A PROPOSED FRAMEWORK PROCESS AND ANALYSIS IN SUPPPORT OF A RANGE OF ALTERNATIVES FOR THE PHASE 2 STOCK DEFINITIONS PROCESS

Executive Summary

The Phase 2 stock definitions process was initiated at the Pacific Fishery Management Council's (Council) September 2024 meeting when it adopted the Phase 2 process (Agenda Item I.8, Attachment 1, September 2024) and plan (Agenda Item I.6, Attachment 2, September 2024). The Council directed staff to develop a range of alternatives (ROA) for the stock definitions step of Phase 2 for decision-making in March 2025. In developing the analysis to support the ROA, it became evident that efficiencies were needed to improve the process. For many species, the history of federal management and a review of the proportion of fishing activity for these species occurring in the exclusive economic zone (EEZ) suggests these species are strong candidates for continued federal management, without need for further analysis, and can be defined as stocks using the approach developed through Amendment 31 and used recently in Amendment 35. For some species, further review and analysis using the factors described at §600.305(c) may be needed to ascertain if they should be Federally managed.

For the purposes of this Phase 2 process, the Internal Planning Team (IPT) developed a framework to identify species as principally caught in the EEZ using a 25 percent threshold, meaning 25 percent or more of fishery mortality occurs in the EEZ. The IPT recognizes this is a precautionary threshold value and may allow more species to remain in the FMP than would under a higher percentage. The 25 percent was selected based on how past management affected the diversity of catch in terms of state or Federal waters and how current and reasonably foreseeable future actions may further change the diversity of catch.

The species for which 25 percent or more of mortality occurs in the EEZ are categorized as not needing further evaluation. The species for which less than 25 percent of the mortality occurs in the EEZ are categorized as requiring further evaluation. The threshold was applied to total mortality for each of the 86 managed groundfish species, by state and fishery sector (commercial and recreational). The use of the threshold identified 60 species that are principally caught in the EEZ, 24 that are not, and 2 that have no reported or observed groundfish fishery mortality. The results indicated that California and Oregon are similar in respect to species caught and area of principal mortality. With the exception of one species, all others caught in Oregon were also caught in California. Spatial data specific to water area (EEZ or state) of mortality off Washington are nearly non-existent, in some cases because of data collection limitations and in other cases because fishery restrictions are in place. The only set of species where mortality off Washington could be definitively identified to the EEZ are those caught only by the commercial fishery sector. Off Washington, the commercial fishery sector is limited to the EEZ; therefore, if a species is only caught in that fishery, its mortality is attributable only to the EEZ. Washington does not collect water area of mortality for recreational species, which inhibits the use of the 25 percent threshold

as a means to identify species mortality to water area. This analysis proposes two options to overcome this issue, one is to use Oregon results as proxy and the other is to identify all species with mortality off Washington as caught by the fishery, i.e., Federally managed.

Using the 25 percent threshold framework, two groups of species were categorized: Group A – species with principal mortality in the EEZ (Table ES 1) and Group B – species that require additional analysis (Table ES 2). Further analysis on Group A could be ceased and stocks of these species could be defined, using any information discerned from the literature review on stock structure, as they are principally caught by the Federal fishery in the EEZ. Additionally, the Council may identify species in Group A that, while principally caught in the EEZ, may be EC species candidates and should be further analyzed for that purpose. Group B are those species that are not principally caught in the EEZ or have no reported or observed mortality in the EEZ. These Group B species must be analyzed via § 600.305(c) if the Council wants to consider removing them from the FMP or identifying them as EC species.

The Council can use these Groups to assist in identification of species to the alternatives presented below. The Council is not bound to adopt all of any group to an alternative. These tables only provide the results of the analysis in a manner consistent with how the alternatives are structured.

Table ES 1. Group A: Species with mortality greater than 25 percent attributable to the EEZ

Species		
• Arrowtooth Flounder	• Greenspotted Rockfish	• Rosethorn Rockfish
• Aurora Rockfish	• Greenstriped Rockfish	• Rougheye/Blackspotted Rockfish a/
• Bank Rockfish	• Halfbanded Rockfish	• Sablefish a/
• Big Skate	• Honeycomb Rockfish	• Sharpchin Rockfish
• Blackgill Rockfish	• Harlequin Rockfish	• Shortraker Rockfish
• Bocaccio Rockfish	• Longnose Skate	• Shortspine Thornyhead a/
• Bronzespotted Rockfish	• Longspine Thornyhead	• Silvergray Rockfish
• Butter Sole	• Mexican Rockfish	• Speckled Rockfish
• California Scorpionfish	• Pacific Cod	• Splitnose Rockfish
• Chilipepper Rockfish a/	• Pacific Hake	• Squarespot Rockfish a/
• Canary Rockfish a/	• Pacific Ocean Perch	• Starry Rockfish
• Cowcod Rockfish	• Pacific Sanddab	• Stripetail Rockfish
• Curlfin Sole	• Pacific Spiny Dogfish a/	• Swordspine Rockfish
• Darkblotched Rockfish	• Petrale Sole a/	• Vermilion/Sunset rockfish (CA) a/
• Dover Sole a/	• Pink Rockfish	• Widow Rockfish a/
• English Sole a/	• Pinkrose Rockfish	• Yelloweye Rockfish a/
• Flag Rockfish	• Pygmy Rockfish	• Yellowmouth Rockfish
• Flathead Sole	• Redbanded Rockfish	• Yellowtail Rockfish a/
• Freckled Rockfish	• Redstripe Rockfish	
• Greenblotched Rockfish	• Rex Sole a/	

a/ indicates species that have defined stocks

Table ES 2. Group B: Species that require further evaluation.

