 non-hake IFQ sector's petrale sole catch increased by over 30% relative to the previous year and slightly exceeded the 2012 TAC, the CRP fishery's 2012 petrale sole catch was slightly less than the previous year's

catch (Table 3), and therefore the CRP fishery is not regarded as driving the increase in overall petrale sole mortality in the non-hake IFQ sector that was seen in 2012.

SABLEFISH

Factor 1.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA
CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA/EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for sablefish is 49, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.61.

Factor 1.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA
CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA/EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA

Moderate Concern

Estimated sablefish spawning biomass dropped under the management target ($SB_{40\%}$) in 2009, and diminished further during the subsequent two years (Stewart, I.J., Thorson, J.T., & Wetzel, C. 2011). This is a continuation of a sharp downward trend that is entering its fourth consecutive decade (Figure 2). While the estimated spawning biomass for 2011 was above the $SB_{25\%}$ overfished threshold, the clear and persistent downward trend in abundance, the sub-target status of spawning biomass, and the uncertainty in the biomass estimates coombine to compel a stock status score of 'moderate' conservation concern for U.S. West Coast sablefish.

Justification:

Estimated sablefish spawning biomass has been trending downwards since the beginning of the 1980s; this trend is attributed to large catches during the late 1970s and early 1980s (Stewart, I.J., Thorson, J.T., & Wetzel, C. 2011). In recent years, estimated sablefish biomass has declined from 47% of SB_0 in 2002 to 35% of SB_0 in 2010, and the 2011 assessment estimates that 2011 sablefish has declined further, to 33% of SB_0 (95% C.I. = 18-49%; Table b in (Stewart, I.J., Thorson, J.T., & Wetzel, C. 2011)). This is below the management target ($SB_{40\%}$) but above the overfished threshold ($SB_{25\%}$) (Figure 2). There is a high degree of uncertainty in the current assessment's estimation of spawning biomass: the estimate is 60,957 t, and the 95% confidence intervals are substantial (16,418 – 105,495 t) (Table b in (Stewart, I.J., Thorson, J.T., & Wetzel, C. 2011)).

Due to their sub-target stock status, sablefish are one of three species classified as being in the 'precautionary zone', along with Pacific whiting and blue rockfish (PFMC 2011). More recently, NMFS has classified sablefish as 'not overfished', with $B:B_{MSY}$ proxy being 0.84 (NMFS 2013).

Figure 2 Estimated sablefish spawning biomass relative to SB_0, with 95% confidence intervals (figure from Stewart, I.J., Thorson, J.T., and Wetzel, C. 2011)

Factor 1.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA
CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA/EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA

Moderate Concern

There are many pieces of information to consider when assigning a score to coastwide sablefish mortality. In 2009 and 2010, sablefish SPR was slightly less than the target ($SPR_{45\%}$); by definition, this constitutes overfishing for those years. However, total fishing mortality of sablefish in 2012 was 63.0% of the OFL, and the stock is currently classified as not experiencing overfishing. There is a high degree of uncertainty regarding the current stock assessment, and fishing mortality seems to have been increasing over the four years preceding the recent stock assessment.
The CRP fishery's catches of sablefish north of 36° N have been relatively small compared to the total caught in the non-hake IFQ sector, but the CRP fishery's catches of sablefish south of 36° N were 43.1% and 48.5% of the total catch in the non-hake IFQ sector in 2011 and 2012, respectively.

Justification:

The most recent stock assessment states that the continuing decline in sablefish abundance is "primarily due to relatively poor recruitments", because fisheries exploitation was below target rates from 1998 through 2008 (Stewart, I.J., Thorson, J.T., & Wetzel, C. 2011). Despite this, the study also notes that relative SPR (1-SPR/1-$SPR_{45\%}$) increased sharply over the 4 years immediately prior to the assessment (Stewart, I.J., Thorson, J.T.,

& Wetzel, C. 2011), as SPR declined towards $SPR_{45\%}$. The relative SPR values for 2009 and 2010 were 101% and 104% (with 95% C.I.s of approximately 60-146%; Table c in (Stewart, I.J., Thorson, J.T., & Wetzel, C. 2011)). This means that overfishing was occurring in these two years (Stewart, I.J., Thorson, J.T., & Wetzel, C. 2011). The 2009 and 2010 relative SPRs are the highest estimated since the large catches of the late 1970s and early 1980s (Figure 3) when, of course, the stock was more abundant (Figure 4).

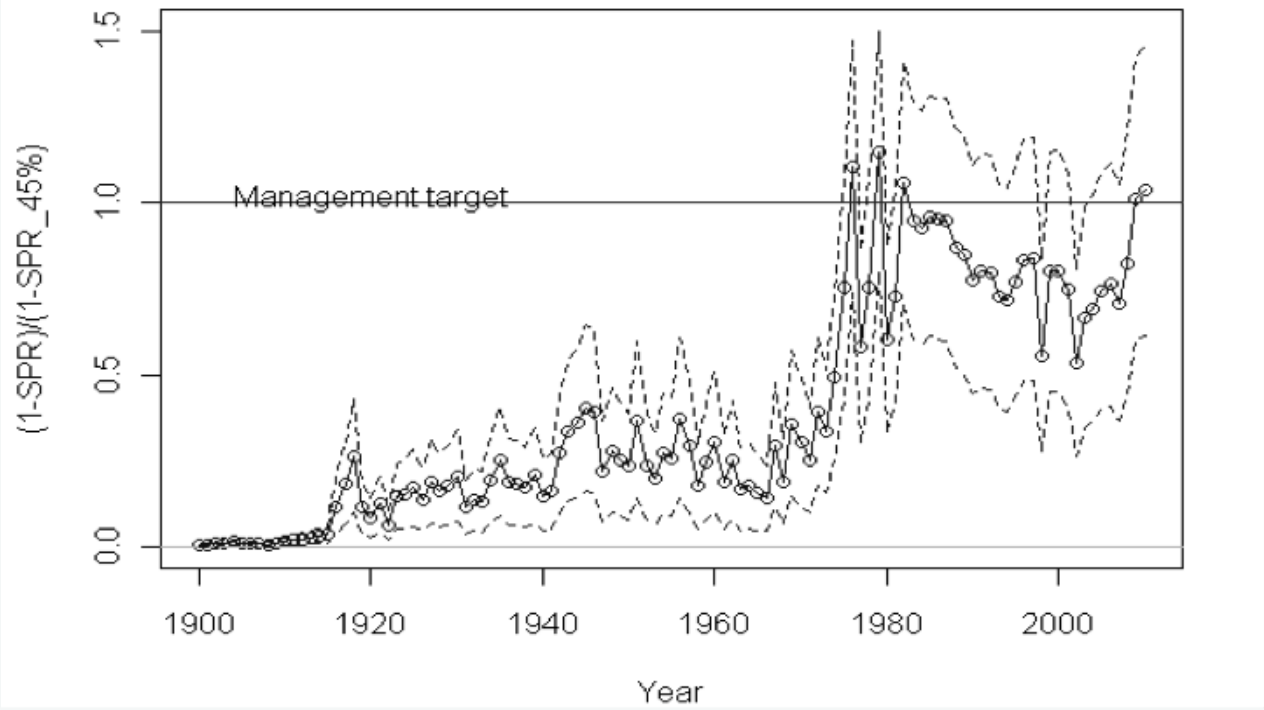

Figure 3 Relative Spawning Potential Ratio ($1\text{-SPR}/1\text{-SPR}_{45\%}$), with 95% confidence intervals. A relative SPR value of >1.0 indicates overfishing for that year. (Figure from Stewart, I.J., Thorson, J.T., and Wetzel, C. 2011)

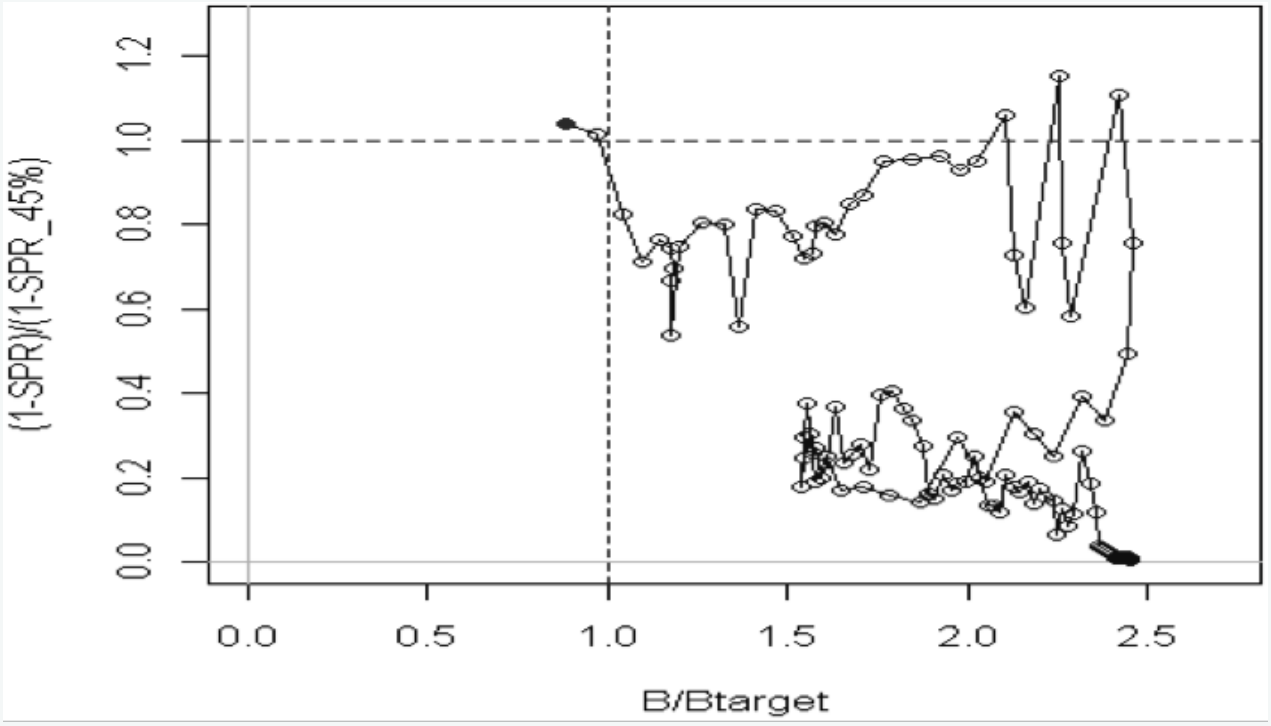

Figure 4 Fishery exploitation, expressed as Relative SPR ($1\text{-SPR}/1\text{-SPR}_{45\%}$), compared to stock status

In apparent contradiction to the SPR-based estimates of potential overfishing in 2009 and 2010, the assessment also notes that from 2001-2010, estimated 'dead' catch (landings + modeled estimates of discarding) exceeded the overfishing limit in only one year (2008) (Table d in (Stewart, I.J., Thorson, J.T., & Wetzel, C. 2011)). In 2013, NMFS classified U.S. west coast sablefish as not experiencing overfishing (NMFS 2013).

Total fishing mortality of sablefish (coastwide) during 2012 was 5,406 t; this was 63% of the coastwide OFL and 66% of coastwide ABC (Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). For that year, total fishing mortality of sablefish north of 36°N was 88% of uncertainty-adjusted ACL, and 56% of the ACL south of 36°N (Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). The non-hake IFQ fishery was responsible for 45% and 32% of total sablefish mortality north and south of 36°N, respectively, in 2012 (Table 15 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)).

In 2011 and 2012, the CRP fishery's catches of sablefish north of 36° N were 5.9% and 4.5% of the total caught in the non-hake IFQ sector, respectively, and were 5.6% and 4.9% of the TAC (Table 4). The CRP's catches of sablefish south of 36° N in 2011 and 2012 were 43.1% and 48.5% of the total catch in the non-hake IFQ sector, respectively; these catches represented 37.2% and 21.5% of the TACs in those years (Table 5).

SHORTSPINE THORNYHEAD

Factor 1.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

High

The Fishbase vulnerability score for shortspine thornyhead is 70, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.33.

Factor 1.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Very Low Concern

Shortspine thornyhead spawning biomass has generally declined since the 1970s, but it has never been been less than the target reference point (Figure d in (Taylor, I.G. & Stephens, A. 2013)). Shortspine thornyhead SB_{2013} is estimated to be 74.2% of SB_0 (95% C.I. = 56.1%-92.3%) (Table b in (Taylor, I.G. & Stephens, A. 2013)).

Factor 1.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Very Low Concern

In 2012, coastwide fishing mortality of shortspine thornyhead across all fisheries was below catch limits (39% of coastwide OFL, 41% of coastwide ABC, and 52% and 32% of ACLs north and south of 34° 27′ N, respectively; Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). The non-hake IFQ sector was responsible for 87% and 1% of total shortspine thornyhead mortality north and south of 34° 27′ N, respectively (Table 15 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). For 2012, shortspine thornyhead SPR was well above $SPR_{50\%}$ (Table d in (Taylor, I.G. & Stephens, A. 2013)). In 2011 and 2012, the CRP fishery's catches of shortspine thornyhead north of 34° 27′ N were 10.9% and 14.5 % of the total caught in the non-hake IFQ sector, respectively, and were 5.4% and 7.3% of the TAC (Appendix II). The CRP's catches of shortspine thornyhead south of 34° 27′ N in 2011 and 2012 were 100.0% and 0.00% of the total catch in the non-hake IFQ sector, respectively; these catches represented 16.9% and 0.00% of the TACs in those years (Appendix II).

Criterion 2: Impacts on other species

All main retained and bycatch species in the fishery are evaluated in the same way as the species under assessment were evaluated in Criterion 1. Seafood Watch® defines bycatch as all fisheries-related mortality or injury to species other than the retained catch. Examples include discards, endangered or threatened species catch, and ghost fishing.

To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard rate score (ranges from 0-1), which evaluates the amount of non-retained catch (discards) and bait use relative to the retained catch. The Criterion 2 rating is determined as follows:

- *Score >3.2=Green or Low Concern*
- *Score >2.2 and ≤3.2=Yellow or Moderate Concern*
- *Score ≤2.2=Red or High Concern*

Rating is Critical if Factor 2.3 (Fishing Mortality) is Crtitical

Criterion 2 Summary

Only the lowest scoring main species is/are listed in the table and text in this Criterion 2 section; a full list and assessment of the main species can be found in Appendix A.

CHILIPEPPER - CALIFORNIA/EASTERN CENTRAL PACIFIC - BOTTOM TRAWLS - UNITED STATES OF AMERICA					
Subscore:	**3.05**	**Discard Rate:**	**1.00**	**C2 Rate:**	**3.05**
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**	
Bank rockfish	1.00:High	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.05)	
Blackgill rockfish	1.00:High	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.05)	
Petrale sole	2.00:Medium	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.05)	
Bocaccio	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)	
Canary rockfish	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)	
Pacific Ocean perch	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)	
Longnose skate	1.00:High	4.00:Low Concern	3.67:Low Concern	Green (3.83)	
Cowcod	1.00:High	3.00:Moderate Concern	5.00:Very Low Concern	Green (3.87)	
Darkblotched rockfish	1.00:High	4.00:Low Concern	5.00:Very Low Concern	Green (4.47)	

Stripetail rockfish	1.00:High	4.00:Low Concern	5.00:Very Low Concern	Green (4.47)
Aurora rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
English sole	2.00:Medium	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Pacific sanddab	3.00:Low	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Splitnose rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Widow rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)

DOVER SOLE - CALIFORNIA/EASTERN CENTRAL PACIFIC - BOTTOM TRAWLS - UNITED STATES OF AMERICA - SOFT SUBSTRATE					
Subscore:	**2.64**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.64**
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**	
Sablefish	1.00:High	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.64)	
Longnose skate	1.00:High	4.00:Low Concern	3.67:Low Concern	Green (3.83)	
Longspine thornyhead	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)	
Shortspine thornyhead	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)	
Splitnose rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)	

ENGLISH SOLE - CALIFORNIA/EASTERN CENTRAL PACIFIC - BOTTOM TRAWLS - UNITED STATES OF AMERICA					
Subscore:	**3.05**	**Discard Rate:**	**1.00**	**C2 Rate:**	**3.05**
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**	
Bank rockfish	1.00:High	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.05)	
Blackgill rockfish	1.00:High	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.05)	

Petrale sole	2.00:Medium	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.05)
Bocaccio	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)
Canary rockfish	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)
Pacific Ocean perch	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)
Chilipepper	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.83)
Longnose skate	1.00:High	4.00:Low Concern	3.67:Low Concern	Green (3.83)
Cowcod	1.00:High	3.00:Moderate Concern	5.00:Very Low Concern	Green (3.87)
Darkblotched rockfish	1.00:High	4.00:Low Concern	5.00:Very Low Concern	Green (4.47)
Stripetail rockfish	1.00:High	4.00:Low Concern	5.00:Very Low Concern	Green (4.47)
Aurora rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Pacific sanddab	3.00:Low	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Splitnose rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Widow rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)

LONGSPINE THORNYHEAD - CALIFORNIA/EASTERN CENTRAL PACIFIC - BOTTOM TRAWLS - UNITED STATES OF AMERICA - SOFT SUBSTRATE					
Subscore:	**2.64**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.64**
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**	
Sablefish	1.00:High	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.64)	
Longnose skate	1.00:High	4.00:Low Concern	3.67:Low Concern	Green (3.83)	
Dover sole	2.00:Medium	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)	

Shortspine thornyhead	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Splitnose rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)