Species		
• Black and Yellow Rockfish	• Dwarf-red Rockfish	• Quillback Rockfish a/
• Black Rockfish a/	• Gopher Rockfish	• Rock Sole
• Blue/Deacon Rockfish	• Grass Rockfish	• Rosy Rockfish
• Brown Rockfish	• Kelp Greenling	• Sand Sole
• Cabezon	• Kelp Rockfish	• Starry Flounder
• Calico Rockfish	• Leopard Shark	• Tiger Rockfish
• Chameleon Rockfish	• Light Dusky Rockfish	• Treefish
• China Rockfish	• Lingcod a/	• Vermilion Rockfish (OR) a/
• Copper Rockfish a/	• Olive Rockfish	•

a/ indicates species that have defined stocks

Range of Alternatives

Based on the analysis, a range of alternatives (ROA) is proposed below.

No Action: All species remain in FMP as currently defined and managed. The list of managed species as shown in Table 3-1 would not be modified. The Council would not define stocks of the species in the FMP other than the ones already defined.

Alternative 1: Species identified as in need of conservation and management. Stocks of the species will be defined as one or more stocks, consistent with the options below, and will remain in the FMP.

Option 1: One stock

Option 2: Two stocks

Option 3: Three stocks

Option 4: Four stocks

Alternative 2: Species identified as not in need of conservation and management. Stocks of the species will not be defined and the species will be removed from the FMP.

Alternative 3: Species identified as an ecosystem component species. Stocks of the species will not be defined, though it will remain in the FMP

Alternatives 1 - 3 represent potential alternative outcomes following the Phase 2 decision-making process for each of the 86 groundfish species currently managed in the FMP. We anticipate that Alternative 1 would be likely to include the majority of those Group A species identified by applying the 25 percent threshold, as well as those Group B species identified as in need of conservation and management following further analysis using the factors at § 600.305(c). We further anticipate that there could be certain Group A species classified as EC species as a result of this review. All species identified for Alternative 1 would further be defined as one or more stocks for the purposes of management under the FMP.

Table ES 3. Potential stock definitions options (Opt) for species where mortality in the EEZ is greater than 25 percent . Species defined under Amendments 31 and 35 are not shown. Population structure (Pop. Struct.) is denoted by U =unknown, Y =yes, or N = no. Options relevant to species are noted by a grayed cell and an "*" Options are based on the literature review source information Agenda Item I.8, Attachment 1, September 2024. Empty columns provided in case the Council recommends other options than indicated by the literature review. Empty columns provided in case the Council recommends other options than indicated by the literature review. Potential Stock delineations boundaries are based on literature review and are offered for Council consideration only.

Species	Pop. Struct	Opt 1	Opt 2	Opt 3	Opt 4	Potential Stock delineations	Notes
Arrowtooth Flounder	U	*				Coastwide	
Aurora Rockfish	U	*				Coastwide	
Bank Rockfish	U	*				Coastwide	
Big Skate	N	*				Coastwide	
Blackgill Rockfish	U	*				Coastwide	
Bocaccio Rockfish	N	*				Coastwide	Range = CA
Bronzespotted Rockfish	U	*				Coastwide or California only	
Butter Sole	U	*				Coastwide	
California Scorpionfish	U	*				Coastwide or California only	Range = CA
Cowcod	Y	*	*			**Opt1.** Coastwide or California/Oregon or **Opt 2.** California and Oregon	Range = CA & OR
Curlfin Sole	U	*				Coastwide	
Darkblotched Rockfish	U	*				Coastwide	
Flag Rockfish	U	*	*			**Opt1.** Coastwide or California/Oregon or **Opt 2.** California and Oregon	Range = CA & OR
Flathead Sole	U	*				Coastwide	
Freckled Rockfish	U	*				Coastwide or California only	Range = CA
Greenblotched Rockfish	U	*				Coastwide	
Greenspotted Rockfish	U	*				Coastwide	
Greenstriped Rockfish	U	*				Coastwide	
Halfbanded Rockfish	U	*				Coastwide	
Honeycomb Rockfish	U	*				Coastwide or California only	
Harlequin Rockfish	U	*	*			**Opt1.** Coastwide or Oregon/Washington. **Opt 2**. Oregon and Washington	Range = OR & WA
Longnose Skate	U	*				Coastwide	
Longspine Thornyhead	U	*				Coastwide	
Mexican Rockfish	U	*				Coastwide or California only	Range = CA

Species	Pop. Struct	Opt 1	Opt 2	Opt 3	Opt 4	Potential Stock delineations	Notes
Pacific Cod	U	*				Coastwide	
Pacific Hake	N	*				Coastwide	
Pacific Ocean Perch	U	*				Coastwide	
Pacific Sanddab	N	*				Coastwide	
Pink Rockfish	U	*	*			**Opt1.** Coastwide or California/Oregon or **Opt 2.** California and Oregon	Range = CA & OR
Pinkrose Rockfish	U	*				Coastwide or California only	Range = CA
Pygmy Rockfish	U	*				Coastwide	
Redbanded Rockfish	U	*				Coastwide	
Redstripe Rockfish	U	*				Coastwide	
Rosethorn Rockfish	U	*				Coastwide	
Sharpchin Rockfish	U	*				Coastwide	
Shortraker Rockfish	U	*				Coastwide	
Silvergray Rockfish	U	*				Coastwide	
Speckled Rockfish	U	*				Coastwide	
Splitnose Rockfish	N	*				Coastwide	
Starry Rockfish	U	*				Coastwide or California only	Range = CA
Stripetail Rockfish	N	*				Coastwide	
Swordspine rockfish	U	*				Coastwide or California only	Range = CA
Yellowmouth Rockfish	U	*				Coastwide	

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Acronyms and Abbreviations

ABC	Acceptable biological catch
ACL	Annual catch limit
CA/OR/WA	California, Oregon, and Washington
CDFW	California Department of Fish and Wildlife
EC	Ecosystem component
EEZ	Exclusive Economic Zone
FMP	Fishery Management Plan
GAP	Groundfish Advisory Subpanel
GMT	Groundfish Management Team
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
mt	Metric ton
NMFS	National Marine Fisheries Service
ODFW	Oregon Department of Fish and Wildlife
OFL	Overfishing limits
PacFIN	Pacific Fisheries Information Network
PMFC	Pacific Fishery Management Council (used in references)
RecFIN	Recreational Fisheries Information Network
RCA	Rockfish Conservation Area
SSC	Scientific and Statistical Committee
WCGOP	West Coast Groundfish Observer Program
WDFW	Washington Department of Fish and Wildlife

1. History of Action

1.1 Phase 1 •

In March 2022, the National Marine Fisheries Service (NMFS) (Agenda Item E.3.a, NMFS Report 1, March 2022, Agenda Item E.3.a, NMFS Report 1, March 2022) informed the Pacific Fishery Management Council (Council) that the Pacific Coast Groundfish Fishery Management Plan (FMP) did not adequately define stocks of its managed groundfish species. The FMP, at that time, provided a list of managed species but did not define discrete stock units of managed groundfish species in a manner consistent with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and its National Standards. NMFS recommended the Council consider a series of actions to define and identify stocks in need of conservation and management to rectify this issue. The Council subsequently initiated the Phase 1 process to define stocks for the "priority" species in 2022, which were the species assessed in 2021 and to be assessed in 2023. Phase 1 started with these species due to the pressing needs of the upcoming harvest specification and management measure process (hereinafter "biennial process") with the understanding that stocks for the remaining species would be defined in a subsequent phase.

Phase 1 developed the analytical process to define stock units of groundfish species. That process relied on a detailed literature review, which focused on genetics, adult movement and larval dispersal to identify stocks of species. The impacts were evaluated by using a framework analysis to understand the biological risks to the species, socioeconomic risks to communities, and management burden from the definitions in order to understand the impacts (Appendix 1, Agenda Item H.3, Attachment 1, June 2023). The Council utilized this same process to define stocks of species to be assessed in 2025 and 2027 (Agenda Item I.4, November 2024). Phase 1 resulted in defining 28 stocks for 21 species under Amendments (A) 31 and A35 (note, A35 has been recommended by the Council to NMFS, but is not yet approved).

The A31 and A35 processes assumed that all the species addressed were caught by the fishery and were in need of conservation and management. Those processes were necessary due to the pressing need to identify stock units to support stock assessments and the biennial groundfish harvest specification and management process. This document does not delve deeply into this history, though instead recommends the following documents as reference material (Table 1), which are incorporated by reference.

Table 1. Reference documents for history of action.

Document	Topic
Agenda Item E.3.a, NMFS Report 1, March 2022	NMFS identifies concerns with FMP regarding stocks
Agenda Item H.5, Attachment 1, November 2022.	Range of Alternatives stock definitions for species assessed in 2021 and those to be assessed in 2023.
Agenda Item F.7, Attachment 1, March 2023	Preliminary Preferred Alternative stock definitions for species assessed in 2021 and those to be assessed in 2023.
Agenda Item H.3, Attachment 1, June 2023	Final Preferred Alternative stock definitions for species to be assessed in 2021 and those to be assessed in 2023.
Agenda Item F.4, Attachment 1, June 2024 •	Range of Alternatives stock definitions for species to be assessed in 2025 & 2027

Document	Topic
Agenda Item I.5, Attachment 1, September 2024	Preliminary Preferred Alternative(s) stock definitions for species to be assessed in 2025 & 2027
Agenda Item I.8, Attachment 1, September 2024	Scoping document for Phase 2
Agenda Item I.4, Attachment 1, November 2024	Final Preferred Alternative stock definitions for stocks to be assessed in 2025 & 2027

1.2 Phase 2

The Council initiated Phase 2 at the November 2023 focused strictly on stock structure. At that meeting, the Council was presented an informational document (Agenda Item E.8, Attachment 1, November 2023) which described the general considerations necessary for Phase 2. Council directed staff to develop an analytical framework based on that document. Staff returned at the September 2024 Council meeting, with the proposed analytical framework of Phase 2 (Agenda Item I.8, Attachment 1, September 2024). The framework was largely predicated on National Standard guidance, notably at §600.305(c), which can be used to determine whether a stock requires conservation and management.

The Council adopted the framework and the revised process planning schedule (Agenda Item E.8, Attachment 2, November 2024). Council staff was directed to develop a range of alternatives (ROA) for all remaining undefined managed groundfish species managed in the FMP for consideration at the March 2025 meeting. The Council also adopted the following draft purpose and need statement for this action at their September 2024 meeting:

> "The function of Amendment [TBD] to the Pacific Fishery Management Council's (Council) Pacific Coast Groundfish Fishery Management Plan (FMP) is to identify and define [TBD] stocks of [TBD] managed groundfish species in need of conservation and management at a geographic scale sufficient for assessing overfished status and determining if overfishing is occurring based on key biological, ecological, social, and economic information currently available. Amendment [TBD] is necessary to align the FMP with the requirements of the Magnuson Stevens Fishery Conservation and Management Act and its National Standards to enhance the Council's ability to attain sustainability objectives, especially those outlined in National Standard 1."

The initial objective of this analysis is to examine the list of currently managed groundfish species and attempt to identify species that are principally caught by the fishery in Federal waters, i.e., the Exclusive Economic Zone (EEZ). In beginning the analysis, it became apparent process efficiencies were possible. As will be described in the following sections, Council staff propose a framework using a threshold to identify species that could remain in the FMP without additional analysis. The threshold framework was developed with the understanding that some of the managed species have principal mortality in commercial and recreational fisheries operating in the EEZ and based on the history of federal management, are good candidates for continued federal management. The development of a threshold was undertaken to identify and implement process efficiencies.

As reference, mortality is the combination of landed catch and dead discard, noting that a discard mortality rate is applied to many released groundfish. Catch can indicate landings, discarded (i.e., released) alive, and dead discards. The terms catch and mortality are often used interchangeably;

however, for this analysis the term mortality is used instead of catch as it signals that the types of data used to analyze the recreational fishery are the same as those used for the commercial fishery analysis (Agenda Item I.8.a, NMFS Report 1, September 2024).