PACIFIC SANDDAB - CALIFORNIA/EASTERN CENTRAL PACIFIC - BOTTOM TRAWLS - UNITED STATES OF AMERICA					
Subscore:	**3.05**	**Discard Rate:**	**1.00**	**C2 Rate:**	**3.05**

Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore
Bank rockfish	1.00:High	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.05)
Blackgill rockfish	1.00:High	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.05)
Petrale sole	2.00:Medium	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.05)
Bocaccio	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)
Canary rockfish	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)
Pacific Ocean perch	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)
Chilipepper	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.83)
Longnose skate	1.00:High	4.00:Low Concern	3.67:Low Concern	Green (3.83)
Cowcod	1.00:High	3.00:Moderate Concern	5.00:Very Low Concern	Green (3.87)
Darkblotched rockfish	1.00:High	4.00:Low Concern	5.00:Very Low Concern	Green (4.47)
Stripetail rockfish	1.00:High	4.00:Low Concern	5.00:Very Low Concern	Green (4.47)
Aurora rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
English sole	2.00:Medium	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Splitnose rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)

Widow rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)

PETRALE SOLE - CALIFORNIA/EASTERN CENTRAL PACIFIC - BOTTOM TRAWLS - UNITED STATES OF AMERICA					
Subscore:	**3.05**	**Discard Rate:**	**1.00**	**C2 Rate:**	**3.05**

Species	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore
Bank rockfish	1.00:High	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.05)
Blackgill rockfish	1.00:High	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.05)
Bocaccio	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)
Canary rockfish	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)
Pacific Ocean perch	1.00:High	2.00:High Concern	5.00:Very Low Concern	Yellow (3.16)
Chilipepper	2.00:Medium	4.00:Low Concern	3.67:Low Concern	Green (3.83)
Longnose skate	1.00:High	4.00:Low Concern	3.67:Low Concern	Green (3.83)
Cowcod	1.00:High	3.00:Moderate Concern	5.00:Very Low Concern	Green (3.87)
Darkblotched rockfish	1.00:High	4.00:Low Concern	5.00:Very Low Concern	Green (4.47)
Stripetail rockfish	1.00:High	4.00:Low Concern	5.00:Very Low Concern	Green (4.47)
Aurora rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
English sole	2.00:Medium	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Pacific sanddab	3.00:Low	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Splitnose rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Widow rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)

SABLEFISH - CALIFORNIA/EASTERN CENTRAL PACIFIC - BOTTOM TRAWLS - UNITED STATES OF AMERICA - SOFT SUBSTRATE					
Subscore:	**3.83**	**Discard Rate:**	**1.00**	**C2 Rate:**	**3.83**
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**	
Longnose skate	1.00:High	4.00:Low Concern	3.67:Low Concern	Green (3.83)	
Dover sole	2.00:Medium	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)	
Longspine thornyhead	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)	
Shortspine thornyhead	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)	
Splitnose rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)	

SABLEFISH - CALIFORNIA/EASTERN CENTRAL PACIFIC - SET LONGLINES - UNITED STATES OF AMERICA					
Subscore:	**5.00**	**Discard Rate:**	**1.00**	**C2 Rate:**	**5.00**
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**	
No other main species caught					

SABLEFISH - CALIFORNIA/EASTERN CENTRAL PACIFIC - TRAPS (UNSPECIFIED) - UNITED STATES OF AMERICA					
Subscore:	**5.00**	**Discard Rate:**	**1.00**	**C2 Rate:**	**5.00**
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**	
No other main species caught					

SHORTSPINE THORNYHEAD - CALIFORNIA/EASTERN CENTRAL PACIFIC - BOTTOM TRAWLS - UNITED STATES OF AMERICA - SOFT SUBSTRATE					
Subscore:	**2.64**	**Discard Rate:**	**1.00**	**C2 Rate:**	**2.64**
Species	**Inherent Vulnerability**	**Abundance**	**Fishing Mortality**	**Subscore**	
Sablefish	1.00:High	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.64)	
Longnose skate	1.00:High	4.00:Low Concern	3.67:Low Concern	Green (3.83)	

Dover sole	2.00:Medium	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Longspine thornyhead	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)
Splitnose rockfish	1.00:High	5.00:Very Low Concern	5.00:Very Low Concern	Green (5.00)

The eight species assessed under Criterion 1 were identified as target species of the CRP fishery by CRP fishery stakeholders. The basic guideline that was used to determine the other species that are included in the assessment under Criterion 2 was as follows: a species was included if the catch of the species in the CRP fishery composed >5% of the fishery's catch, *or* >1% of the CRP fishery's catch *and* >5% of species' total mortality across all fisheries, *or* <1% of the CRP fishery's catch *and* >20% of species' total mortality across all fisheries. Species of concern were also included where appropriate. This selection procedure resulted in the inclusion of ten Criterion 2 species. Several of these Criterion 2 stocks are often retained when caught in the CRP fishery (e.g., bank rockfish, blackgill rockfish).

Of the ten stocks assessed under Criterion 2, six received "green" scores and the remaining four received "yellow" scores; none of the 2011 or 2012 CRP fishery's major species received a "red" ranking. The two lowest-scoring Criterion 2 species were bank rockfish and blackgill rockfish. The relatively low bank rockfish score was driven by a lack of species-specific information regarding current stock status and the appropriateness of current levels of fishing mortality, and the relatively low blackgill rockfish score was driven by concerns regarding current levels of coastwide fishing mortality, as well as concerns regarding a substantial increase in blackgill rockfish catch in the 2012 CRP fishery relative to the 2011 fishery. The remaining "yellow" species are all overfished or rebuilding species for which fishing mortality is a "very low" conservation concern. It should be noted that several of the species included under Criterion 2 (aurora rockfish, bank rockfish, blackgill rockfish, and longnose skate) are mostly or entirely retained when they are caught. They are included here under Criterion 2 because they are not the primary species caught in this fishery, and they are not the subjects of this report's recommendations.

Criterion 2 Assessment

SCORING GUIDELINES

Factor 2.1 - Inherent Vulnerability
(same as Factor 1.1 above)

Factor 2.2 - Abundance
(same as Factor 1.2 above)

Factor 2.3 - Fishing Mortality
(same as Factor 1.3 above)

LONGNOSE SKATE

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for longnose skate is 55, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.53.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Low Concern

Estimated longnose skate spawning biomass has been gradually declining since the early 20th century, but it has yet to approach $SB_{40\%}$(Gertseva, V.V. & Schirripa, M.J. 2008). For the last year assessed (2007), the estimated spawning biomass for longnose skate was 66% of estimated SB_0 (Table ES-2 in (Gertseva, V.V. & Schirripa, M.J. 2008)). Longnose skate spawning biomass was projected to be 60% and 57% of SB_0 for 2011 and 2012, respectively (Table 3-6 in (PFMC 2011)). For 2013, longnose skate were classified as 'not overfished', with a $B:B_{MSY}$ ratio of 1.65, by NMFS (NMFS 2013). The lack of a more recent stock assessment precludes a stock status score of 'very low' concern.

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Low Concern

For 2012, total fishing mortality of longnose skate was 33% of OFL, 34% of the ABC, and 73% of ACL ; this mortality was at a level that is not expected to reduce spawning biomass to less than $SB_{45\%}$within at least the next 6 years. Approximately 92% of the 2012 fishing mortality of longnose skate was attributed to the non-hake IFQ fishery. The stock was classified as not experiencing overfishing for 2013, but there is no recent stock assessment. The CRP fishery's observed catch of longnose skate increased by over 73% from 2011 to 2012, but was still just 2.7% of the 2012 OFL.

Justification:

The fishing mortality rate associated with the target $SPR_{45\%}$was calculated at 4.3% for longnose skate in the 2008 assessment (Gertseva, V.V. & Schirripa, M.J. 2008); mortality rates from 2001 to the last year assessed (2007) ranged from 0.68% to 1.87% (Table ES-4 in (Gertseva, V.V. & Schirripa, M.J. 2008)). However, the authors of the most recent stock assessment suggest that the proxy mortality rate of $F_{SPR45\%}$ may not be appropriate for longnose skate, as it would be expected to result in a long-term spawning biomass of 12% of SB_0 (Gertseva, V.V. & Schirripa, M.J. 2008). Therefore, it is useful to review the potential for current harvest rates to reduce spawning biomass to less than $SB_{45\%}$.
The OFL, ABC, and ACL for 2012 were 3,006 t, 2,873 t, and 1,349 t, respectively (Table 2a to Part 660, Subpart C, (CFR 2012)); this corresponds to the lower, uncertainty-adjusted alternative harvest specifications presented in (PFMC 2011) and the 'medium' harvest scenario presented in the 2008 assessment's decision table (Gertseva, V.V. & Schirripa, M.J. 2008). In that table, annual catches of 1,349 between 2009 and 2018

are not expected to reduce the spawning biomass to below $SB_{40\%}$ (Table 19 in (Gertseva, V.V. & Schirripa, M.J. 2008)). The 2011 non-hake commercial fishing mortality (1,117 t; (Bellman, M.A., Al-Humaidhi, A., Jannot, J., & Majewski J. 2012)) was essentially the same as the 'medium' catch levels assessed in the 2008 stock assessment's decision table, and as such would not expected to reduce longnose skate spawning biomass to less than $SB_{45\%}$ within the next 6 years. It should be noted that a target of $SPR_{50\%}$ will be applied to longnose skate and dogfish starting in 2015 (Ames, K., pers. comm. 2014).

Total fishing mortality of longnose skate in 2012 (991 t) was 33% of OFL, 34% of the ABC, and 73% of ACL (Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). The non-hake IFQ fishery was responsible for 92% of this catch (Table 15 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). The stock was classified as not undergoing overfishing in 2013 (NMFS 2013).

In the CRP fishery, the observed catch of longnose skate increased by over 73% from the first and second years of the fishery (Table 8). The total observed catch of longnose skate in the 2012 CRP fishery (Table 8) was 2.7% of the coastwide OFL for 2012 (3,006 t). Longnose skate caught with trawl gear in the CRP fishery were primarily retained in both 2011 and 2012 (Appendix II).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively (Appendix II).

BANK ROCKFISH

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for bank rockfish is 68, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.25.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Low Concern

The last bank rockfish assessment, which was done in 2000, showed declines in biomass and spawning output over a twenty-year period (Piner, K., Schirripa, M., Builder, T., & Rogers, J. 2000). For 2013, NMFS classified the California stock of bank rockfish as not overfished, but did not estimate the $B:B_{MSY}$ ratio (NMFS 2013). The stock status score reflects the lack of a recent assessment or estimate of this stock's status.

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Moderate Concern

There are no recent species-specific harvest specifications for bank rockfish (PFMC 2014), and NMFS classifies bank rockfish as 'unknown' in regard to potential overfishing (NMFS 2012). In a recent productivity-susceptibility assessment, bank rockfish recieved a rank of 'high concern' for vulnerability to overfishing (Table 4-4 in (PFMC 2011)). In 2012, the observed catch in the CRP trawl fishery was approximately 72.9% of all bank rockfish fishing mortality south of 40°10'N (Appendix II).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively (Appendix II).

BLACKGILL ROCKFISH

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase inherent vulnerability score for blackgill rockfish is 70, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.22.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Low Concern

In an assessment of the blackgill rockfish stock in the Conception and Monterey INPFC areas, blackgill rockfish spawning output is estimated to have diminished sharply from the early 1970s through the mid-1990s, and to have been less than the overfished threshold from 1990 through 2005 (Table 20 in (Field, J.C. & Pearson, D. 2011)). Since 2000, blackgill rockfish spawning output relative to SO_0 has increased, and in 2011 it was estimated at 30.2% of SO_0 (Table B.2 in (Field, J.C. & Pearson, D. 2011)). This is less than the management target ($SO_{40\%}$) but greater than the overfished threshold ($SO_{25\%}$).

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Moderate Concern

Estimates of blackgill rockfish SPR for the two most recent years assessed (2009 and 2010) were 0.473 and 0.454, respectively (Table 20 in (Field, J.C. & Pearson, D. 2011)), and as such are slightly less than the F_{MSY} proxy ($SPR_{50\%}$). Similarly, estimates of SPR for the years 2000-2004 were all under 0.50 (Table 20 in

(Field, J.C. & Pearson, D. 2011)). Therefore, while NMFS classifies blackgill rockfish as 'unknown' in regard to potential overfishing (NMFS 2012), the SPR data suggest that overfishing relative to the SPR target may be occurring. The observed catch of blackgill rockfish in the 2011 CRP fishery was minimal relative to the total catch across all fisheries, but the observed catch in the 2012 CRP trawl fishery sharply increased relative to 2011 and was 23.4% of total mortality of blackgill rockfish south of 40°10'N in that year (Appendix II). It bears noting that the PFMC recently established a "40-10" harvest guideline for blackgill rockfish (Ames, K., pers. comm. 2014).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively (Appendix II).

Criterion 3: Management Effectiveness

Management is separated into management of retained species (harvest strategy) and management of non-retained species (bycatch strategy).

The final score for this criterion is the geometric mean of the two scores. The Criterion 3 rating is determined as follows:

- *Score >3.2=Green or Low Concern*
- *Score >2.2 and ≤3.2=Yellow or Moderate Concern*
- *Score ≤2.2 or either the Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern = Red or High Concern*

Rating is Critical if either or both of Harvest Strategy (Factor 3.1) and Bycatch Management Strategy (Factor 3.2) ratings are Critical.

Criterion 3 Summary

Region / Method	Harvest Strategy	Bycatch Strategy	Score
California / Eastern Central Pacific / Traps (unspecified) / United States of America	4.00	0.00	Green (4.00)
California / Eastern Central Pacific / Bottom trawls / United States of America	4.00	5.00	Green (4.47)
California / Eastern Central Pacific / Bottom trawls / United States of America / soft substrate	4.00	5.00	Green (4.47)
California / Eastern Central Pacific / Set longlines / United States of America	4.00	0.00	Green (4.00)

The management of the CRP fishery's retained and bycatch species is strong, as it is generally characterized by access to up-to-date stock assessments, the use of biomass reference points and associated harvest control rules to determine harvest levels, 100% at-sea observer coverage, and enhanced management measures developed by the fishery's participants.

Criterion 3 Assessment

SCORING GUIDELINES

Factor 3.1 - Harvest Strategy

Seven subfactors are evaluated: Management Strategy, Recovery of Species of Concern, Scientific Research/Monitoring, Following of Scientific Advice, Enforcement of Regulations, Management Track Record, and Inclusion of Stakeholders. Each is rated as 'ineffective,' 'moderately effective,' or 'highly effective.'

- *5 (Very Low Concern)—Rated as 'highly effective' for all seven subfactors considered*
- *4 (Low Concern)—Management Strategy and Recovery of Species of Concern rated 'highly effective' and all other subfactors rated at least 'moderately effective.'*
- *3 (Moderate Concern)—All subfactors rated at least 'moderately effective.'*

- *2 (High Concern)—At minimum, meets standards for 'moderately effective' for Management Strategy and Recovery of Species of Concern, but at least one other subfactor rated 'ineffective.'*
- *1 (Very High Concern)—Management exists, but Management Strategy and/or Recovery of Species of Concern rated 'ineffective.'*
- *0 (Critical)—No management exists when there is a clear need for management (i.e., fishery catches threatened, endangered, or high concern species), OR there is a high level of Illegal, unregulated, and unreported fishing occurring.*

Factor 3.1 Summary

FACTOR 3.1 - MANAGEMENT OF FISHING IMPACTS ON RETAINED SPECIES							
Region / Method	**Strategy**	**Recovery**	**Research**	**Advice**	**Enforce**	**Track**	**Inclusion**
California / Eastern Central Pacific / Traps (unspecified) / United States of America	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Moderately Effective	Highly Effective
California / Eastern Central Pacific / Bottom trawls / United States of America	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Moderately Effective	Highly Effective
California / Eastern Central Pacific / Bottom trawls / United States of America / soft substrate	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Moderately Effective	Highly Effective
California / Eastern Central Pacific / Set longlines / United States of America	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Highly Effective	Moderately Effective	Highly Effective

Subfactor 3.1.1 – Management Strategy and Implementation

Considerations: What type of management measures are in place? Are there appropriate management goals, and is there evidence that management goals are being met? To achieve a highly effective rating, there must be appropriate management goals, and evidence that the measures in place have been successful at maintaining/rebuilding species.

CALIFORNIA / EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA

Highly Effective

Sablefish composed 88.4% and 92.5% of the catch in the fixed gear component of the CRP fishery in 2011 and 2012, respectively; no other one species contributed more than 4% of the CRP fixed gear component's total catch in either of those years (Appendix II). Therefore, sablefish are the only retained species considered for the fixed gear componenet of the CRP fishery.

The management of sablefish includes the use of appropriate limit and target reference points, the incorporation of uncertainty and risk aversion through the determination of the ABC and ACL, and a harvest control rule that reduces mortality when biomass drops below the target reference point and reduces F to zero when biomass falls below a minimum threshold. For these reasons, management strategy and implementation for the fixed gear componenet of the CRP fishery, for which sablefish accounts for approximately 90% of catch in both 2011 and 2012, is scored 'highly effective'.

CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Highly Effective

For the purposes of this report, there are 15 retained stock/area combinations that are considered to be "main species" that are caught by trawl gear in the CRP fishery. As over 70% of these stocks meet the three primary standards for "highly effective" management strategy and implementation, the CRP trawl fishery receives a score of "highly effective".

Justification:

Reference Points
Of the stock/area combinations caught by the CRP fishery, 21 are considered in this report (Table 9; Appendix II). Six are overfished/rebuilding or are primarily discarded by the CRP fishery, and therefore are considered "bycatch" in the CRP fishery. Of the 15 retained stock/area combinations, four do not have biomass reference points to date (Table 9).

Species/Stock	Last assessment or update	ABC:OFL (2012)	ACL:OFL (2012)	Fishery exploitation and reference points				Retained or Bycatch?
				F_{MSY} Proxy	Target biomass (harvest control trigger)	Overfished threshold	Zero mortality threshold	
Aurora rockfish (South of 40° 10'	2013	-	-	-	-	-	-	R
Bank rockfish (South of 40° 10'	2000	-	-	-	-	-	-	R
Bocaccio (South of 40° 10' N)	2009	0.96	0.37	$F_{50\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	B
Blackgill rockfish (South of 40° 10' N)	2012	-	-	-	-	-	-	R
Canary rockfish	2011	0.95	0.17	$F_{50\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	B
Chilipepper rockfish (South of 40° 10'N)	2007	0.96	0.96	$F_{50\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	R
Cowcod (South of 40°10'N)	2013	0.77	0.23	$F_{50\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	B
Darkblotched rockfish	2013	0.96	0.60	$F_{50\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	B
Dover sole	2011	0.96	0.56	$F_{30\%}$	$B_{25\%}$	$B_{12.5\%}$	$B_{5\%}$	R
English sole	2013	0.96	0.96	$F_{30\%}$	$B_{25\%}$	$B_{12.5\%}$	$B_{5\%}$	R
Longnose skate	2007	0.96	0.45	$F_{45\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	R
Longspine thornyhead (North of 34°27'N)	2013	0.83	0.59	$F_{50\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	R
Longspine thornyhead (South of 34°27'N)	2013	0.83	0.11	$F_{50\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	R
Pacific sanddab	2013	-	-	-	-	-	-	R
Petrale sole	2013	0.96	0.91	$F_{30\%}$	$B_{25\%}$	$B_{12.5\%}$	$B_{5\%}$	R
Sablefish (North of 36°N)	2011	0.96	0.77	$F_{45\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	R
Sablefish (South of 36°N)	2011	0.96	0.77	$F_{45\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	R
Shortspine thornyhead (North of 34°27'N)	2013	0.96	0.66	$F_{50\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	R
Shortspine thornyhead (South of 34°27'N)	2013	0.96	0.17	$F_{50\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	R
Splitnose rockfish (South of 40°10'N)	2009	0.96	0.96	$F_{50\%}$	$B_{40\%}$	$B_{25\%}$	$B_{10\%}$	B
Stripetail rockfish (South of 40°10'N)	2013	-	-	-	-	-	-	B

Figure 5 Stock assessments and management references for stocks in report

Incorporating Uncertainty and Risk Aversion: Determination of ABC and ACL

A formal process is in place to buffer for uncertainty and risk aversion through the determination of the ABC and ACL. After the OFL has been determined (the process is described under the "Scientific Advice" section in

subsequent pages), the ABC is derived from the OFL by applying a buffer against scientific uncertainty. For this step, the Scientific and Statistical Committee quantifies the stock assessment variability (σ) based on the species or stock's Category (1, 2, or 3), and the Council determines the probability (P*) that the estimated OFL is too high, given the stock assessment variability. The scientific uncertainty buffer (the difference between OFL and ABC) is determined by applying σ to the appropriate P*. The ABC, then, is essentially the OFL minus the scientific uncertainty buffer.

The Annual Catch Limit (ACL) is the harvest specification that is derived from ABC. It can be equal to or less than ABC, but not greater. The ACL is derived from ABC by taking into consideration conservation objectives, socioeconomic and ecological concerns, management uncertainty, and other sources of uncertainty (PFMC 2011b). Due to the relative lack of information for Category 2 and Category 3 stocks, a greater degree of scientific uncertainty exists regarding the OFL and the scientific uncertainty buffer between the OFL and the ABC therefore tends to be correspondingly larger.

These measures are consistent with Seafood Watch guidelines for addressing uncertainty.

Harvest Control Rule
In order for management to receive a score of "highly effective", the Seafood Watch guidelines require a strategy for reducing mortality when biomass falls below a threshold, and for identifying a threshold at which mortality is reduced to zero. The management of many retained groundfish species meets this benchmark through the "40-10" (or, for flatfish, the "25-5") harvest control rule. The precautionary threshold that triggers the harvest control rule is either B_{MSY} or the proxy ($B_{40\%}$ for non-flatfish, and $B_{25\%}$ for flatfish), or another level determined by the Council (between 25% and 50% of B_0) (PFMC 2011b). If biomass falls below $B_{10\%}$ for non-flatfish or $B_{5\%}$ for flatfish, the allowable catch is set at zero (PFMC 2011). The actual reduction in allowable harvest takes place when the Council determines the ACL for the stock (PFMC 2011b). There is no precautionary biomass threshold and no associated harvest control rule for Category 2 or Category 3 species.

Eleven of the 15 primary stock/area combinations retained by the CRP trawl fishery have a harvest control rule that reduces mortality when biomass falls below a threshold and sets fishing mortality to zero when a minimum level (Table 9).

Subfactor 3.1.2 – Recovery of Species of Concern

Considerations: When needed, are recovery strategies/management measures in place to rebuild overfished/threatened/ endangered species or to limit fishery's impact on these species and what is their likelihood of success? To achieve a rating of Highly Effective, rebuilding strategies that have a high likelihood of success in an appropriate timeframe must be in place when needed, as well as measures to minimize mortality for any overfished/threatened/endangered species.

CALIFORNIA / EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA / EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA

Highly Effective

As of 2013, there are seven groundfish stocks that are considered to be overfished or are rebuilding from being overfished. Each of these stocks has a recovery plan and receives regular status updates and rebuilding analyses. In addition to these coastwide measures, particpants in the CRP fishery abide by regional fishing

plans to further manage and minimize the bycatch of overfished species. For these reasons, the recovery of stocks of concern is considered to be 'highly effective' for the CRP fishery.

Justification:

As of the second quarter of 2013, there were seven Pacific coast groundfish stocks that were classified as 'overfished' or 'rebuilding' from an overfished state: bocaccio (south of 40°10'N), canary rockfish, cowcod (south of 40°10'N), darkblotched rockfish, Pacific ocean perch, petrale sole, and yelloweye rockfish (NMFS 2013). These species each have a rebuilding strategy in place, and receive regular status updates and rebuilding analyses. The rebuilding analyses include estimated probabilities of recovery at different time points, based on different harvest decisions. Harvest control rules are in place for each rebuilding species, and current mortality rates are in line with these rules.

The CRP fishery's primary *raison d'être* is to pool overfished species quota and to fish in such a way as to maximize the catch of target species while minimizing the catch of overfished species (Labrum, K. & Oberhoff, D. 2013). To ensure the latter, all participants in the CRP fishery abide by regional fishing plans. These plans define zones that are known or are thought to be of low, medium, or high risk of overfished species catch, and prescribe management practices to each zone to minimize overfished species catch (Labrum, K. & Oberhoff, D. 2013). These management efforts are supported by rapid data sharing between CRP fishery members. The early evidence suggests that the CRP fishery uses less overfished species quota, relative to their holdings, than the IFQ fishery as a whole (Figure 6; note that Pacific halibut is included in this figure but is not an overfished species) (Labrum, K. & Oberhoff, D. 2013).

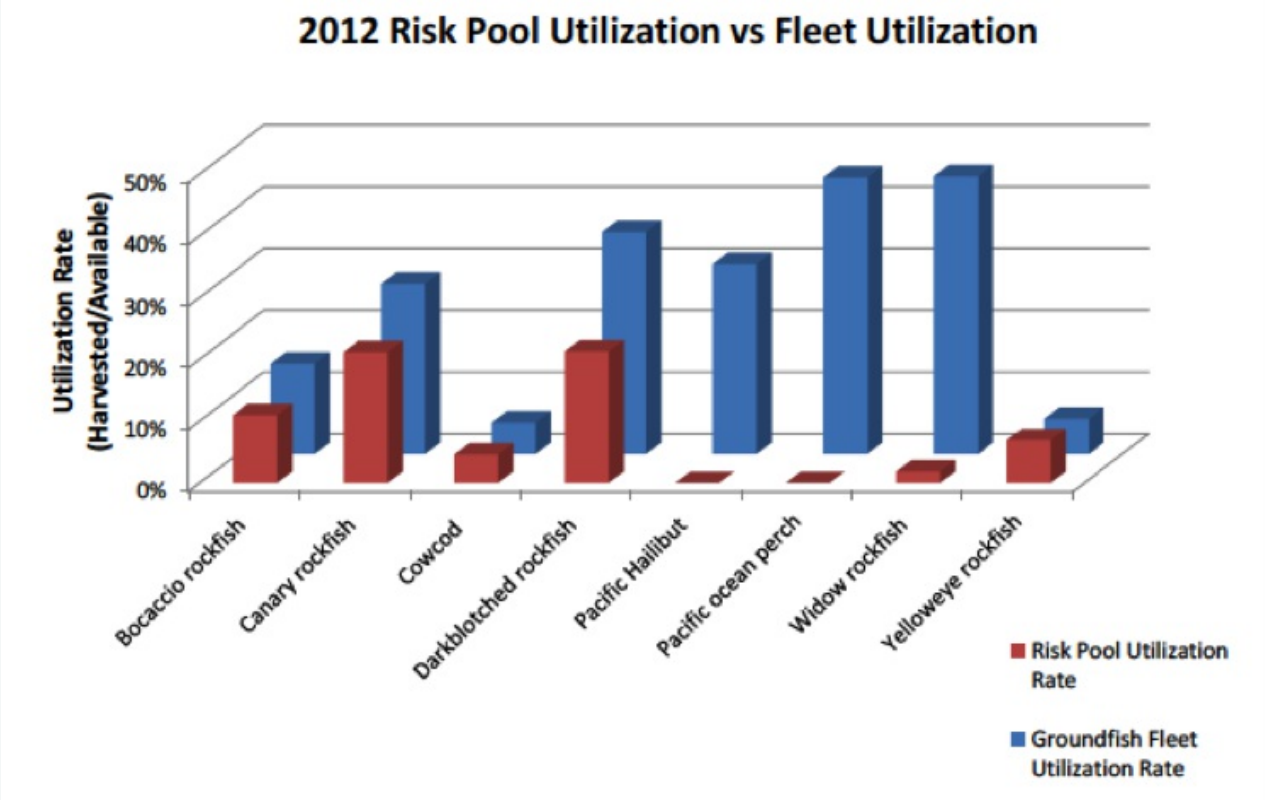

Figure 6 Quota usage rates (quota harvested/quota available) for seven overfished species and Pacific halibut in the CRP and larger IFQ fisheries, 2012 (Figure from Labrum, K. and Oberhoff, D. 2013)

Subfactor 3.1.3 – Scientific Research and Monitoring

Considerations: How much and what types of data are collected to evaluate the health of the population and the fishery's impact on the species? To achieve a Highly Effective rating, population assessments must be conducted

regularly and they must be robust enough to reliably determine the population status.

CALIFORNIA / EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA

Highly Effective

The fixed gear component of the CRP fishery is scored 'highly effective' for scientific research and monitoring due to the recent stock assessment for sablefish (which compose approximately 90% of the fishery's catch).

CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Highly Effective

The CRP trawl fishery receives a score of "highly effective" for scientific research and monitoring, as 80% of the fishery's Criterion 1 stocks have up-to-date stock assessments.

Justification:

The Seafood Watch criteria define stocks with up-to-date information as those that have stock assessments that are less than 3 years old, or regular monitoring every 1-3 years. Of the 15 main stocks/management units that are retained by the CRP fishery, three have stock assessments that are not "up to date" (Table 9).

Subfactor 3.1.4 – Management Record of Following Scientific Advice

Considerations: How often (always, sometimes, rarely) do managers of the fishery follow scientific recommendations/advice (e.g. do they set catch limits at recommended levels)? A Highly Effective rating is given if managers nearly always follow scientific advice.

CALIFORNIA / EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA / EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA

Highly Effective

One of the primary avenues through which science informs management of west coast groundfish is through the determination of the OFL. The OFL sets a maximum limit on allowable catch, and ABCs and ACLs do not exceed OFLs (Table 19). Therefore, compliance with science meets the standard for 'highly effective' for the CRP fishery. It is important to note that this is simply noting that scientific advice is not overruled by management, and is not an indication that there is sufficient science for all species.

Justification:

The manner in which OFLs are determined ensures that the science is not overridden by other concerns:

Category 1 species: Category 1 stocks have data-rich, quantitative stock assessments that support stock-specific estimates of overfishing level (OFL) and biomass reference points. The OFL is determined by applying the F_{MSY} harvest rate (or proxy rate) to the current estimated exploitable biomass of the stock (PFMC 2011b).

Category 2 species: Category 2 species often lack up-to-date stock assessments or have assessments that are

relatively data-poor, and often lack information for stock status, exploitation rate, and recruitment. Category 2 stocks tend to lack biomass reference points and are managed with OFLs that are based on historical catches and at least one index of abundance, such as survey biomass trends (PFMC 2011b).

Category 3 species: Category 3 stocks are those that are more data-poor than Category 2 stocks. Category 3 stocks are managed with OFLs derived from historical catch-based methods and life-history information (Cope, J.M., in press) (PFMC 2011). The greater degree of uncertainty regarding Category 3 stocks is addressed through increasing the OFL to ABC uncertainty buffer over Category 2.

In essence, the process by which OFLs, ABCs, and ACLs are determined ensures that the maximum acceptable mortality is determined by scientists and cannot be overruled, exceeded, or otherwise ignored by managers.

Subfactor 3.1.5 – Enforcement of Management Regulations

Considerations: Do fishermen comply with regulations, and how is this monitored? To achieve a Highly Effective rating, there must be regular enforcement of regulations and verification of compliance.

CALIFORNIA / EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA / EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA

Highly Effective

Enforcement is scored 'highly effective' due to the measures that are present for the larger IFQ fishery and the enhanced measures in place for the CRP fishery.

Justification:

For the larger IFQ fishery, methods to ensure compliance with regulations include the use of fish tickets, logbooks, and Vessel Monitoring System (VMS) (PFMC 2011b). Sorted landings and associated information are recorded on state-issued fish tickets (PFMC 2011b). Logbooks are administered by the states, and are required of all trawl vessels (PFMC 2011b). In order to enforce area closures, both limited entry and open access vessels are required to have VMS installed and operating while fishing (CFR 2012). Vessels that are required to use VMS during trips must ensure that their VMS is successfully transmitting information before participating in the fishery (CFR 2012).

Participants in the CRP fishery must abide by the regional fishing plans and associated spatial restrictions on fishing effort (Labrum, K. & Oberhoff, D. 2013). Enforcement of these measures is accomplished through review of vessel and trip-level data by the Risk Pool Manager, the use of proprietary software to collect spatially explicit catch data, and, if necessary, the auditing of VMS data for vessels suspected of violations (Labrum, K. & Oberhoff, D. 2013). No violations were reported for 2012 (Labrum, K. & Oberhoff, D. 2013).

Subfactor 3.1.6 – Management Track Record

Considerations: Does management have a history of successfully maintaining populations at sustainable levels or a history of failing to maintain populations at sustainable levels? A Highly Effective rating is given if measures enacted by management have been shown to result in the long-term maintenance of species overtime.

CALIFORNIA / EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA / EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA

Moderately Effective

For the U.S. west coast groundfish fishery as a whole, there is not a long-term track record of management success. In particular, the management track record for the period 1970-2000 was demonstrably unsuccessful, and managers appear to have not controlled fishing mortality of salefish to a great enough degree. While the early indications suggest that recent changes are improving various aspects of the west coast groundfish fishery, these measures have not yet been in place long enough to develop a sufficiently length 'track record' of success. Similarly, while the first two years of the CRP fishery have been successful in minimizing the catch of overfished species, the program has not been in place long enough to provide a demonstrable 'track record' of success. The CRP fishery's track record is therefore scored 'moderately effective'.

Justification:

Aggressive measures meant to build domestic fisheries capacity during the 1970s ultimately led to overcapitalization and overfishing, and these issues combined with environmental factors to result in steep declines in the abundance of many groundfish species during the 1970s, 1980s, and 1990s. Several species of rockfish were particularly diminished during this period (Figure 7). Subsequent management measures that significantly reduced allowable catch created economic and social turbulence, and the groundfish fishery was declared an economic disaster in January of 2000 (Shaw, W. & Conway, F.D.L. 2007). In 2002, nine species of groundfish were declared 'overfished' (Shaw, W. & Conway, F.D.L. 2007).