The Internal Planning Team (IPT) proposes a 25 percent threshold of mortality in the EEZ, meaning that if 25 percent or more of a species fishery-related mortality is in the EEZ, it would be identified as having potential for remaining in the FMP without further evaluation. The precautionary threshold of 25 percent reflects management implications over the last 20 plus years and their effects on where and when the fishery operates. Past area-based management measures restricted the fishery access to a narrow range of fishing grounds and likely impacted the diversity of catch. Meaning, it could appear as if species highly linked to the EEZ in the past are primarily caught in state waters currently. Based on recent actions to restore access to the continental shelf and thus more of the EEZ, it is reasonable to foresee that diversity of catch is likely to shift back to reflect the past. Given this and other uncertainties related to the fishery, a low threshold was selected to account for changes in in the fishery.

The following documents the framework analysis and its results. The Council will be asked a series of key questions related to the framework. In brief, if the threshold is adopted, the IPT expects that at least two groups of species will be identified; a group whose mortality is primarily associated with the EEZ (Group A) and a group whose mortality is not (Group B). The Council could move forward with defining stocks of species principally caught in the EEZ and then use the process outlined at § 600.305(c) to analyze the remaining species.

2. Evaluation of Process

An overarching goal of this Phase 2 is to identify and define stocks of groundfish in need of conservation and management. At the September 2024 Council meeting, a series of steps necessary to attain this goal was identified. The process, as adopted (Figure 1), followed the National Standard (NS) guidance, notably at §600.305(c). In brief, the process would determine if a species was in need of conservation and management by analyzing each species through the lens of its conservation status (i.e., overfished, undergoing overfishing, etc.) and/or the set of 10 non-exhaustive factors found in the regulations. That process is not in question. However, given the potential number of species to be analyzed, the IPT investigated if there were any efficiencies that could be identified to the process.

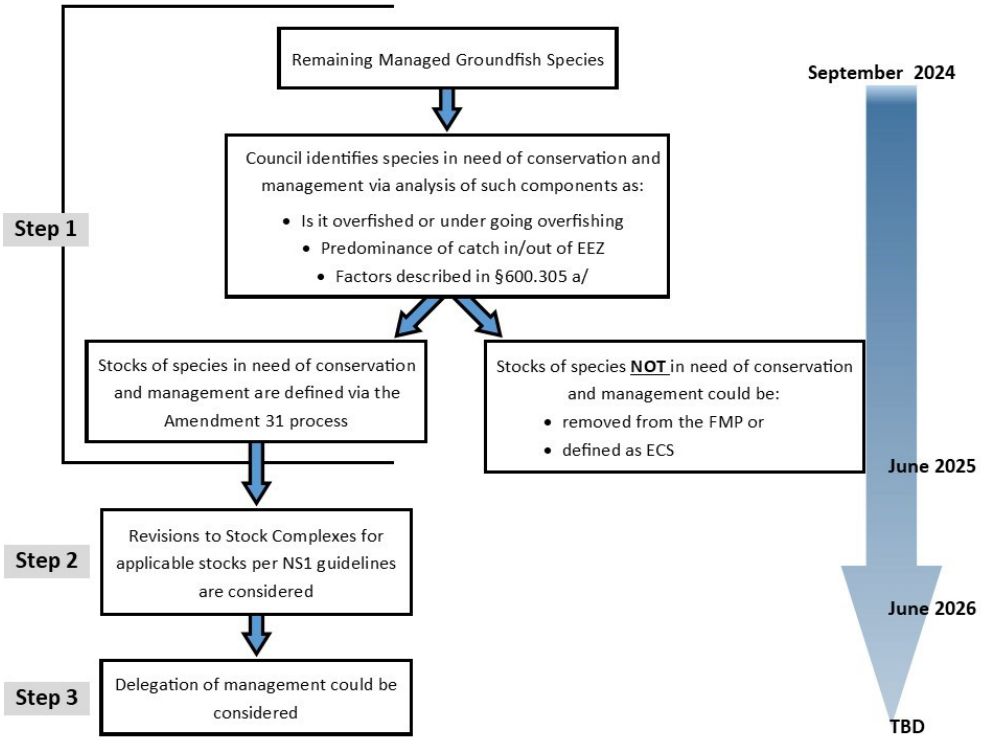


Figure 1. Proposed Process for Phase 2 as of September 2024.

For many species, the history of federal management and a review of the proportion of fishing activity for these species occurring in the EEZ indicates that some are strong candidates for continued federal management. This group of species could, without need for further analysis, be defined as stocks using the approach developed through Amendment 31 and used recently in Amendment 35. Most of the currently 86 managed species were adopted to the FMP under Amendment 1. The Council, at that time, realized that key aspects of the fishery, such as expanding markets and improving technologies, could adversely affect the overall biological and economic health of the groundfish fishery if unlimited fisheries on unidentified groundfish were allowed to be developed. The Council took broad action and incorporated all species of the Scorpaenidae family (e.g., rockfish) and others as species managed under the FMP. They did not define stock units of the managed species, as has been noted in A31 and A35 documentation (see Table 1 above.

The Phase 2 process proposes to rely on the history of federal management and mortality proportion analysis to confirm retention of the majority of the FMP species in the FMP (Group A), and to utilize a literature review on stock structure to define those species as one or more stocks. The Phase 2 analysis would then shift to a more in depth review of the Group B species, which would be evaluated through the framework provided at §600.305(c) to determine whether they are in need of conservation and management after the in-depth review. Those Group B species identified as in need of conservation and management would be retained for management under the FMP. Those Group B species not determined to be in need of conservation and management would then be reviewed for removal from the FMP or designation as EC species. Additionally, as part of the Phase 2 analysis, it is possible that some Group A species could be identified as appropriate for designation as EC species.

The MSA provides NMFS and the PFMC authority over fishing activity occurring in the EEZ (3-200 nautical miles). Some of the current FMP species have principal mortality in the EEZ as a result of the Federal fishery, whereas others do not. As will be made clear in the following analysis, in at least the last 21 years most of the groundfish species in the FMP have had mortality in the EEZ and have been caught by the Federally managed fishery, albeit at differing levels. Given this finding, the IPT proposes it is possible to identify species principally caught by the fishery in the EEZ, i.e., those species that could remain in the FMP without further analysis, via a percentage based understanding of mortality in and out of the EEZ. This framework proposes that the use of §600.305(c) –Figure 1– must be completed for only those species whose mortality principally occurs in state waters[1], not in the EEZ, and for any species the Council is considering removing from the FMP or identifying as EC species.