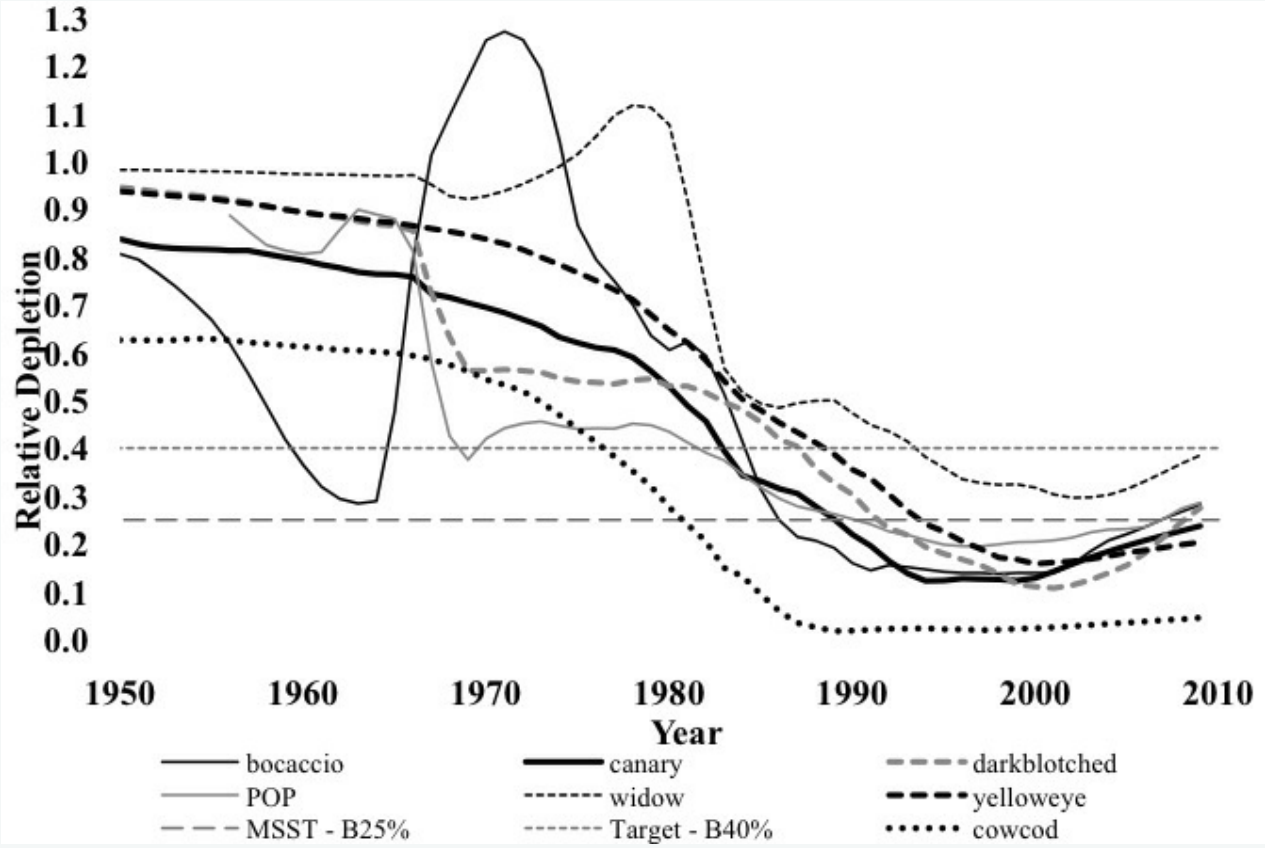

Figure 7 Estimated spawning biomass relative to SB_0 for seven 'overfished' rockfish species (Figure from PFMC 2011)

For the fisheries that target sablefish, the track record is not encouraging. Estimated sablefish spawning biomass has been declining since the early 1980s, and it is now below the management target (SB40%). Sablefish is therefore one of three groundfish species in the "precautionary" zone (PFMC 2011a). Significant changes to the management of the West Coast groundfish fishery have combined to improve matters in recent years. Fishing capacity is managed by the Limited Entry program, which was introduced in 1994. Rebuilding plans for the overfished stocks, which were adopted in 2003 and 2004, have significantly reduced fishing mortality for these stocks. With the exception of cowcod, the estimated biomasses for these overfished species have been increasing in the years since overfishing plans were implemented (Figure 10). And most recently, a catch shares program began in 2011 (NOAA 2012a).

Subfactor 3.1.7 – Stakeholder Inclusion

Considerations: Are stakeholders involved/included in the decision-making process? Stakeholders are individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g., fishermen, conservation groups, etc.). A Highly Effective rating is given if the management process is transparent and includes stakeholder input.

CALIFORNIA / EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA / EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA

Highly Effective

The west coast groundfish fishery is characterized by solid stakeholder inclusion. The Pacific Fishery Management Council meets multiple times each year, in meetings that are open to the public (PFMC 2012a). The Council receives advice from the Groundfish Advisory Subpanel, which represents the interests of commercial and recreational fisheries, tribes, conservationists, and the general public.
Stakeholders from the commercial fishing and environmental sectors created the elements of the CRP fishery and are responsible for its associated agreements, regional plans, enforcement measures, data-sharing efforts, and Advisory Committee (Labrum, K. & Oberhoff, D. 2013). As such, the CRP fishery is defined by stakeholder inclusion.

Factor 3.2 - Bycatch Strategy

SCORING GUIDELINES

Four subfactors are evaluated: Management Strategy and Implementation, Scientific Research and Monitoring, Record of Following Scientific Advice, and Enforcement of Regulations. Each is rated as 'ineffective,' 'moderately effective,' or 'highly effective.' Unless reason exists to rate Scientific Research and Monitoring, Record of Following Scientific Advice, and Enforcement of Regulations differently, these rating are the same as in 3.1.

- *5 (Very Low Concern)—Rated as 'highly effective' for all four subfactors considered*
- *4 (Low Concern)—Management Strategy rated 'highly effective' and all other subfactors rated at least 'moderately effective.'*
- *3 (Moderate Concern)—All subfactors rated at least 'moderately effective.'*
- *2 (High Concern)—At minimum, meets standards for 'moderately effective' for Management Strategy but some other factors rated 'ineffective.'*
- *1 (Very High Concern)—Management exists, but Management Strategy rated 'ineffective.'*
- *0 (Critical)—No bycatch management even when overfished, depleted, endangered or threatened species*

are known to be regular components of bycatch and are substatntially impacted by the fishery

FACTOR 3.2 - BYCATCH STRATEGY						
Region / Method	**All Kept**	**Critical**	**Strategy**	**Research**	**Advice**	**Enforce**
California / Eastern Central Pacific / Traps (unspecified) / United States of America	Yes	All Species Retained				
California / Eastern Central Pacific / Bottom trawls / United States of America	No	No	Highly Effective	Highly Effective	Highly Effective	Highly Effective
California / Eastern Central Pacific / Bottom trawls / United States of America / soft substrate	No	No	Highly Effective	Highly Effective	Highly Effective	Highly Effective
California / Eastern Central Pacific / Set longlines / United States of America	Yes	All Species Retained				

Subfactor 3.2.2 – Management Strategy and Implementation

Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and how successful are these management measures? To achieve a Highly Effective rating, the primary bycatch species must be known and there must be clear goals and measures in place to minimize the impacts on bycatch species (e.g., catch limits, use of proven mitigation measures, etc.).

CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Highly Effective

The management strategy and implementation for five of the six bycatch species caught in the trawl component of the CRP fishery meets the Seafood Watch criteria for 'highly effective'. The sixth bycatch species, stripetail rockfish, does not have species-specific reference points or catch limits. However, the CRP trawl fishery's impact on this species is of lesser concern than the other five species, as the fishery's catch of this species in 2011 was minimal (a total of 16 pounds; Appendix II), and the stripetail rockfish stock status and fishing mortality are not of high concern (see Criterion 2). Therefore, the score for management strategy and implementation for bycatch species remains "highly effective" due to the management of the other five species.

Justification:

Reference Points
Five of the six bycatch species are managed with appropriate biomass reference points (Table 9).
Incorporating Uncertainty and Risk Aversion: Determination of ABC and ACL
Five of the six bycatch species are managed with stock-specific OFLs, ABCs, and ACLs (Table 9). As with Factor 3.1, both scientific and management uncertainty are effectively addressed during the process of deriving ABCs and ACLs from OFLs.

Harvest Control Rule:
Five of the six bycatch species are managed with a harvest control rule that reduces F when biomass drops below a target reference point, and sets F to zero if biomass falls below a minimum threshold (Table 9).

Subfactor 3.2.3 – Scientific Research and Monitoring

Considerations: Is bycatch in the fishery recorded/documented and is there adequate monitoring of bycatch to measure fishery's impact on bycatch species? To achieve a Highly Effective rating, assessments must be conducted to determine the impact of the fishery on species of concern, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are being met

CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Highly Effective

All six bycatch species have up-to-date stock assessments (Table 9). The IFQ sector, of which the CRP fishery is a part, requires 100% at-sea observer and 100% dockside monitoring coverage (NOAA 2012). Scientific research and monitoring is therefore scored "highly effective" for the bycatch species caught in the trawl component of the CRP fishery.

Subfactor 3.2.4 – Management Record of Following Scientific Advice

Considerations: How often (always, sometimes, rarely) do managers of the fishery follow scientific recommendations/advice (e.g., do they set catch limits at recommended levels)? A Highly Effective rating is given if managers nearly always follow scientific advice.

CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Highly Effective

Five of the six bycatch species are managed with stock-specific OFLs, ABCs, and ACLs (Table 9). As with factor 3.1, the process for the determination of OFLs, ABCs, and ACLs is designed to ensure that managers adhere to scientific advice regarding maximum allowable catch levels. Scientific advice therefore recieves a score of "highly effective" for the trawl component of the CRP fishery.

Subfactor 3.2.5 – Enforcement of Management Regulations

Considerations: Is there a monitoring/enforcement system in place to ensure fishermen follow management regulations and what is the level of fishermen's compliance with regulations? To achieve a Highly Effective rating, there must be consistent enforcement of regulations and verification of compliance.

CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Highly Effective

See description for Factor 3.1.

Criterion 4: Impacts on the habitat and ecosystem

This Criterion assesses the impact of the fishery on seafloor habitats, and increases that base score if there are measures in place to mitigate any impacts. The fishery's overall impact on the ecosystem and food web and the use of ecosystem-based fisheries management (EBFM) principles is also evaluated. Ecosystem Based Fisheries Management aims to consider the interconnections among species and all natural and human stressors on the environment.

The final score is the geometric mean of the impact of fishing gear on habitat score (plus the mitigation of gear impacts score) and the Ecosystem Based Fishery Management score. The Criterion 2 rating is determined as follows:

- *Score >3.2=Green or Low Concern*
- *Score >2.2 and ≤3.2=Yellow or Moderate Concern*
- *Score ≤2.2=Red or High Concern*

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

Region / Method	Gear Type and Substrate	Mitigation of Gear Impacts	EBFM	Score
California / Eastern Central Pacific / Traps (unspecified) / United States of America	2.00: Moderate Concern	0.50: Moderate Mitigation	4.00: Low Concern	Yellow (3.16)
California / Eastern Central Pacific / Bottom trawls / United States of America	1.00: High Concern	1.00: Strong Mitigation	4.00: Low Concern	Yellow (2.83)
California / Eastern Central Pacific / Bottom trawls / United States of America / soft substrate	2.00: Moderate Concern	1.00: Strong Mitigation	4.00: Low Concern	Green (3.46)
California / Eastern Central Pacific / Set longlines / United States of America	2.00: Moderate Concern	0.50: Moderate Mitigation	4.00: Low Concern	Yellow (3.16)

Groundfish fishing gears tend to contact the seafloor, and the gears used in the CRP fishery are no exception. The four gears that are used in this fishery include bottom longline, pot, bottom trawl, and Scottish seine (data for the latter are incorporated into the data for the bottom trawl component of the fishery). After reviewing GIS data for fishing intensity on different habitats, as well as GIS data for the protection of those habitats from these gears, the bottom trawl component of the CRP fishery received a score of "high concern" for Factor 4.1 (except for Dover sole, thornyheads, and sablefish, which were scored "moderate"). The trawl fishery received a score of "strong mitigation" for Factor 4.2. Conversely, the fixed gear componenet received a Factor 4.1 score of "moderate concern", due to the use of fixed gears on deep boulder habitat, and a score of "moderate mitigation" for Factor 4.2, due to relatively low protection of deep boulder habitat.

Criterion 4 Assessment

SCORING GUIDELINES

Factor 4.1 - Impact of Fishing Gear on the Habitat/Substrate

- *5 (None) - Fishing gear does not contact the bottom*
- *4 (Very Low) - Vertical line gear*
- *3 (Low)—Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Bottom seine on resilient mud/sand habitats. Midwater trawl that is known to contact bottom occasionally (*
- *2 (Moderate)—Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Bottom seine except on mud/sand*
- *1 (High)—Hydraulic clam dredge. Dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 (Very High)—Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl) Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.*

Factor 4.2 - Mitigation of Gear Impacts

- *+1 (Strong Mitigation)—Examples include large proportion of habitat protected from fishing (>50%) with gear, fishing intensity low/limited, gear specifically modified to reduce damage to seafloor and modifications shown to be effective at reducing damage, or an effective combination of 'moderate' mitigation measures.*
- *+0.5 (Moderate Mitigation)—20% of habitat protected from fishing with gear or other measures in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing.*
- *+0.25 (Low Mitigation)—A few measures are in place (e.g., vulnerable habitats protected but other habitats not protected); there are some limits on fishing effort/intensity, but not actively being reduced*
- *0 (No Mitigation)—No effective measures are in place to limit gear impacts on habitats*

Factor 4.3 - Ecosystem-Based Fisheries Management

- *5 (Very Low Concern)—Substantial efforts have been made to protect species' ecological roles and ensure fishing practices do not have negative ecological effects (e.g., large proportion of fishery area is protected with marine reserves, and abundance is maintained at sufficient levels to provide food to predators)*
- *4 (Low Concern)—Studies are underway to assess the ecological role of species and measures are in place to protect the ecological role of any species that plays an exceptionally large role in the ecosystem. Measures are in place to minimize potentially negative ecological effect if hatchery supplementation or fish aggregating devices (FADs) are used.*
- *3 (Moderate Concern)—Fishery does not catch species that play an exceptionally large role in the ecosystem, or if it does, studies are underway to determine how to protect the ecological role of these species, OR negative ecological effects from hatchery supplementation or FADs are possible and management is not place to mitigate these impacts*
- *2 (High Concern)—Fishery catches species that play an exceptionally large role in the ecosystem and no efforts are being made to incorporate their ecological role into management.*
- *1 (Very High Concern)—Use of hatchery supplementation or fish aggregating devices (FADs) in the fishery is having serious negative ecological or genetic consequences, OR fishery has resulted in trophic cascades or other detrimental impacts to the food web.*

Factor 4.1 - Impact of Fishing Gear on the Habitat/Substrate

CALIFORNIA / EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA

Moderate Concern

GIS data indicate that the fixed gear component of the CRP fishery accessed approximately 12% of the '>60 m boulder' habitat in 2012 (Appendix III). This effort included 67 km^2 that were fished 3-5 times/km^2, and 8 km^2 that were fixed 6-12 times/km^2 (Appendix III). The Seafood Watch criteria require a score of 'moderate' for the use of bottom longline and trap gear on boulders, and this is therefore the Factor 4.1 score that is applied to the fixed gear component of the CRP fishery.

CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High Concern

GIS data indicate that mud >60 m and sand >60 m are the primary habitat types found in the study area, and that trawling at all intensity levels primarily takes place on these two habitat types. In general, trawl effort does not seem to be disproportionately focused on any one habitat type, with one exception: high trawl effort was noted for a disproportionately large amount of 'boulder >60 m' habitat, relative to this habitat's representation in the study area. However, the area of 'boulder >60 m' habitat that was affected by this highest trawl intensity was still <1% of this habitat's total area, and as such this seems to be a situation of high effort focused on a small area or areas of this particular habitat.
The Seafood Watch criteria require a score of 'high' conservation concern for a fishery with bottom trawl effort over cobble, boulder, or deep gravel. While there was no trawl effort over cobble or deep gravel, a Factor 4.1 score of 'high' conservation concern is compelled for the trawl component of the CRP fishery by the presence of intense trawl effort on small area of boulder >60 m habitat in both years, and the fact that 4.2% and 6.1% of blocks containing records of coral and/or sponge were trawled in 2011 and 2012, respectively.

Justification:

Detailed rationale:
To facilitate the evaluation of gear impact on habitat, representatives of The Nature Conservancy conducted a GIS analysis in which logbook information for the start and stop of each fishing event was overlaid on an Essential Fish Habitat (EFH) layer. This analysis generated data for the intensity of fishing effort on 11 different habitats, with each 'habitat' being a unique substrate/depth combination (Appendix III). Tables 10 and 11 present summaries of trawl fishing intensity on different habitat types. Results relevant to factor 4.1 include the following:

- Of the 22 habitat/depth/year combinations analyzed, the areas of 21 were >90% untrawled in 2011 and in 2012 (it is not known if the areas that were not trawled in 2011 are the same as those not trawled in 2012, however);

- At least one trawl tow took place on 4.2% and 6.1% of all blocks with coral and/or sponge records in 2011 and 2012, respectively;

- The highest trawl intensity level (16-34 tows/km^2/year) was focused on boulders at >60 m depth, sand at >60 m depth, and in 2012 only, mud at >60 m depth;

- The 'boulder at >60 m' habitat made up only 7.1% of the total area analyzed, but accounted for 22.2% and 36.5% of the area affected by the highest trawl intensity level in 2011 and 2012, respectively. However, the total areas of 'boulder at >60 m' habitat that were affected by the highest trawl intensity in these two years represented <1% of the total 'boulder at >60 m' habitat present in the study area, and >95% of 'boulder >60 m' habitat was not trawled at all in these two years. These results suggest that small areas of 'boulder at >60 m' were intensively trawled in 2011 and 2012.

- One major change from 2011 to 2012 was the introduction of highest intensity trawl effort (16-34 tows/km^2/year) on a relatively small area of the 'mud >60m' habitat type. While no blocks of this habitat type

underwent this highest trawl intensity in 2011, 38 km^2 of this habitat type were categorized as undergoing 16-34 tows/km^2 in 2012 (Appendix III). Despite this increase, the proportion of this habitat type that underwent this highest trawl effort in 2012 was still minimal relative to the overall extent of this habitat type.