[1] For the purposes of this action, we (the action team) propose the Council apply the 25 percent threshold to conclude that all species with 75 percent or more of mortality occurring in state waters are those species whose mortality principally occurs in state waters.

3. Framework

The objective of this framework analysis was to examine the list of currently managed groundfish species and attempt to identify species that are caught by the Federal fishery. The rationale for this approach is to ascertain if there is a means to improve the efficiency of this Phase 2 action. As noted above there are 86 groundfish managed by the FMP; however, the total number of species to be reviewed through this action increased from what was reported to the Council in November 2024. The earlier process document indicated a total of 66 species would be analyzed under Phase 2 (Agenda Item I.8, Attachment 1, September 2024), assuming that those species considered under A31 and A35 would not be included. However, in order to complete a comprehensive review of the stocks in need of conservation and management, the IPT determined it is prudent to include those previously defined stocks in this analysis. If all species were evaluated using the factors at §600.305(c), the process would be replicated 86 times. Though this analysis does not apply all of the factors, an initial focus on Factor 2– "The stock is caught by the fishery" – provides a means to potentially achieve efficiencies and reduce replication in the Phase 2 process. Because the Council only has authority to manage fisheries operating in the EEZ this analysis considers the percentage of mortality in the EEZ for a species as a way to determine if Factor 2 applies (the stock is caught by the fishery).

The analysis was approached with the understanding that some species are principally caught in the EEZ by commercial and recreational fisheries. This analysis does not rely on the term 'predominantly,' which is used in § 600.305, but rather employs the term 'principally caught in the EEZ,' as predominance commonly indicates a majority of, or, in mathematical terms, greater than 50 percent. This analysis uses the term 'principally' as it adds flexibility to the Council's decision-making process. Many of the species in the FMP that could be considered not predominantly caught in the EEZ at present may be more a reflection of impacts related to such things as management actions to rebuild species, area based management effects, and markets, and not catch percentage. Accordingly, Council staff is proposing to apply the 25 percent threshold to determine whether a species is principally caught by the Federal fishery or in state waters. Under this framework, species with greater than 25 percent of their fishery mortality in the EEZ are considered principally caught by the Federal fishery (i.e., Group A). Species with less than 25 percent of their fishery mortality in the EEZ would not be considered as principally caught by the Federal fishery (i.e., Group B).

As there are no recommended standards for defining at what level constitutes a species being principally caught by the fishery, the framework (Figure 2) proposes the 25 percent threshold to identify species caught by the fishery because this percentage reflects the existing uncertainty of mortality related to catch by water area. The past 20 years have seen multiple changes to the groundfish fishery, many of which severely restricted the fishery in time and space. These restrictions limited the diversity of species caught by the fishery and may have skewed the data towards state waters for some species with historically high fishery mortality in the EEZ, as state waters were the only areas open to fishing. As the majority of once-overfished groundfish species have rebuilt, the Council has recently modified area-based management restrictions, notably in terms of area-based closures (e.g., non-trawl rockfish conservation area (RCA). These changes may result in an increase in mortality of species currently caught in state waters to the EEZ, as

before. Therefore, to apply a means to assess whether species are principally caught in the EEZ or state waters in accordance with recent history, the IPT contemplated a precautionary threshold level of 25 percent.

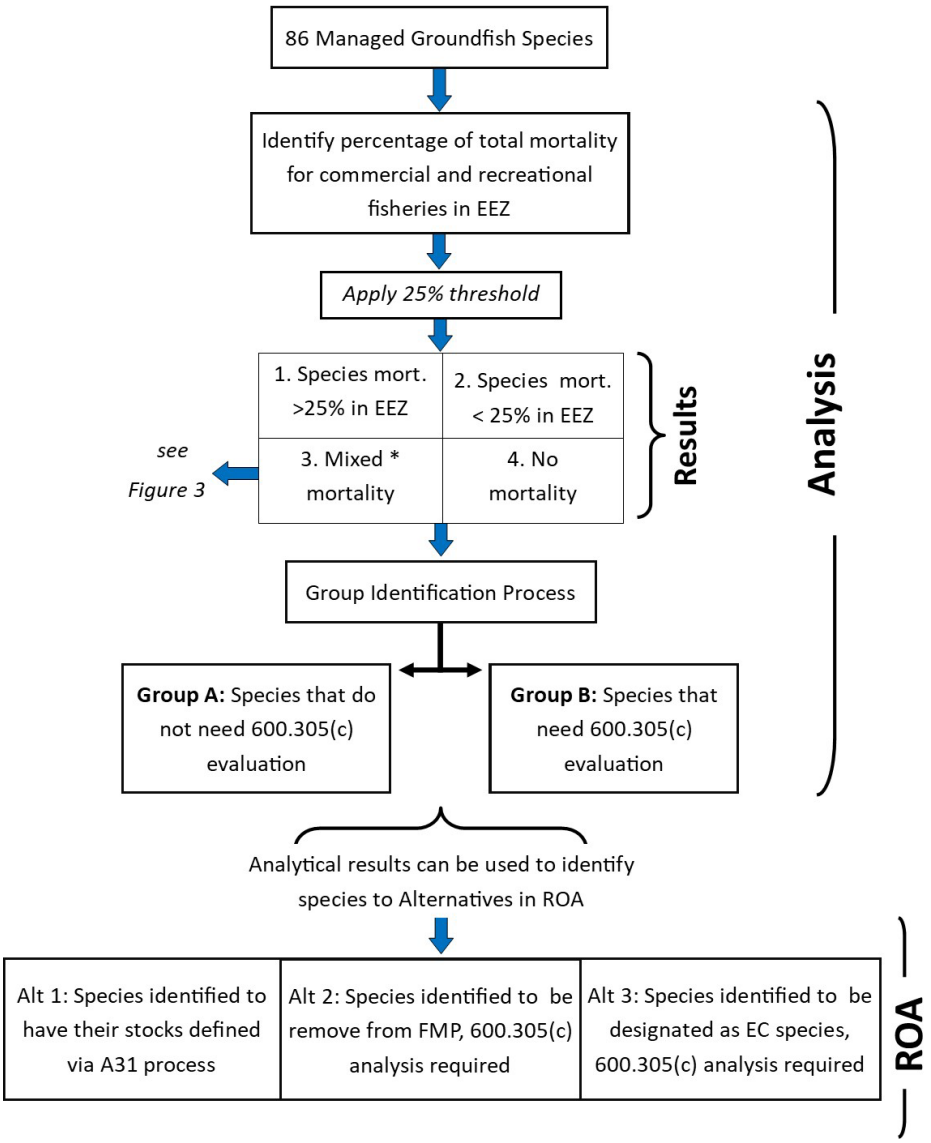


Figure 2. Proposed analytical framework to identify species to water areas via the 25 percent threshold . The results of the analysis may serve to inform the Council on the alternatives they want to have the species considered under.

The goal of this framework is to better identify species caught by the fishery in order to determine whether continued management in the FMP is appropriate. Review of the NMFS commercial fishery analysis (Agenda Item I.8.a, NMFS Report 1, September 2024) and initial investigations of the recreational fishery mortality[2] indicated all the currently managed groundfish in the FMP have been caught by the fishery in the EEZ at some point, though with high variability by year, fishery sector (commercial and recreational), and/or state. In order to respect these and other factors, the percentage of mortality by fishery sector and state in the EEZ was considered the most

[2] See Appendices A: California, B: Oregon, and C: Washington for detail.

appropriate method to apply as a threshold to initially identify those species caught by the fishery that should remain in the FMP.

The framework is expected to identify four overarching outcomes (**Table 2**): 1) species with total mortality greater than 25 percent in the EEZ; 2) species with total mortality less than 25 percent in the EEZ; 3) species where mortality varies by sector, e.g., greater than 25 percent in one sector, but less than 25 percent in the other; and 4) species with *de minimus* mortality in either water area. Species identified in the greater than 25 percent category would generally be defined per the A31 framework. No further analysis would be necessary to retain them in the FMP. However, the Council could recommend any of these species be analyzed for removal or EC species designation via § 600.305(c). Species identified in the less than 25 percent category would generally be subject to the § 600.305(c) analysis and could be identified for removal from the FMP or designation as an EC species. However, any of these species could also remain in the FMP, if recommended by the Council with appropriate justification for why other factors outweigh either the 25 percent threshold or the overall *de minimus* mortality. In that case, those stocks would subsequently be defined per the A31 framework.

Table 2. Potential outcomes of the analysis.

Category	Results
Species with mortality >25% in the EEZ	• Mortality in both commercial and recreational sectors is greater than 25 percent • Mortality in commercial sector is greater than 25 percent, no mortality in recreational sector a/ • Mortality in recreational sector is greater than 25 percent, no mortality in commercial sector a/
Species with mortality < 25% in the EEZ	• Mortality in both commercial and recreational sectors is less than 25 percent
Species with mixed mortality results in the EEZ	• Mortality in commercial sector is greater than 25 percent, mortality in recreational sector occurs but is less than 25 percent • Mortality in recreational sector is greater than 25 percent, mortality in commercial sector occurs but is less than 25 percent
Species with no estimated mortality	• No (or *de minimus*) mortality in state or EEZ for both the commercial and recreational sectors

a/ these are species where there is no mortality associated with the species in the EEZ by the sector

Species with mixed mortality results in the EEZ present a unique challenge. The mortality of these species in the EEZ in one sector relative to the threshold may conflict with the mortality in the EEZ in another sector; meaning a clear path to identify them as either caught by or not caught by the Federal fishery is cannot be easily identified by the 25 percent framework. A secondary framework (Figure 3) is proposed to address these species. The fishery sector of primary mortality would be used to categorize the species. If the identified fishery sector of primary mortality principally occurs in the EEZ under the 25 percent threshold, the species would be assigned to the greater than 25 percent category and stocks would generally be defined. If the identified fishery of primary mortality principally occurs in state waters, the fish would generally be assigned to the less than 25 percent category and further evaluated, as appropriate, under the § 600.305(c) factors.

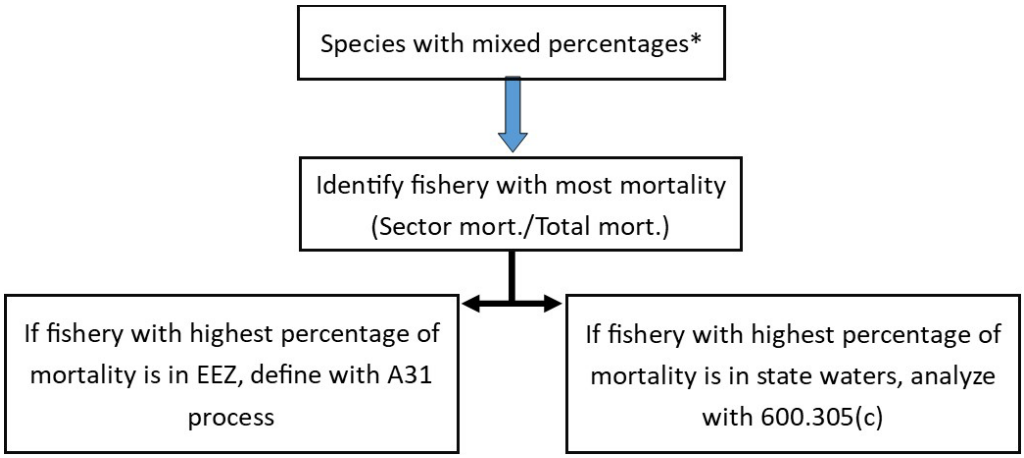


Figure 3. Proposed framework of how to address species with mixed results

4. Analytical Results

The Phase 2 framework analysis was applied to all 86 groundfish species managed by the Council in the groundfish FMP (See FMP Table 3-1). Species addressed in A31 and A35 are flagged, as appropriate.