2011	Habitat Type										
	Boulder		Cobble		Gravel		Mud		Sand		Corals and Sponges
	<60 m	>60 m	<60 m	>60 m	<60 m	>60 m	<60 m	>60 m	<60 m	>60 m	
Area of each habitat (km²)	604	2,645	4	2	3	18	1,084	14,034	3,103	15,565	734
% of total area (37,062 km²)	1.6	7.1	0.0	0.0	0.0	0.0	2.9	37.9	8.4	42.0	2.0
Representation of each habitat type in four different fishing intensity levels											
% of area w/ zero tows/km²	1.8	7.6	0.0	0.0	0.0	0.1	3.2	37.0	9.1	41.2	2.1
% of area w/ 1-5 tows/km²	0.0	0.8	0.0	0.0	0.0	0.0	0.0	49.2	0.0	50.0	1.0
% of area w/6-15 tows/km²	0.0	7.4	0.0	0.0	0.0	0.0	0.0	35.1	0.0	57.4	1.7
% of area w/ 16-34 tows/km²	0.0	**22.2**	0.0	0.0	0.0	0.0	0.0	**0.0**	0.0	77.8	0.0
% of each habitat type affected at each fishing intensity											
% of habitat w/ zero tows/km²	100.0	98.4	100.0	100.0	100.0	100.0	100.0	90.0	100.0	90.4	95.8
% of habitat w/ 1-5 tows/km²	0.0	0.8	0.0	0.0	0.0	0.0	0.0	9.4	0.0	8.6	3.7
% of habitat w/ 6-15 tows/km²	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.9	0.5
% of habitat w/ 16-34 tows/km²	0.0	**0.2**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0

Figure 8 CRP fishery trawl effort on 11 different habitat types in the CRP area, 2011 (Source: Appendix III)

2012	Habitat Type										
	Boulder		Cobble		Gravel		Mud		Sand		Corals and Sponges
	<60 m	>60 m	<60 m	>60 m	<60 m	>60 m	<60 m	>60 m	<60 m	>60 m	
Area of habitat type (km2)	604	2,645	4	2	3	18	1,084	14,034	3,103	15,565	734
% of total area (37,062 km²)	1.6	7.1	0.0	0.0	0.0	0.0	2.9	37.9	8.4	42.0	2.0
Representation of each habitat type in four different fishing intensity levels											
% of area w/ zero tows/km²	1.8	7.5	0.0	0.0	0.0	0.1	3.2	38.6	9.2	39.6	2.0
% of area w/ 1-5 tows/km²	0.0	2.1	0.0	0.0	0.0	0.0	0.0	29.4	0.0	68.4	1.2
% of area w/6-15 tows/km²	0.0	8.5	0.0	0.0	0.0	0.0	0.0	40.8	0.0	50.7	2.3
% of area w/ 16-34 tows/km²	0.0	**36.5**	0.0	0.0	0.0	0.0	0.0	**51.4**	0.0	12.2	2.7
% of each habitat type affected at each fishing intensity											
% of habitat w/ zero tows	100.0	95.5	100.0	100.0	100.0	100.0	100.0	92.5	100.0	85.7	93.9
% of habitat w/ 1-5 tows	0.0	2.4	0.0	0.0	0.0	0.0	0.0	6.3	0.0	13.1	4.8
% of habitat w/ 6-15 tows	0.0	1.1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.1	1.1
% of habitat w/ 16-34 tows	0.0	**0.1**	0.0	0.0	0.0	0.0	0.0	**0.3**	0.0	0.1	0.3

Figure 9 CRP fishery trawl effort on 11 different habitat types in the CRP area, 2012 (Source: Appendix III)

CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Moderate Concern

While the trawl fishery received a score of "high" due to concerns regarding the potential for gear impacts on deep boulders, corals, and sponges, the Dover sole, thornyhead, and sablefish component of the trawl fishery receives a score of "moderate" concern due to these species' known associations with soft substrates (PFMC 2005).

Factor 4.2 - Mitigation of Gear Impacts

CALIFORNIA / EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA

Moderate Mitigation

The GIS data compiled by The Nature Conservancy (Appendix III) show that fixed gears are prohibited from 100% of seven of the 11 assessed habitats. However, one of the habitats that is open to fixed gear fishing has relatively low protection: only 21% of the boulder >60 m habitat found in the CRP fishery area is protected from fixed gear fishing. As this area is a focus of the fixed gear component of the CRP fishery (see Factor 4.1 and Appendix III), the lack of protection for this habitat type compels a Factor 4.2 score of 'moderate' mitigation for the fixed gear component of the CRP fishery.

CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE

Strong Mitigation

The GIS data compiled by The Nature Conservancy (Appendix III) show that >50% of the areas of 9 of the 11 assessed habitats are protected from bottom trawling by statutory closures. When voluntary closures by the CRP fishery are taken into account, the number of habitats that are >50% protected from bottom trawling rises to 10 out of 11. The lone habitat type that is not >50% protected is sand >60 m, of which 37% is off-limits to bottom trawling (24% due to statutory closures and 13% due to CRP fishery voluntary closures). However, this is a very widespread habitat in the study area, and in both 2011 and 2012, approximately 99% of this habitat type was subjected to fewer than 5 trawl tows/km^2/ year (Tables 20 and 21). Therefore, every habitat type assessed is either >50% protected from the most impactful gear used in the CRP fishery (bottom trawling), or is subject to demonstrably low bottom trawl fishing effort. For these reasons, the Factor 4.2 score for the trawl component of the CRP fishery is 'strong mitigation' of fishing gear impacts.

Factor 4.3 - Ecosystem-Based Fisheries Management

CALIFORNIA / EASTERN CENTRAL PACIFIC, TRAPS (UNSPECIFIED), UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA
CALIFORNIA / EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA / EASTERN CENTRAL PACIFIC, SET LONGLINES, UNITED STATES OF AMERICA

Low Concern

The CRP fishery does not target any species of exceptional ecological importance. There are no ecosystem-based harvest controls in place for any species. Currently, a Fishery Ecosystem Plan (FEP) is being developed. This plan will inform the existing single-species management approach with information regarding the influence of ecosystem considerations on the managed species, and vice versa. As the fishery does not catch exceptional species, and a fishery ecosystem plan is being developed with a clear timeline, a process for incorporation into existing management processes, and suggestions for research to elucidate some broader ecosystem considerations for the groundfish fishery, the score for impacts on the ecosystem and food web is a "low" concern.

Justification:

The ecosystem and food web
The available information suggests that groundfish biomass production on the U.S. west coast is driven by bottom-up forces, with relative abundances of different groups of groundfish influenced by top-down effects including fisheries. Groundfish production in the northeast Pacific is tightly coupled to variations in primary production (Ware, D.M. & Thomson, R.E. 2005). Food web modeling of the Northern California Current (NCC) suggests that fisheries-induced biomass declines of some groundfish species may have released other, commercially viable groundfish species from predation pressure (Field, J.C. 2004) (Brand, E.J., Kaplan, I.C., Harvey, C.J., Levin, P.S., Fulton, E.A., Hermann, A.J., & Field, J.C. 2007), and that this effect may have at least partially offset the effect of increased fisheries mortality on one species in particular (longspine thornyhead; (Field, J.C. 2004)). Food web modeling also suggests that reducing fishing pressure on groundfish would result in a complex array of biomass tradeoffs between predator and prey species (Brand, E.J., Kaplan, I.C., Harvey, C.J., Levin, P.S., Fulton, E.A., Hermann, A.J., & Field, J.C. 2007).

Among the non-hake components of the groundfish assemblage, no one single species stands out as currently playing a particularly outsized ecological role. An Ecopath model of the Northern California Current ecosystem

(Field, J.C. 2004) suggests that non-hake groundfish species assemblages (large flatfish, small flatfish, rockfish, roundfish, and elasmobranchs) have relatively minimal influence on each other or on the remaining species groups in the NCC ecosystem (Figure 2.11 in (Field, J.C. 2004)). Indeed, the influence of fishing is greater for many species groups in this model. Likewise, fisheries have a greater effect on the groundfish species assemblages than do most species assemblages in the model (Field, J.C. 2004). Similarly, an Atlantis model of the California Current ecosystem (Brand, E.J., Kaplan, I.C., Harvey, C.J., Levin, P.S., Fulton, E.A., Hermann, A.J., & Field, J.C. 2007) also suggested that fishing mortality is the primary determinant of fish abundance.

It is possible that previous fisheries exploitation has reduced the current ecological influence of groundfish species. Field's model of the NCC shows that groundfish species constituted almost 100% of the identified species groups that experienced reduced biomass during the period 1960-2002; in contrast, the biomasses of forage fish, salmon, and a number of marine mammals increased substantially over this time (Figure 3.14 in (Field, J.C. 2004)). Field, referring to groundfish, suggests that "a large group of stocks in this ecosystem no longer fill the functional role that they used to", and presents information to suggest that fisheries have reduced the standing biomasses of three groundfish groups (gadids, sablefish, and rockfish) by over 50% (and, in the case of sablefish, over 90%) (Figure 2.17 in (Field, J.C. 2004)).

One example from this study suggests that fisheries-induced reductions of groundfish species of moderate-to-high ecological importance may have non-trivial effects on other species over long time periods. Starting in the late 1970s, a reduction in sablefish abundance (and, to a lesser extent, shortspine thornyhead abundance) may have released at least one other groundfish species (longspine thornyhead) from a primary source of natural mortality and thereby allowed longspine thornyhead biomass to remain relatively constant in the face of increasing fishing mortality (Figure 3.17 in (Field, J.C. 2004)). Indeed, longspine thornyhead, despite having the classic characteristics of a species that would not be resilient to increasing fishing pressure, is one of the very few groundfish species in the model to have maintained its biomass from 1960 to 2002 (Figure 3.14 in (Field, J.C. 2004)).

In another model, using Atlantis ecosystem modeling software, Brand and colleagues (2007) similarly found evidence of biomass tradeoffs between different groundfish species groups. When this model was used to simulate a scenario in which F = 0 for 42 years, the results indicated that small deep rockfish (ie, thornyhead) steadily declined through the time period, in part due to an increase in a major predator (sablefish), and midwater rockfish initially increased but then declined after 25 years due to increased predation pressure. Conversely, large demersal fish (ie, lingcod) increased steadily until approximately year 20, and then showed a second, sudden increase as a result of release from predation pressure (Brand, E.J., Kaplan, I.C., Harvey, C.J., Levin, P.S., Fulton, E.A., Hermann, A.J., & Field, J.C. 2007).

In summary, there is not information to suggest that the west coast non-hake commercial groundfish fisheries are a primary source of mortality for any species that currently play an ecological role of exceptional importance.

Ecosystem-based fishery management of groundfish species

The Pacific Fishery Management Council is in the process of revising a draft Fishery Ecosystem Plan (FEP) for the California Current Ecosystem. The general purpose of the FEP is to bring broader ecosystem considerations and ecosystem science into the Council's existing species-specific management processes. The purpose and need statement for the FEP specifies that one of the FEP's roles will be to provide a basis for the consideration of management tradeoffs (PFMC 2011c); such consideration may address issues such as the apparent sablefish/longspine thornyhead biomass tradeoff identified above. The draft FEP's focus leans more towards improving understanding of the CCE on managed species; it also identifies areas for research, including the trophic dynamics of various commercial species (PFMC 2011c).

It is worth noting that, beginning in 2015, all skates (except for longnose skate), Pacific grenadier, soupfin shark, spotted ratfish, and finescale codling will be designated as Ecosystem Component species (Ames, K., pers. comm. 2014).

Acknowledgements

Scientific review does not constitute an endorsement of the Seafood Watch® program, or its seafood recommendations, on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

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Appendix A: Extra By Catch Species

SPLITNOSE ROCKFISH

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for splitnose rockfish is 66, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.28.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

Estimated splitnose rockfish spawning output declined from the 1960s through the 1990s (Gertseva, V.V., Cope, J.M., & Pearson, D.E. 2009). Splitnose rockfish spawning output was below $SO_{40\%}$ from 1995-2003, but has been increasing since 1999 (35.8%) through the last year assessed (2009; 65.6%) (Table 19 in (Gertseva, V.V., Cope, J.M., & Pearson, D.E. 2009)). The 2009 SO estimate is the highest since 1978 (Table 19 in (Gertseva, V.V., Cope, J.M., & Pearson, D.E. 2009)).

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

For the most recent year assessed (2008), splitnose rockfish SPR was well above the target $SPR_{50\%}$ (Gertseva, V.V., Cope, J.M., & Pearson, D.E. 2009) Total fishing mortality of splitnose rockfish south of 40°10'N was 4% of the OFL, ABC, and ACL in 2012 (Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)), and the coast-wide stock of splitnose rockfish was classified as not experiencing overfishing for 2013 (NMFS 2013). In 2011 and 2012, catches in the CRP fishery accounted for 36.8% and 47.1%, respectively, of the total fishing mortality of splitnose rockfish south of 40°10'N (Appendix II).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA, SOFT SUBSTRATE
CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively

(Appendix II).

AURORA ROCKFISH

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for aurora rockfish is 56, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.33.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

In the recent assessment, aurora rockfish SB_{2013} is estimated to be approximately 64% of SB_0 (95% confidence intervals = 0.48-0.79; Table ES-2 in (Hamel, O.S., Cope, J.M., & Matson, S. 2013)). The reconstruction of biomass trends presented in the recent assessment indicates that the stock's biomass has never been lower than the management target of $SB_{40\%}$ (Figure ES-4 in (Hamel, O.S., Cope, J.M., & Matson, S. 2013)).

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

Estimates of SPR have exceeded $SPR_{50\%}$ for the past 18 years (Hamel, O.S., Cope, J.M., & Matson, S. 2013), and estimated SPR_{2012} is 69% (Table ES-4 in (Hamel, O.S., Cope, J.M., & Matson, S. 2013)). In 2011 and 2012, the observed catches in the CRP trawl fishery accounted for 57.2% and 73.9%, respectively, of the total fishing mortality of aurora rockfish south of 40°10'N (Appendix II).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively (Appendix II).

BOCACCIO

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for bocaccio is 63, and the species' productivity score in Table 1 of (Cope,

J.M., et al., 2011) is 1.28.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High Concern

The stock status of bocaccio off of the coast of California is considered to be of 'high' conservation concern for this assessment due to the proximity of the stock's biomass to the overfished threshold, the fact that the lower 95% confidence interval is well under the overfished threshold, and the fact that the stock is listed as a 'species of concern' by NOAA.

Justification:

The spawning output of the California population of bocaccio declined sharply in the 1950s to the early 1960s, and then rose rapidly in the later 1960s due to strong year classes (Field, J.C., Dick, E.J., Pearson, D., & MacCall, A.D. 2009). By the early 1970s, spawning output had exceeded mean unfished levels and commercial fishery catches and exploitation rates peaked; subsequently, a sharp decline in spawning output occurred in the later 1970s and through the 1980s and 1990s, until reaching a nadir of 13.7% of SO_0 in 1998 (Table 26 in (Field, J.C., Dick, E.J., Pearson, D., & MacCall, A.D. 2009). Bocaccio were officially classified as overfished following the 1996 stock assessment (Field, J.C. & He, X. 2009), and starting in 2000, fishing mortality was constrained by several years of low catch limits (Field, J.C., Dick, E.J., Pearson, D., & MacCall, A.D. 2009). Spawning output has increased in the years since the stock was declared overfished. In 2009, the spawning output of southern bocaccio was estimated to be at 28.1% (95% C.I.= 18-37%) of SO_0, which placed it above the overfished threshold for rockfish ($SO_{25\%}$) but below the target reference point ($SO_{40\%}$) (Field, J.C., Dick, E.J., Pearson, D., & MacCall, A.D. 2009). The southern (California) unit of bocaccio is classified as 'not overfished – rebuilding' by NMFS in 2013 (NMFS 2013). The southern unit is listed as a 'species of concern' by NOAA Fisheries Office of Protected Resources (NOAA Fisheries 2013), and the species as a whole is listed as 'critically endangered' by the IUCN, although the IUCN website notes that the status 'needs updating' (IUCN 2012).

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

The estimated SPR for southern bocaccio in 2008 was 95%, which easily exceeded the MSY proxy ($SPR_{50\%}$) and continued a recent trend of minimal exploitation. An analysis of rebuilding options suggests that an SPR at the 2008 levels has a 99% chance of rebuilding the stock by 2038. While the stock assessment is not new, catch of bocaccio has been tightly controlled in the intervening years, and the 2012 catch of southern bocaccio was well under the OFL, ABC, and ACL. The CRP fishery has been responsible for 31.6% and 43.5% of the total amount of bocaccio caught in the non-hake IFQ sector in 2011 and 2012, respectively, but these catches were <7% of those years' respective TACs.

Justification:

After reaching a low point of 10% of SPR_0 in 1985, the SPR of southern bocaccio has steadily increased, passing the MSY proxy of $SPR_{50\%}$ in 1997 and exceeding 90% in recent years (Table 26 in (Field, J.C., Dick, E.J., Pearson, D., & MacCall, A.D. 2009). The 2009 assessment for the southern bocaccio population estimated the 2008 SPR at 95%, (Field, J.C., Dick, E.J., Pearson, D., & MacCall, A.D. 2009), which exceeds the MSY proxy for rockfish of $SPR_{50\%}$. There is evidence that the current SPR level will not impede recovery: the target SPR for rebuilding is 77.7% (PFMC 2011d), and in the 2009 analysis of bocaccio rebuilding efforts, an SPR of 95%

(which corresponds to the SPR estimate for 2008) has a 77% chance of recovery by 2022 and a 99% chance by 2038 (Table 3 in (Field, J.C. & He, X. 2009). While the species as a whole remains classified as 'critically endangered' by the IUCN (although this status is noted as requiring an update; (IUCN 2012)), the southern stock appears to be rebuilding (see Factor 1.2) and its SPR values have been over 90% for several consecutive years.

The total fishing mortality of southern bocaccio in 2012 was 139.5 t; this was approximately 19% of the OFL, 20% of the ABC, and 51% of the ACL (Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). The non-hake IFQ sector was responsible for only 6% of the 2012 bocaccio mortality, as recreational fisheries accounted for the majority (Table 15 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)).
The CRP fishery has been responsible for 31.6% and 43.5% of the total amount of bocaccio caught in the non-hake IFQ sector in 2011 and 2012, respectively (Table 6). The CRP fishery's bocaccio catches during these two years were 2.8% and 6.4% of the TACs (Table 6).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively (Appendix II).

CANARY ROCKFISH

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for canary rockfish is 62, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.28.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High Concern

Estimated spawning biomass for canary rockfish in 2011 is below the overfished threshold, and the stock was classified by NMFS as 'overfished' for 2013. Canary rockfish stock status is thus scored as a 'high' conservation concern.

Justification:

Estimated biomass for canary rockfish in 2011 was 6,458 t (95% C.I. = 4,506 – 8,411 t), which was 23.2% (95% C.I. = 17-30%) of SB_0 (Table b in (Wallace, J.R. & Cope, J.M. 2011)). This was less than $SB_{25\%}$, and as

such constituted an overfished status (Figure 5) (Wallace, J.R. & Cope, J.M. 2011). While the short-term trend over the past several years is a moderate increase, the trend is 'very uncertain' in the words of the 2011 assessment's authors, and is likely to slow as recent below-average year classes come into the spawning biomass (Wallace, J.R. & Cope, J.M. 2011). Canary rockfish was classified by NMFS as "overfished", with a $B:B_{MSY}$ proxy ratio of 0.58, in 2013 (NMFS 2013).

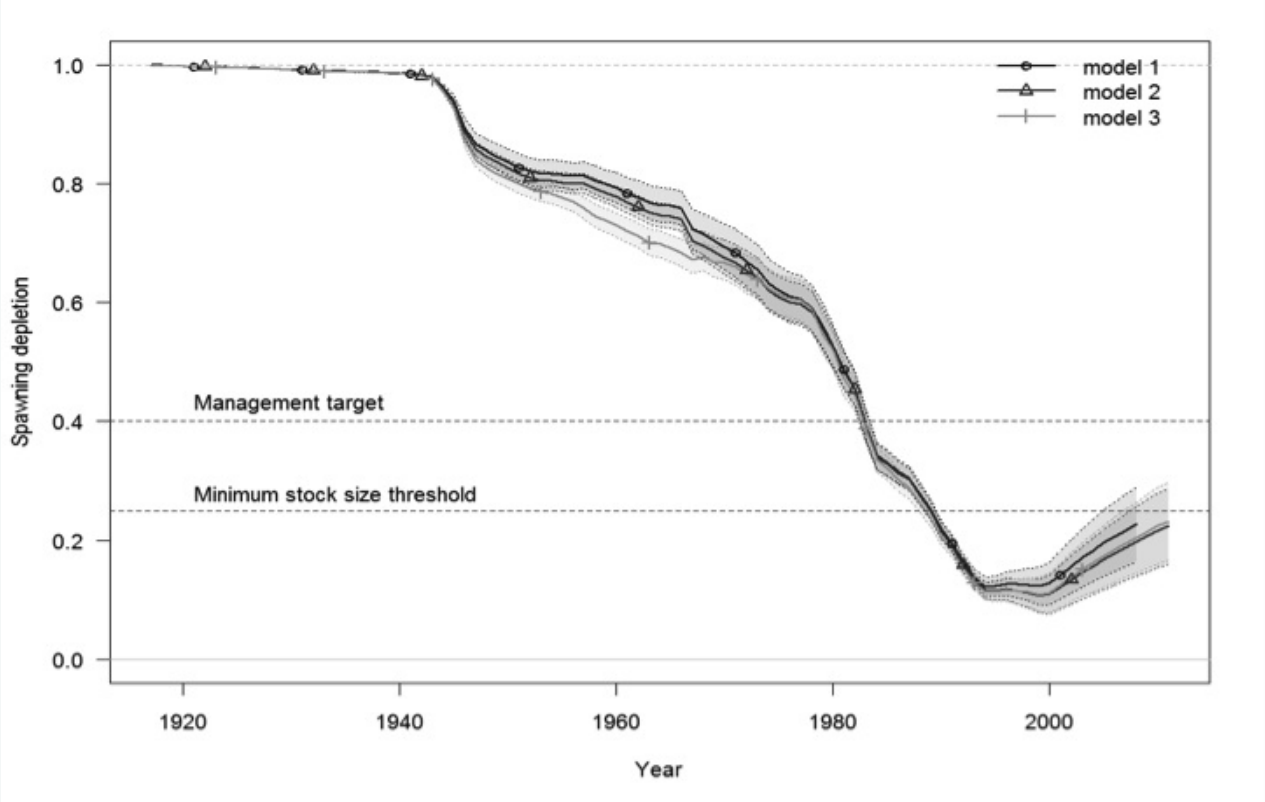

Figure 10 Modeled estimates of canary rockfish spawning biomass relative to SB_0 (Figure from Wallace and Cope 2011)

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

Total fishing mortality of canary rockfish was approximately 19% of the OFL in 2012. Catches in recent years have been consistent with the harvest rule identified in the canary rockfish rebuilding plan, and are at a level that is modeled to have a greater than 70% probability of allowing the canary rockfish stock to rebuild. The stock was classified as not undergoing overfishing in 2012. The CRP fishery's contributions to canary rockfish mortality have been relatively minimal; canary rockfish fishing mortality in the CRP fishery has been <10% of the stock's mortality in the larger non-hake IFQ fishery in both 2011 and 2012.

Justification:

The estimated canary rockfish SPR dropped below the management target ($SPR_{50\%}$) in 1977 and reached a minimum of 13.1% in 1992; SPR slightly increased over the next several years, but only began a substantial increase between 1999 (28.1%) and 2000 (71.2%) as a result of the implementation of the rebuilding plan (Table 13 in (Wallace, J.R. & Cope, J.M. 2011)). For 2010, estimated SPR was 88% of SPR_0 (Table f in (Wallace, J.R. & Cope, J.M. 2011)). It is also worth noting that the estimated 2010 SPR (88%) was nearly identical to one of the rebuilding alternatives (SPR = 88.7%) modeled in the 2007 canary rockfish rebuilding analysis (Stewart, I.J. 2007b); when this SPR was modeled, it resulted in a 75.0% chance of recovery within the maximum allotted timeframe, which was the same as the most stringent harvest control option that was

modeled (F = 0) (Table 4 in (Stewart, I.J. 2007b)). (The 2007 rebuilding analysis is used in lieu of the 2009 rebuilding analysis due to the divergence between the 2009 assessment's biomass estimates compared to those in the 2007 and 2011 assessments). That modeling exercise indicates that the estimated 2010 SPR, and those of recent years, are at levels that will allow, with >70% probability, the rebuilding of the stock.

Commercial landings have not exceeded the overfishing level during the last ten years, as catch was constrained by OYs that were set much lower than the corresponding overfishing levels (Table c in (Wallace, J.R. & Cope, J.M. 2011)). In 2012, total mortality of canary rockfish across all fisheries (44.8 t) was 7.0% of OFL, 8% of ABC, and 42% of ACL (Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). The non-hake IFQ sector was responsible for approximatley 11% of the 2012 canary rockfish mortality (Table 15 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). More recently, NMFS categorized canary rockfish as not experiencing overfishing in 2013 (NMFS 2013).

The CRP fishery was responsible for 7.3% and 5.0% of the non-hake IFQ sector's total catches of canary rockfish in 2011 and 2012, respectively (Table 6). The CRP fishery's catches of canary rockfish represented 1.0% and 1.4% of the available TAC in 2011 and 2012, respectively (Table 6).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively (Appendix II).

COWCOD

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for cowcod is 70, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.06.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Moderate Concern

A recent assessment of the cowcod sub-stock in the Southern California Bight (SCB) indicates that this sub-stock is above $SB_{25\%}$ but below $SB_{40\%}$. The status of the stock between 40°10'N and the SCB is not known. The sub-stock in the SCB continues to rebuild, but the lack of information regarding the status of the stock north of the SCB moderates this score.

Justification:

In 2000, cowcod were declared 'overfished' based upon an assessment of the SCB sub-stock (Dick, E.J. 2011).

Cowcod spawning biomass in the SCB has undergone two periods of steep reductions; the first came from 1900 through the early 1930s, when spawning biomass fell from 100% of SB_0 to less than 60%, and the second occurred from the late 1960s through the late 1980s, when spawning biomass fell again from over 60% of SB_0 in 1965 to approximately 10% in the late 1980s (Figure c in (Dick, E.J. & MacCall, A.D. 2013)). Spawning biomass has gradually increased in the years since. The estimated spawning biomass for 2013 was 33.9% of SB_0 (95% C.I. = 15%-65.6%; Table b in (Dick, E.J. & MacCall, A.D. 2013)). This was above the minimum stock size threshold for rockfish ($SB_{25\%}$), but less than the target reference point ($SB_{40\%}$).

Cowcod in 'southern California' were classified as 'overfished' for 2013 (NMFS 2013). The status of cowcod north of Point Conception and south of Cape Mendocino (i.e., south of 40°10'N but north of the SCB) is not known ((Dick, E.J. & MacCall, A.D. 2013)).

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

Recent cowcod exploitation rates have been well below the rate modeled to produce MSY and have been less than target harvest control rules; recent catches, if continued, are projected to allow spawning biomass to increase in coming years. In 2012, total cowcod mortality across all fisheries was 9% of the OFL. Approximately 8% of the 2012 cowcod mortality was taken in the non-hake IFQ sector.The CRP fishery was responsible for 48.7% and 53.4% of the non-hake IFQ sector's total catches of cowcod in 2011 and 2012, respectively.

Justification:

SCB cowcod exploitation rates have been ≤0.1% in each year since 2003 (Table h in in (Dick, E.J. & MacCall, A.D. 2013)); for comparison, the 2013 assessment's estimate of the exploitation rate that produces MSY is 5.5% (Table d in (Dick, E.J. & MacCall, A.D. 2013)). For rebuilding purposes, the exploitation rate limit for 2013/2014 is set at 0.7% (Table 4 in (Dick, E.J. & MacCall, A.D. 2013b)). Catches in line with the current ACL are modeled to allow for spawning biomass to continue to increase (Table 6 in (Dick, E.J. & MacCall, A.D. 2013b)).
In 2012, total fishing mortality of cowcod was 1.15 t; this was 9% of OFL, 11% of ABC, and 38% of ACL (Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). The non-hake IFQ sector was responsible for approximately 8% of the cowcod mortality in 2012 (Table 15 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)).

The CRP fishery was responsible for 48.7% and 53.4% of the non-hake IFQ sector's total catch of cowcod rockfish in 2011 and 2012, respectively (Table 7). The CRP fishery's catch of cowcod in 2012 was significantly greater than its catch in 2011, but was still only 2.8% of the available 2012 TAC (Table 7).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively (Appendix II).

DARKBLOTCHED ROCKFISH

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for darkblotched rockfish is 69, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.39.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Low Concern

Darkblotched rockfish spawning output declined sharply from the 1970s through approximately 2000, and was below the limit reference point ($SO_{25\%}$) from 1992 through 2007 (Table 13 in (Gertseva, V.V. & Thorson, J.T. 2013)). Spawning output has increased since 2000, and darkblotched rockfish SO_{2013} was estimated to 36% of SO_0 (95% C.I. = 16%-56%; Table ES-2 in (Gertseva, V.V. & Thorson, J.T. 2013)). This is above the limit reference point, but below the target reference point.

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

For 2012, darkblotched rockfish SPR was estimated to be 86%, which is well above the F_{MSY} proxy of $SPR_{50\%}$; SPR has been above 50% for at least the past ten years (Gertseva, V.V. & Thorson, J.T. 2013). In 2012, total fishing mortality of darkblotched rockfish was 21% of the OFL, 22% of the ABC, and 35% of the ACL (Table 16 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). The non-hake IFQ fishery was the source for 78% of total darkblotched rockfish fishing mortality in 2012 (Table 15 in (Bellman, M.A., Jannot, J., Mandrup, M., & McVeigh, J. 2013)). The CRP fishery was responsible for <1% and 2.46% of the non-hake IFQ sector's total catches of darkblotched rockfish in 2011 and 2012, respectively (Appendix II). Darkblotched rockfish were classified by NMFS as not experiencing overfishing in 2013 (NMFS 2013).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively (Appendix II).

PACIFIC OCEAN PERCH

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for Pacific Ocean perch is 60, and the species' score in Table 1 of (Cope, J.M., et al., 2011) is 1.44.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High Concern

Pacific Ocean perch spawning output (a proxy for adult biomass) dropped below the overfished threshold (SO25%) in 1980 and has been there ever since; for 2011, Pacific Ocean perch spawning output was 19.1% of SO0 (Table b in (Hamel, O.S. et al 2011)). The stock is classified as 'overfished' by NMFS for 2012 (B:BMSY proxy ratio of 0.478, for 2012)(NMFS 2012).

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

Total fishing mortality of Pacific Ocean perch in 2011 was well below (6%) the overfishing limit (Table 16 in (Bellman, M.A., et al., 2012)). The stock is on a rebuilding plan that specifies a harvest control rule of 86.4% of SPR (i.e. fishing mortality be low enough that SPR remains at 86.4 or above). Since 2002, SPR has been above 80% and as high as 91.2%; in 2010 the SPR was 87.0% (Table 8 in (Hamel, O.S. et al 2011)). According to modeled rebuilding scenarios, an SPR of 83.9% or greater has a >70% probability of rebuilding in the maximum timeframe; an SPR of 86.4% has a 73.2% probability (Table 4 in (Hamel, O.S. 2011)).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively (Appendix II).

STRIPETAIL ROCKFISH

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for stripetail rockfish is 65, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.39.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Low Concern

Recent efforts to assess the status of the stripetail rockfish stock were "highly uninformative" in regard to the scale of the population, but yielded results that indicate that the stock is above the target (Cope, J., Dick, E.J., MacCall, A., Monk, M., Soper, B. & Wetzel, C. 2013). A score of 'very low' stock status concern is precluded by the uncertainty in the latest assessment.

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

Over the past decade, coastwide fishing removals of stripetail rockfish have been very low relative to catches in previous decades (Table 11 in (Cope, J., Dick, E.J., MacCall, A., Monk, M., Soper, B. & Wetzel, C. 2013)). The recent assessment yielded results to indicate that current coastwide fishing pressure is "negligibly small" (Cope, J., Dick, E.J., MacCall, A., Monk, M., Soper, B. & Wetzel, C. 2013). In 2012, the CRP fishery was responsible for approximatey 48.8% of total fishing mortality of stripetail rockfish south of 40°10'N (Appendix II).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively (Appendix II).

WIDOW ROCKFISH

Factor 2.1 - Inherent Vulnerability

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

High

The Fishbase vulnerability score for widow rockfish is 65, and the species' productivity score in Table 1 of (Cope, J.M., et al., 2011) is 1.31.

Factor 2.2 - Abundance

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

After being considered overfished in the 1990s and early 2000s, an up-to-date stock assessment estimates that the 2011 adult biomass of widow rockfish is above the target reference point of SB40% (51.1% of SB0 in 2011; (He, X., et al., 2011)). Widow rockfish were classified as 'not overfished' for 2012 (B:BMSYproxy ratio of 1.277; (NMFS 2012)).

Factor 2.3 - Fishing Mortality

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

Very Low Concern

Total fishing mortality of widow rockfish was 216 t in 2011; this was 4% of the overfishing limit (Table 16 in (Bellman, M.A., et al., 2012)). Widow rockfish SPR has been above 95% since 2003, and SPR for 2010 was 97.5%, well above the management target of SPR50% (Table ES5 in (He, X., et al., 2011)). Since 2002, exploitation rates have been less than 1%, whereas three calculations of sustainable exploitation rate are all above 6.7% (Table ES4 in (He, X., et al., 2011)). Finally, the stock is classified as 'not overfished' by NMFS for 2012 (NMFS 2012).

Factor 2.4 - Discard Rate

CALIFORNIA/EASTERN CENTRAL PACIFIC, BOTTOM TRAWLS, UNITED STATES OF AMERICA

< 20%

The rates of discards:landings in the CRP trawl fishery were 14% and 16% in 2011 and 2012, respectively (Appendix II).