The analysis was conducted at a state level for both commercial and recreational fisheries to provide potential flexibility in Council decision making. Percentages of commercial and recreational mortality data were calculated by water area. Commercial mortality data was obtained from Agenda Item I.8.a, NMFS Report 1, September 2024 and is based on weight. Recreational data was obtained from the Recreational Fishery Information (RecFIN) database and the GEMM (as necessary) for a five year period, 2018-19, 2021-23. The time period does not include 2020 per the Scientific and Statistical Committee's (SSC) recommendation. An aspect of recreational fishery mortality estimates is that not all species have weight estimates. Thus, for some species it is possible to have a total mortality for the estimated number of fish but not have a corresponding weight estimate. Missing recreational weight estimates were not commonly found in the data. Regardless, estimated mortality by number of fish offers a more robust and complete set of data for analysis than does weight for the recreational sector. There are other caveats to recreational data specific to each state. California is the only state to report mortality estimates by water area (i.e., state or EEZ). Oregon and Washington do not report this information, though Oregon does collect water area information as part of their sampling protocols. The Oregon sample data was used to generate the proportion of mortality in the EEZ (see Appendix A).

As predicted, the analysis for California and Oregon found that the managed groundfish fell into one of four Categories in each state: 1) species where total mortality is greater than 25 percent in the EEZ; 2) species where total mortality is less than 25 percent in the EEZ; 3) species for which mortality is mixed; and 4) species with *de minimus* mortality in either water area. As reference from above, species where there was no mortality at all in one sector and the other sector was greater than or less than 25 percent, were assigned aforementioned Category 1 or Category 2, as appropriate. Species where mortality was mixed, i.e., one sector has greater than 25 percent of mortality in the EEZ and the other sector has less than 25 percent of mortality in the EEZ, were assigned to Category 3.

Applying the threshold approach to Washington data, notably recreational data, was of limited use because Washington does not collect spatial data by water area for the recreational fishery. All non-tribal commercial mortality is in the EEZ, as the groundfish fishery is restricted from fishing in state waters and thus is linked to the Category 1 noted above. These issues make it difficult to accurately identify water area for species with mortality only in the recreational sector, as well as those with mortality in both commercial and recreational sectors. The IPT proposes two solutions regarding area of mortality in the Washington section.

The following sections detail the findings for each state in each of the categories. The information displayed is summarized for brevity; however, full data sets, by state, are found in Appendix A.

4.1 California:

Species with Mortality greater than 25 Percent in the EEZ

The commercial and recreational fisheries off California catch 57 species[3] where 25 percent or more of their fishery mortality is attributed to the EEZ (Table 3), respectively. In the commercial sector, 54 species have mortality greater than 25 percent in the EEZ; whereas, in the recreational sector, 37 species have mortality greater than 25 percent in the EEZ. In this category, four species are only caught by the recreational sector (i.e., no commercial sector mortality) and 20 species are only caught by the commercial sector (i.e., no recreational sector mortality) as noted in Table 3. Detailed information is provided in Appendix A: California.

Table 3. Species with greater than 25 percent (%) of mortality attributed to the EEZ off California. Individual species of cryptic pairs noted by an *

Species		
• Arrowtooth Flounder	• Greenblotched Rockfish	• Rosethorn Rockfish
• Aurora Rockfish a/	• Greenspotted Rockfish	• Rougheye Rockfish* a/
• Bank Rockfish	• Greenstriped Rockfish	• Sablefish
• Big Skate	• Halfbanded Rockfish b/	• Sharpchin Rockfish a/
• Blackgill Rockfish	• Honeycomb Rockfish	• Shortraker Rockfish a/
• Blackspotted Rockfish* a/	• Longnose Skate	• Shortspine Thornyhead a/
• Bocaccio Rockfish	• Longspine Thornyhead a/	• Silvergray Rockfish
• Bronzespotted Rockfish b/	• Mexican Rockfish	• Speckled Rockfish
• Butter Sole a/	• Pacific Cod a/	• Splitnose Rockfish a/
• California Scorpionfish	• Pacific Hake	• Squarespot Rockfish
• Chilipepper Rockfish	• Pacific Ocean Perch a/	• Starry Rockfish
• Cowcod Rockfish	• Pacific Sanddab	• Stripetail Rockfish
• Curlfin Sole a/	• Petrale Sole	• Swordspine Rockfish b/
• Darkblotched Rockfish a/	• Pink Rockfish a/	• Sunset Rockfish *
• Dover Sole a/	• Pinkrose Rockfish	• Vermilion Rockfish*
• English Sole a/	• Pygmy Rockfish a/	• Widow Rockfish
• Flag Rockfish	• Redbanded Rockfish	• Yelloweye Rockfish
• Flathead Sole a/	• Redstripe Rockfish b/	• Yellowmouth Rockfish a/
• Freckled Rockfish	• Rex Sole a/	• Yellowtail Rockfish

a/ species only caught by the commercial sector b/ species only caught by the recreational sector

Table 4 examines the species in this category through 25 percent mortality bins. In the commercial sector, the majority, 51 species, have between 50 and-100 percent of their mortality attributed to the EEZ. . Based on these results, species with mortality in the commercial sector are highly linked to the EEZ, In the recreational fishery, the results are more diverse though the majority of species have between 50 and 100 percent of their mortality in the EEZ. See Appendix A for detail.

[3] There are two cryptic pairs, rougheye/blackspotted and vermilion/sunset rockfishes in this category. Each species is treated as a single species for the total count.

Table 4. The number of species, by sector where mortality was greater than 25 percent in the EEZ off California in 25 percent bins. Note, in the "mortality greater than 25 percent category", total of 53 species had mortality in the commercial sector and a total 37 species had mortality in the recreational sector.