Appendix B: CGC Fishery Catch Data (Provided by The Nature Conservancy unless otherwise noted)

2011 Fixed Gear Observed Catch			
Species name	Sum of Discards (lbs)	Sum of Retained (lbs)	Total Catch (dis + ret)
SUM	36,895	506,026	542,922
Sablefish	6576	403629	410205
Sablefish	718	68695	69413
Shortspine Thornyhead	525	14323	14849
Shortspine Thornyhead	335	13753	14088
Longnose Skate	10921	139	11060
Shark Unid	7872	0	7872
Filetail Cat Shark	3243	0	3243
Blackgill Rockfish	59	3142	3201
Longspine Thornyhead	1352	499	1851
Grenadier Unid	378	1192	1570
Pacific Grenadier	858	0	858
Brown Cat Shark	686	0	686
Dover Sole	558	82	640
Blue Shark	463	0	463
Giant Grenadier	405	0	405
Skate Unid	193	202	395
Longnose Cat Shark	395	0	395
Black Skate	347	0	347
Spiny Dogfish Shark	321	0	321
Slope Rockfish Unid	0	221	221
Pacific Flatnose	152	0	152
Aurora Rockfish	2	125	127
Pacific Hake	127	0	127
Pacific Sleeper Shark	70	0	70
Deepsea Skate	61	0	61
Sandpaper Skate	54	0	54
Kelp Rocks Wood Mud	51	0	51
Tanneri Tanner Crab	39	0	39
California Slickhead	28	0	28
Invertebrate Unid	24	0	24
Lingcod	0	21	21
Urochordate Unid	14	0	14
Sea Star Unid	11	0	11
Slickhead Unid	8	0	8
Pacific Hagfish	7	0	7
Sea Whips	5	0	5
Octopus Unid	5	0	5
Splitnose Rockfish	4	1	5
Tanner Crab Unid	4	0	4
Sea Cucumber Unid	4	0	4
Sponge Unid	3	0	3
Darkblotched Rockfish	1	2	3
Spotted Ratfish	3	0	3
Sixgill Shark	3	0	3
Petrale Sole	2	0	2
Mixed Species	2	0	2
Brittle/Basket Star Unid	2	0	2
Stony Coral	1	0	1
Urchin Unid	1	0	1
Sea Pens	1	0	1
Sea Snail Unid	1	0	1

Sea Whips/Fans	0	0	0
Decorator/Spider Crab Unid	0	0	0
Sea Fans	0	0	0
SUM	0	-	0
Anemone Unid	0	0	0
California Skate	0	0	0
Cat Shark Unid	0	0	0
Deepsea sole	0	0	0
Hagfish Unid	0	0	0
Hydrocoral	0	0	0
Longspine Thornyhead	0	0	0

2012 Fixed Gear Observed Catch			
Species name	**Sum of Discards (lbs)**	**Sum of Retained (lbs)**	**Total Catch (dis + ret)**
SUM	6,874	263,600	270,473
Sablefish	2,186	197,801	199,987
Sablefish	415	50,570	50,985
Blackgill Rockfish	498	10,302	10,800
Dover Sole	285	3,650	3,935
Shortspine Thornyhead	144	940	1,084
Longnose Skate	1,072	0	1,072
Shark Unid	615	0	615
Filetail Cat Shark	572	0	572
Kelp Rocks Wood Mud	388	0	388
Aurora Rockfish	37	280	317
Tanner Crab Unid	85	0	85
Brown Cat Shark	70	0	70
Pacific Grenadier	61	0	61
Pacific Sleeper Shark	60	0	60
Urchin Unid	51	0	51
Slope Rockfish Unid	0	51	51
Invertebrate Unid	51	0	51
Tanneri Tanner Crab	41	0	41
Longspine Thornyhead	33	0	33
Hagfish Unid	24	0	24
Sea Cucumber Unid	23	0	23
Sea Star Unid	22	0	22
Grenadier Unid	16	5	21
Decorator/Spider Crab Unid	18	0	18
Anemone Unid	17	0	17
Irregular Echinoids	15	0	15
Sandpaper Skate	14	0	14
Octopus Unid	13	0	13
Brittle/Basket Star Unid	12	0	12
Sponge Unid	11	0	11
Sea Snail Unid	8	0	8
Sea Whips	3	0	3
Spiny Dogfish Shark	3	0	3
Mixed Species	2	0	2
Pacific Hake	2	0	2
Sea Squirts Unid	1	0	1
Giant Grenadier	1	0	1
Jellyfish Unid	1	0	1
Urochordate Unid	1	0	1
Mollusk Unid	1	0	1
California Grenadier	1	0	1
Sea Pens	1	0	1
Rex Sole	1	0	1
Pacific Hagfish	1	0	1
Crab Unid	0	0	0
Black Hagfish	0	0	0

Spiky King Crab	0	0	0
Isopod Unid	0	0	0
Soft Coral	0	0	0
Viperfish Unid	0	0	0
Dragonfish Unid	0	0	0
Squat Lobster Unid	0	0	0
Squid Unid	0	0	0

2011 CGC Trawl Gear Observed Catch, and Total Mortality Across All Fisheries for Species with >1 t Caught in 2011 CGC Trawl Fishery (Total mortality data from Table 15 in Bellman et al., 2012. Bold font indicates values that caused a species to be considered a 'main' species in the CGC fishery, and included under Criterion 2 in this assessment).

Species name	Sum of CGC Discards (lbs)	Sum of CGC Retained (lbs)	Tota CGC Catch (dis + ret)	% of CGC Fishery's Total Catch	Total Mortality (all fisheries; lbs)	CGC Fishery's Contribution to Total Mortality (%)
Dover Sole	10885	847834	858719	35.3	17476609	4.9
Chilipepper Rockfish	11432	306643	318075	13.1	724660	43.9
Sablefish	2545	205595	208140	8.6	14511279	1.4
Longspine Thornyhead	2122	204433	206555	8.5	2171202	9.5
Petrale Sole	1948	154837	156785	6.4	2101514	7.5
Shortspine Thornyhead	69	128263	128332	5.3	2228721	5.8
Longnose Skate	25243	67858	93102	3.8	2498126	3.7
Pacific Sanddab	19931	24203	44134	1.8	725586	6.1
Skate Unid	102	42573	42675	1.8		
Pacific Hake	31209	10254	41463	1.7	511464532	0.0
Splitnose Rockfish	26984	6861	33845	1.4	92021	**36.8**
Arrowtooth Flounder	7084	26726	33809	1.4	5877220	0.6
English Sole	5359	24153	29512	1.2	452896	6.5
Bank Rockfish	32	25357	25389	1.0	64375	**39.4**
Rex Sole	482	22467	22949	0.9	979008	2.3
Spotted Ratfish	22469	0	22469	0.9	164421	13.7
Kelp Rocks Wood Mud	21735	0	21735	0.9		
Dungeness Crab	20604	0	20604	0.8	58031866	0.0
Blackgill Rockfish	72	17882	17954	0.7	331289	5.4

Tanneri Tanner Crab	11935	0	11935	0.5		
Aurora Rockfish	848	7975	8822	0.4	15432	**57.2**
Spiny Dogfish Shark	8738	19	8757	0.4	3663336	0.2
Brown Cat Shark	8571	0	8571	0.4		
California Slickhead	7387	0	7387	0.3		
Shark Unid	7204	36	7240	0.3		
Invertebrate Unid	5961	0	5961	0.2		
Lingcod	1314	4593	5907	0.2	581756	1.0
Giant Grenadier	4725	0	4725	0.2		
Filetail Cat Shark	3958	0	3958	0.2		
Bocaccio Rockfish	2	3222	3224	0.1	246455	1.3
Mixed Species	2383	125	2508	0.1		
California Skate	1421	776	2197	0.1	21120	10.4
Sandpaper Skate	2020	39	2059	0.1		
Anemone Unid	1885	0	1885	0.1		
Tanner Crab Unid	1777	0	1777	0.1		
Longnose Cat Shark	1588	0	1588	0.1		
Black Skate	1567	1	1568	0.1		
Darkblotched Rockfish	22	1306	1329	0.1		
Pacific Grenadier	1216	0	1216	0.0		
Squid Unid	946	81	1027	0.0		
Deepsea Sole	914	47	961	0.0		
Pacific Sleeper Shark	954	0	954	0.0		
Sea Star Unid	911	0	911	0.0		
Shortbelly Rockfish	849	0	849	0.0		
Octopus Unid	401	437	838	0.0		
Armored Box Crab	766	0	766	0.0		
Canary Rockfish	0	593	593	0.0		
Eelpout Unid	584	0	584	0.0		

American Shad	273	239	512	0.0		
Rock Sole	68	399	467	0.0		
Bigfin Eelpout	424	0	424	0.0		
Shortspine/Longspine Thornyhead	380	0	380	0.0		
Pacific Electric Ray	379	0	379	0.0		
Market Squid	0	366	366	0.0		
California Grenadier	324	0	324	0.0		
Greenstriped Rockfish	296	8	304	0.0		
Rougheye Rockfish	0	300	300	0.0		
Sanddab Unid	105	187	292	0.0		
Other Nongroundfish	0	279	279	0.0		
Twoline Eelpout	212	0	212	0.0		
Redbanded Rockfish	20	163	183	0.0		
Pacific Halibut	181	0	181	0.0		
Pallid Eelpout	177	0	177	0.0		
Curlfin Turbot	146	0	146	0.0		
Snailfish Unid	138	0	138	0.0		
Soupfin Shark	30	95	125	0.0		
Garbage/Trash	119	0	119	0.0		
Pacific Ocean Perch	0	115	115	0.0		
Urchin Unid	112	0	112	0.0		
Brown Box Crab	102	0	102	0.0		
Jellyfish Unid	101	0	101	0.0		
White Croaker	0	98	98	0.0		
Sand Sole	0	85	85	0.0		
Threadfin Slickhead	77	0	77	0.0		
Rosethorn Rockfish	51	18	69	0.0		
Slickhead Unid	69	0	69	0.0		

Rockfish Unid	66	3	69	0.0		
Grenadier Unid	67	0	67	0.0		
Blue Shark	62	0	62	0.0		
Shelf Rockfish Unid	0	60	60	0.0		
Longspine Combfish	58	0	58	0.0		
Sculpin Unid	58	0	58	0.0		
Sea Cucumber Unid	56	0	56	0.0		
Sea Snail Unid	55	0	55	0.0		
Yellowtail Rockfish	0	54	54	0.0		
Ragfish	44	0	44	0.0		
Jack Mackerel	34	0	34	0.0		
Slender Sole	34	0	34	0.0		
Widow Rockfish	1	31	32	0.0		
Kelp Greenling	0	27	27	0.0		
Pacific Sardine	7	18	25	0.0		
California King Crab	25	0	25	0.0		
Crab Unid	18	0	18	0.0		
Big Skate	17	0	17	0.0		
Stripetail Rockfish	16	0	16	0.0		
Flatfish Unid	0	16	16	0.0		
Nudibranch Unid	15	0	15	0.0		
Cowcod Rockfish	1	14	15	0.0		
Shortraker Rockfish	0	14	14	0.0		
Scarlet King Crab	13	0	13	0.0		
Deepsea Skate	11	0	11	0.0		
Mackerel Unid	0	11	11	0.0		
Speckled Rockfish	10	0	10	0.0		
Blackspotted Rockfish	0	9	9	0.0		
Sponge Unid	9	0	9	0.0		

Shrimp Unid	7	0	7	0.0		
Rosy Rockfish	6	0	6	0.0		
White Skate	6	0	6	0.0		
Red Rock Crab	5	0	5	0.0		
Pacific Flatnose	5	0	5	0.0		
Pacific Mackerel	4	0	4	0.0		
Mollusk Unid	4	0	4	0.0		
Pacific Scabbardfish	4	0	4	0.0		
Midshipman (Toadfish) Unid	3	0	3	0.0		
Pygmy Rockfish	3	0	3	0.0		
Aleutian Skate	3	0	3	0.0		
Greenspotted Rockfish	0	2	2	0.0		
Pink Surfperch	2	0	2	0.0		
Sharpchin Rockfish	2	0	2	0.0		
Hornyhead Turbot	0	2	2	0.0		
Spiny King Crab	2	0	2	0.0		
Combfish Unid	2	0	2	0.0		
Oxeye Oreo	2	0	2	0.0		
Tubeshoulder Unid	2	0	2	0.0		
Viperfish Unid	2	0	2	0.0		
Soft Coral	2	0	2	0.0		
Halfbanded Rockfish	1	0	1	0.0		
Greenblotched Rockfish	0	1	1	0.0		
Roundfish Unid	1	0	1	0.0		
Cancer Crab Unid	1	0	1	0.0		
Starry Skate	1	0	1	0.0		
Fangtooth	1	0	1	0.0		
Pacific Rock Crab	1	0	1	0.0		

Egg Case Unid	1	0	1	0.0		
Redstripe Rockfish	1	0	1	0.0		
Horny Gorgonians	1	0	1	0.0		
Decorator/Spider Crab Unid	1	0	1	0.0		
Poacher Unid	1	0	1	0.0		
Surfperch Unid	0	0	0	0.0		
Other Id Fish	0	0	0	0.0		
Spiny Lobster Unid	0	0	0	0.0		
Black Eelpout	0	0	0	0.0		
Spotted Cusk-eel	0	0	0	0.0		
Anchovy Unid	0	0	0	0.0		
Brittle/Basket Star Unid	0	0	0	0.0		
Hermit Crab Unid	0	0	0	0.0		
Pacific Herring	0	0	0	0.0		
Sea Whips	0	0	0	0.0		
Urochordate Unid	0	0	0	0.0		
Worm Unid	0	0	0	0.0		

2012 CGC Trawl Gear Observed Catch, and Total Mortality Across All Fisheries for Species with >1 t Caught in 2012 CGC Trawl Fishery (Total mortality data from Table 15 in Bellman et al., 2013. Bold font indicates values that caused a species to be considered a 'main' species in the CGC fishery, and included under Criterion 2 in this assessment).

Species name	Sum of Discards (lbs)	Sum of Retained (lbs)	Total Catch (dis + ret)	% of CGC Fishery's Total Catch	Total Mortality (all fisheries; lbs)	CGC Fishery's Contribution to Total Mortality (%)
Dover Sole	4334	1103587	1107920	32.6	158105610	0.7
Longspine Thornyhead	10334	393822	404157	11.9	2049353	19.7
Chilipepper Rockfish	41919	257003	298922	8.8	666789	44.8

Shortspine Thornyhead	573	235061	235633	6.9	2049617	11.5
Sablefish	3061	228517	231578	6.8	11918486	1.9
Longnose Skate	39505	140200	179705	**5.3**	2184761	8.2
Petrale Sole	2203	170587	172789	5.1	2448742	7.1
Blackgill Rockfish	234	100486	100720	3.0	430872	**23.4**
Pacific Sanddab	30376	55144	85520	2.5	662754	12.9
Arrowtooth Flounder	12169	60210	72378	2.1	5529374	1.3
Pacific Hake	64733	6591	71324	2.1	354295512	0.0
Splitnose Rockfish	47964	16389	64353	1.9	136488	**47.1**
Aurora Rockfish	5619	35449	41069	1.2	55579	**73.9**
English Sole	9470	28419	37889	1.1	494784	7.7
Bank Rockfish	74	30046	30119	0.9	41315	**72.9**
Spotted Ratfish	25038	15	25053	0.7	190215	13.2
Kelp Rocks Wood Mud	19740	0	19740	0.6		
Rex Sole	2203	15001	17204	0.5	978501	1.8
Spiny Dogfish Shark	16901	5	16906	0.5	1831558	0.9
Lingcod	5120	11460	16580	0.5		
Brown Cat Shark	15384	0	15384	0.5	742826	2.1
Stripetail Rockfish	14124	267	14390	0.4	29498	**48.8**
Giant Grenadier	11977	0	11977	0.4		
Tanneri Tanner Crab	10396	0	10396	0.3		
California Slickhead	10196	0	10196	0.3		
Shark Unid	9741	27	9768	0.3		
Bocaccio Rockfish	0	8440	8440	0.2	307567	2.7
Dungeness Crab	6920	0	6920	0.2	44746182	0.0
Invertebrate Unid	6778	0	6778	0.2		
Filetail Cat Shark	5233	0	5233	0.2		
Darkblotched Rockfish	38	4814	4851	0.1	231375	2.1

Mixed Species	4136	0	4136	0.1		
Sandpaper Skate	3744	0	3744	0.1	91536	4.1
Grenadier Unid	643	2776	3419	0.1		
Tanner Crab Unid	2989	0	2989	0.1		
Skate Unid	294	2550	2844	0.1		
Longnose Cat Shark	2797	0	2797	0.1		
Pacific Grenadier	2719	0	2719	0.1	164906	1.6
Squid Unid	2646	23	2669	0.1		
Deepsea Sole	1883	771	2654	0.1		
Shortbelly Rockfish	2404	77	2481	0.1	16424	15.1
Anemone Unid	2409	0	2409	0.1		
Sanddab Unid	388	1905	2293	0.1		
California Skate	1417	394	1811	0.1		
Pacific Electric Ray	1658	0	1658	0.0		
Sea Star Unid	1622	0	1622	0.0		
Black Skate	1524	15	1539	0.0		
Pacific Sleeper Shark	1413	0	1413	0.0		
Rock Sole	92	1316	1408	0.0		
Big Skate	137	1087	1224	0.0		
Eelpout Unid	1112	0	1112	0.0		
Armored Box Crab	1057	0	1057	0.0		
Greenstriped Rockfish	967	89	1057	0.0		
Widow Rockfish	1	1039	1040	0.0		
Octopus Unid	868	129	997	0.0		
Pacific Halibut	961	0	961	0.0		
Canary Rockfish	0	794	794	0.0		
Rockfish Unid	775	0	775	0.0		
Redbanded Rockfish	97	669	766	0.0		

Bigfin Eelpout	723	0	723	0.0		
Greenspotted Rockfish	184	432	616	0.0		
Shortspine/Longspine Thornyhead	585	0	585	0.0		
Twoline Eelpout	433	0	433	0.0		
Butter Sole	4	411	415	0.0		
Slender Sole	212	167	379	0.0		
Jellyfish Unid	369	0	369	0.0		
Other Nongroundfish	0	361	361	0.0		
Sharpchin Rockfish	279	0	279	0.0		
Rougheye Rockfish	0	248	248	0.0		
Market Squid	0	231	231	0.0		
Threadfin Slickhead	227	0	227	0.0		
California Grenadier	222	0	222	0.0		
American Shad	155	41	196	0.0		
Smelt Unid	0	186	186	0.0		
Curlfin Turbot	171	0	171	0.0		
Snailfish Unid	139	0	139	0.0		
Longspine Combfish	128	0	128	0.0		
Kelp Greenling	0	120	120	0.0		
Cat Shark Unid	120	0	120	0.0		
Blackspotted Rockfish	0	116	116	0.0		
Cowcod Rockfish	3	107	110	0.0		
Pacific Ocean Perch	9	99	108	0.0		
Pacific Flatnose	96	0	96	0.0		
Slope Rockfish Unid	0	95	95	0.0		
Rosethorn Rockfish	82	7	89	0.0		
Sculpin Unid	85	0	85	0.0		
Irregular Echinoids	77	0	77	0.0		

Greenblotched Rockfish	0	73	73	0.0		
Mola Mola (Sunfish)	66	0	66	0.0		
Pacific Sardine	61	0	61	0.0		
White Croaker	2	55	57	0.0		
Sponge Unid	55	0	55	0.0		
California King Crab	54	0	54	0.0		
Shrimp Unid	52	0	52	0.0		
Sixgill Shark	51	0	51	0.0		
Decomposed Fish	50	0	50	0.0		
Garbage/Trash	31	0	31	0.0		
Sea Snail Unid	30	0	30	0.0		
Sand Sole	0	30	30	0.0		
Sea Squirts Unid	29	0	29	0.0		
Midshipman (Toadfish) Unid	27	0	27	0.0		
Urchin Unid	22	0	22	0.0		
Pink Rockfish	0	22	22	0.0		
Plainfin Midshipman	21	0	21	0.0		
Sea Cucumber Unid	20	0	20	0.0		
Brown Rockfish	0	20	20	0.0		
Pacific Staghorn Sculpin	20	0	20	0.0		
Pink Surfperch	19	0	19	0.0		
Sea Whips	18	0	18	0.0		
Flatfish Unid	17	0	17	0.0		
Surfperch Unid	16	0	16	0.0		
Halfbanded Rockfish	14	0	14	0.0		
Urochordate Unid	14	0	14	0.0		
Brittle/Basket Star Unid	14	0	14	0.0		

Vermilion Rockfish	0	12	12	0.0		
Black Eelpout	12	0	12	0.0		
Brown Box Crab	12	0	12	0.0		
Rosy Rockfish	10	0	10	0.0		
Deepsea Skate	8	0	8	0.0		
Sea Pens	8	0	8	0.0		
Threadfin Sculpin	6	0	6	0.0		
Yelloweye Rockfish	0	6	6	0.0		
White Skate	6	0	6	0.0		
Scarlet King Crab	6	0	6	0.0		
Yellowtail Rockfish	0	5	5	0.0		
Roughscale Sole	5	0	5	0.0		
Smooth Grenadier	4	0	4	0.0		
Egg Case Unid	4	0	4	0.0		
Abyssal Grenadier	3	0	3	0.0		
Decorator/Spider Crab Unid	2	0	2	0.0		
Laternfish Unid	2	0	2	0.0		
Mexican Rockfish	0	2	2	0.0		
King Crab Unid	2	0	2	0.0		
King of the Salmon	2	0	2	0.0		
Poacher Unid	2	0	2	0.0		
Shortraker Rockfish	2	0	2	0.0		
Viperfish Unid	1	0	1	0.0		
Pacific Scabbardfish	1	0	1	0.0		
Yellowfin Tuna	0	1	1	0.0		
Crab Unid	1	0	1	0.0		
Red Rock Crab	1	0	1	0.0		
Whiptail Gulper Unid	1	0	1	0.0		

Tubeshoulder Unid	1	0	1	0.0		
Worm Unid	1	0	1	0.0		
Nudibranch Unid	1	0	1	0.0		
Fangtooth	1	0	1	0.0		
Hermit Crab Unid	1	0	1	0.0		
Soft Coral	1	0	1	0.0		
Squarespot Rockfish	0	0	0	0.0		
Aplacophora Unid	0	0	0	0.0		
Hornyhead Turbot	0	0	0	0.0		
Redstripe Rockfish	0	0	0	0.0		
Scaleless Dragonfish Unid	0	0	0	0.0		
Sevengill Shark	0	0	0	0.0		
Blackdragon Unid	0	0	0	0.0		
Softhead Grenadier	0	0	0	0.0		
Pacific Hagfish	0	0	0	0.0		
Squat Lobster Unid	0	0	0	0.0		
Pacific Saury	0	0	0	0.0		
Bull Sculpin	0	0	0	0.0		
Cusk-eel Unid	0	0	0	0.0		
Deepsea Smelt Unid	0	0	0	0.0		
Other Id Fish	0	0	0	0.0		
Pacific Argentine	0	0	0	0.0		
Crinoids Unid	0	0	0	0.0		
Lyre Crab Unid	0	0	0	0.0		
Pacific Viperfish	0	0	0	0.0		

All Pacific Groundfish IFQ Species												
IFQ Species	**2011**	**2011**	**2011 Total**	2011	2011 Whiti	**2011**	**2012**	**2012**	**2012 Total**	2012	2012	**2012**

	TAC (Sector QP)	Total Sector Catch (QP)	Sector Utilization	Non-whiting Sector Catch (QP)	Whiting Sector Catch (QP)	Groundfish Collective Catch (QP)	TAC (Sector QP)	Total Sector Catch (QP)	Sector Utilization	Non-whiting Sector Catch (QP)	Whiting Sector Catch (QP)	Groundfish Collective Catch (QP)
Arrowtooth flounder	27,406,105	5,576,000	20.3%	5,547,823	28,177	33,621	20,861,131	5,497,232	26.4%	5,393,814	54,616	72,700
Bocaccio rockfish South of 40Ã‚Â°10' N.	132,277	11,715	8.9%	11,715	-	3,702	132,277	19,461	14.7%	19,461	-	8,456
Canary rockfish	57,100	8,125	14.2%	6,239	1,886	593	57,761	15,942	27.6%	13,774	2,168	794
Chilipepper rockfish South of 40Ã‚Â°10' N.	3,252,370	688,187	21.2%	688,187		328,395	2,934,904	642,329	21.9%	643,174	-	298,375
Cowcod South of 40Ã‚Â°10' N.	3,968	39	1.0%	39		19	3,968	204	5.1%	204	-	109
Darkblotched rockfish	552,997	200,264	36.2%	197,577	2,687	1,486	548,808	197,918	36.1%	188,184	9,433	4,874
Dover sole	49,018,682	17,269,411	35.2%	17,269,250	161	1,060,505	49,018,682	16,063,162	32.8%	16,049,785	1,319	1,109,634
English sole	41,166,808	302,936	0.7%	302,935	1	35,952	21,037,611	324,291	1.5%	323,438	52	38,135
Lingcod	4,107,873	639,244	15.6%	629,175	10,069	6,076	3,991,800	839,509	21.0%	831,036	8,060	16,413
Longspine thornyheads North of 34Ã‚Â°27' N.	4,334,839	2,119,804	48.9%	2,119,803	1	297,670	4,219,648	2,010,604	47.6%	2,013,119	116	414,145
Minor shelf rockfish North of 40Ã‚Â°10' N.	1,150,813	34,225	3.0%	32,934	1,291	-	1,150,813	88,221	7.7%	85,802	1,726	-
Minor shelf rockfish South of 40Ã‚Â°10' N.	189,598	6,633	3.5%	6,633		2,930	189,598	28,522	15.0%	25,069	-	15,301
Minor slope rockfish North of 40Ã‚Â°10' N.	1,828,779	319,938	17.5%	295,561	24,377	152	1,828,779	486,088	26.6%	326,552	158,556	-
Minor slope rockfish South of 40Ã‚Â°10' N.	831,958	113,337	13.6%	113,337		64,040	831,958	271,674	32.7%	270,847	-	184,770
Other flatfish	9,253,683	1,527,767	16.5%	1,525,875	1,892	59,851	9,253,683	1,514,202	16.4%	1,500,933	9,673	104,117
Pacific cod	2,502,247	556,691	22.2%	554,143	2,548	-	2,502,247	873,698	34.9%	873,580	94	-
Pacific halibut (IBQ) North of 40Ã‚Â°10' N.	257,524	70,839	27.5%	70,063	776	-	232,856	100,647	43.2%	70,213	1,373	-
Pacific ocean perch North of 40Ã‚Â°10' N.	263,148	101,433	38.5%	100,884	549	-	263,441	118,146	44.8%	90,680	27,462	-
Pacific whiting	204,628,442	201,030,361	98.2%	521,814	200,508,547	43,268	151,373,798	144,759,024	95.6%	507,336	144,207,288	65,287
Petrale sole	1,92	1,78	93.2%	1,7	1	177	2,32	2,33	100.3%	2,3	1	175

	0,226	9,627		89,626		,002	4,995	2,199		31,478		,816
Sablefish North of 36Ã‚Â° N.	5,613,719	5,287,802	94.2%	5,220,841	66,961	314,429	5,438,797	4,928,150	90.6%	4,806,019	104,082	243,164
Sablefish South of 36Ã‚Â° N.	1,170,390	1,009,286	86.2%	1,009,286		435,095	1,133,352	503,511	44.4%	499,843	-	244,026
Shortspine thornyheads North of 34Ã‚Â°27′ N.	3,156,138	1,574,518	49.9%	1,569,715	4,803	171,533	3,120,533	1,571,037	50.3%	1,551,370	18,364	227,612
Shortspine thornyheads South of 34Ã‚Â°27′ N.	110,231	18,653	16.9%	18,653		18,653	110,231	803	0.7%	808	-	-
Splitnose rockfish South of 40Ã‚Â°10′ N.	3,045,245	88,523	2.9%	88,523		69,569	3,206,513	130,462	4.1%	117,251	-	56,753
Starry flounder	1,471,586	25,936	1.8%	25,936		-	1,480,404	18,404	1.2%	18,402	-	-
Widow rockfish	755,348	303,703	40.2%	58,010	245,693	324	755,352	340,220	45.0%	115,736	224,474	1,040
Yelloweye rockfish	1,323	128	9.7%	128		-	1,323	76	5.7%	76	-	6
Yellowtail rockfish North of 40Ã‚Â°10′ N.	6,821,455	1,629,184	23.9%	692,858	936,326	-	6,850,556	2,194,139	32.0%	1,729,446	464,691	-
Total	375,004,872	242,304,309	65%	40,467,563	201,836,746	3,124,865	294,855,819	185,869,875	63%	40,397,430	145,293,548	3,281,527

Appendix C: CGC Fishery Habitat Data (Provided by The Nature Conservancy)

Fixed Gear Effort by Habitat													
	footprint		**amount of habitat by fishing effort (km2)**										
2011 Effort	total area (km2)	percent of total	boulder < 60m	boulder > 60m	cobble < 60m	cobble > 60m	gravel < 60m	gravel > 60m	mud < 60m	mud > 60m	sand < 60m	sand > 60m	corals and sponges
fixed gear: none (0 times / km2 / year)	47121	97.86%	657	3151	4	2	3	18	1319	19520	3840	18607	959
fixed gear: low (1-2 times / km2 / year)	835	1.73%		113						711		11	6
fixed gear: medium (3-5 times / km2 / year)	161	0.33%		23						132		6	
fixed gear: high (6-12 times / km2 / year)	35	0.07%								33		2	
TOTAL AREA			657	3287	4	2	3	18	1319	20396	3840	18626	965
2012 Effort	total area (km2)	percent of total	boulder < 60m	boulder > 60m	cobble < 60m	cobble > 60m	gravel < 60m	gravel > 60m	mud < 60m	mud > 60m	sand < 60m	sand > 60m	corals and sponges
fixed gear: none (0 times / km2 / year)	47602	98.86%	657	2936	4	2	3	18	1319	20200	3840	18623	954
fixed gear: low (1-2 times / km2 / year)	446	0.93%		276						167		3	8
fixed gear: medium (3-5 times / km2 / year)	96	0.20%		67						29			2
fixed gear: high (6-12 times / km2 / year)	8	0.02%		8									1
TOTAL AREA			657	3287	4	2	3	18	1319	20396	3840	18626	965

Trawl Effort by Habitat													
	footprint		**amount of habitat by fishing effort (km2)**										
2011 Effort	total area (km2)	percent of total	boulder < 60m	boulder > 60m	cobble < 60m	cobble > 60m	gravel < 60m	gravel > 60m	mud < 60m	mud > 60m	sand < 60m	sand > 60m	corals and sponges
trawl: none (0 times / km2 / year)	34112	1	604	2602	4	2	3	18	1084	12626	3103	14066	703
trawl: low (1-5 times / km2 / year)	2690	0		21						1323		1346	27
trawl: medium (6-15 times / km2 / year)	242	0		18						85		139	4
trawl:high (16-34 times / km2 / year)	18	0		4								14	
Total coverage by each type			0	0	0	0	0	0	0	0	0	0	0
Total area of each type			604	2645	4	2	3	18	1084	14034	3103	15565	734
2012 Effort	total area (km2)	percent of total	boulder < 60m	boulder > 60m	cobble < 60m	cobble > 60m	gravel < 60m	gravel > 60m	mud < 60m	mud > 60m	sand < 60m	sand > 60m	corals and sponges
trawl: none (0 times / km2 / year)	33663	1	604	2525	4	2	3	18	1084	12979	3103	13341	689
trawl: low (1-5 times / km2 / year)	2984	0		64						878		2042	35
trawl: medium (6-15 times / km2 / year)	341	0		29						139		173	8
trawl:high (16-34 times / km2 / year)	74	0		27						38		9	2
Total coverage by each type			0	0	0	0	0	0	0	0	0	0	0
Total area	37062		604	2645	4	2	3	18	1084	14034	3103	15565	734

Trawl Closures by Habitat Type in Groundfish Collective Project Area											
	amount of habitat by closure type (km2)										
	boulder < 60m	boulder > 60m	cobble < 60m	cobble > 60m	gravel < 60m	gravel > 60m	mud < 60 m	mud > 60 m	sand < 60 m	sand > 60 m	corals and sponges
Closure Type											
Trawl: CA State waters	527	40	4	0	2	0	891	839	1988	923	71
Trawl: EFH	65	1307	0	0	0	2	0	3015	95	1698	264
Trawl: RCA	3	71	0	2	1	16	0	495	1	1106	86
Trawl: Groundfish Collective voluntary closure	9	794	0	0	0	0	0	3148	82	2013	117
% of total habitat closed to trawl fishing in CGC project area	100 %	84%	100 %	100 %	100 %	100 %	82 %	53 %	70 %	37 %	73 %
Open to Trawl Fishing by Groundfish Collective	0	433	0	0	0	0	193	6537	937	9825	196
% of total habitat open to trawl fishing	0%	16%	0%	0%	0%	0%	18 %	47 %	30 %	63 %	27 %
Total amount of habitat in Groundfish Collective fishing area (km2)	604	2645	4	2	3	18	1084	14034	3103	15565	734

Fixed Gear Closures by Habitat Type in Groundfish Collective Project Area											
	amount of habitat by closure type (km2)										
	boulder < 60m	boulder > 60m	cobble < 60m	cobble > 60m	gravel < 60m	gravel > 60m	mud < 60 m	mud > 60 m	sand < 60 m	sand > 60 m	corals and sponges
Closure Type											
Fixed: CA MPA (SMR,SMP,SMCA)	148	49					184	260	350	430	78
Fixed: EFH bottom contact gear closure	3	24		2	1	18		102	1	120	32
Fixed: Non-Trawl RCA	48	512					148	5203	178	6912	250
Fixed: Groundfish Collective voluntary closure	458	98	4	0	2	0	987	1553	3311	922	36
% of total habitat closed to	100	21%	100	100	100	100	100	35	100	45	51

fixed gear fishing in CGC project area	%		%	%	%	%	%	%	%	%	%
Open to fixed gear fishing by Groundfish Collective	0	2604	0	0	0	0	0	13278	0	10242	388
% of total habitat open to fixed gear fishing	0%	79%	0%	0%	0%	0%	0%	65%	0%	55%	49%
Total amount of habitat in Groundfish Collective fishing area (km2)	657	3287	4	2	3	18	1319	20396	3840	18626	784

Appendix D: Details of "Inherent Vulnerability" Analysis

Throughout this report the inherent vulnerability of assessed stocks is informed by the productivity scores presented in Table 1 of Cope, J.M et al. 2011. The manner in which these productivity scores are interpreted is described below.

Cope and colleagues scored each species for 10 productivity attributes; for each attribute, the species was put into one of three "bins" based on its species-specific information for that attribute. Each bin had a score associated with it, and the three bins were: low productivity (score of 1), medium (2), and high (3) (Table 2 in Cope, J.M et al. 2011). The species' overall productivity score was then derived from its scores on these 10 specific attributes. Since a species' productivity score could range between 1.0 and 3.0 (i.e, no species could have an overall productivity score of less than 1 or more than 3), the "distance" over which a species' productivity score could range was 2. If this "distance" (i.e., 2) is divided equally between the three bins, we can say that the "low" productivity bin includes productivity scores of 1 to 1.67, the "medium" bin has scores of 1.68-2.33, and the "high" bin has scores of 2.34-3.0. To inform this report's assessment of inherent vulnerability (rather than resilience), these scores are reversed to reflect vulnerability, so that high vulnerability is indicated by a productivity score of 1.0-1.67, medium vulnerability is a score of 1.68-2.33, and low vulnerability is a score of 2.34-3.0. These scores are presented alongside Fishbase vulnerability scores, which are interpreted in accordance with Seafood Watch criteria. Where there was a discrepancy between the productivity scores and the Fishbase vulnerability scores, the productivity scores were the final determinant of the inherent vulnerability score.