Sector	25-50%	51-75%	75-100%
Commercial	3	8	~~42~~ 43
Recreational	12	7	18

Species with Mortality less than 25 Percent in the EEZ

A total of 18 groundfish species have mortality of less than 25 percent attributed to EEZ (Table 5)[4] off California, i.e., they are principally caught in state waters. The commercial sector catches 16 of these species; whereas the recreational sector catches 17. There are no commercial sector mortality of kelp rockfish and kelp greenling attributed to the EEZ. In the recreational sector, there is no mortality for chameleon rockfish attributed to the EEZ. Otherwise, all other species are caught in both sectors.

Table 5. Species with less than 25 percent (%) of mortality attributed to the EEZ off California. Individual species of cryptic pairs noted by an *

Species		
• Black and Yellow Rockfish	• Calico Rockfish	• Kelp Greenling b/
• Black Rockfish	• Chameleon Rockfish a/	• Kelp Rockfish b/
• Blue Rockfish*	• China Rockfish	• Leopard Shark
• Deacon Rockfish*	• Copper Rockfish	• Olive Rockfish
• Brown Rockfish	• Gopher Rockfish	• Quillback Rockfish
• Cabezon	• Grass Rockfish	• Treefish

a/ species only caught by the commercial sector
b/species only caught by the recreational sector

Table 6 examines the species in this category through percent mortality bins. In both the commercial and recreational sectors, the majority of species in this category have less than 10 percent of their total fishery mortality attributed to the EEZ. In other words, the majority of mortality for these species is attributed to state waters for both sectors. See Appendix A for detail.

Table 6. The number of species, by sector where mortality was less than 25 percent in the EEZ off California in shown percentage bins. Note, in the "mortality less than 25 percent category", total of 16 species had mortality in the commercial sector and a total 17 species had mortality in the recreational sector.

Sector	1-10%	11-20%	21-25%
Commercial	11	4	1
Recreational	~~11~~10	~~5~~6	1

Species with Mixed Mortality Results in the EEZ

Eight species in the commercial and recreational sectors off of California have mortality percentages with mixed results, i.e., one sector is greater than 25 percent and the other is less than

[4] There is a cryptic pair blue/deacon rockfishes in this category. Each species is counted as a single species for the total count.

25 percent. (Table 7). Seven species (canary and tiger rockfishes, lingcod, rock and sand soles, Pacific spiny dogfish, and starry flounder) had mortality in the commercial sector greater than 25% in the EEZ, but less than 25 percent in the recreational sector. For one species, rosy rockfish, the recreational sector had mortality slightly greater than 25 percent in the EEZ, but less than 25 percent in the commercial sector.

Table 7. Species caught off California in commercial (com) and recreational (rec) where mortality is in the EEZ is above 25 percent (%) for one sector but below in the other

Species	% of Comm. Mort in EEZ	% of Rec. Mort in EEZ	Species	% of Comm. Mort in EEZ	% of Rec. Mort in EEZ
Canary Rockfish	89.3%	20.6%	Sand Sole	61.3%	11.6%
Lingcod	81.0%	12.8%	Pacific Spiny Dogfish	99.2%	21.4%
Rock Sole	64.5%	22.3%	Starry Flounder	80.5%	18.3%
Rosy Rockfish	17.1%	25.9%	Tiger Rockfish	33.0%	22.5%

For these species, the framework shown at Figure 2 was used to identify the water area of principal mortality. In brief, a commercial to recreational proportion of mortality in all water areas was used to identify which sector had the majority of the mortality. The resulting proportion identified which sector should be used to indicate the water area of principal mortality. For example, 80 percent of canary rockfish mortality is in the commercial sector is linked to the EEZ, whereas, 21 percent of canary rockfish mortality is attributed to the EEZ. When analyzed using the mortality proportions, the commercial sector was identified as the fishery of primary mortality. The commercial mortality is primarily in the EEZ, thus, the water area of principal mortality for canary rockfish is the EEZ. Using this analysis, the principal mortality for both canary rockfish and Pacific spiny dogfish is attributed to the EEZ. The remaining species are linked to state waters (Table 8)

Table 8. Identification of principal sector and water area of mortality (mort) off of California for species with mixed mortality in the EEZ using the proportion analysis of commercial sector and recreational sector weight (mt) ratios. C =commercial sector R = recreational sector

Species	Mean comm mort (mt)	Mean rec mort (mt)	Comm/Rec proportion total of mortality	Fishery of principal mortality.	Principal water area of mortality
Canary Rockfish	120.9	80.6	60:40	C	EEZ
Lingcod	234.1	414.6	36:64	R	State
Rock Sole	0.3	1.7	15:85	R	State
Rosy Rockfish	0.5	15.9	3:97	R	State
Sand Sole	0.2	0.3	40:60	R	State
P. Spiny Dogfish	122.6	8.5	94:6	C	EEZ
Starry Flounder	0.6	0.7	46:53	R	State
Tiger Rockfish	0.1	0.7	13:88	R	State

Regarding the species with mixed mortality results, the additional analysis indicated that canary rockfish and Pacific spiny dogfish mortality could be attributed to the EEZ. Therefore, with this consideration, the recommendation is to add these two species to the list of species with mortality greater than 25 percent in the EEZ. The remaining six species with mixed mortality appear to have

principal mortality in state waters and are recommended to be added to the number of species with mortality less than 25 percent in the EEZ.

Species with No Estimated Groundfish Fishery Mortality in the EEZ off of California

Three species do not have any directed commercial or recreational groundfish mortality off of California in state or Federal waters. (Table 9).

Table 9. Species with no mortality in the commercial or recreational groundfish sectors in the EEZ waters off of California

Species		
Dwarf-red Rockfish	Light Dusky Rockfish	Harlequin Rockfish

Conclusions

A total of 83 of the 86 managed groundfish species are caught off California. Based on the 25 percent threshold and the mixed category analysis, the results show: 1) 59 species were found to have mortality greater than 25 percent in the EEZ, and therefore principal mortality for these species is attributed to the EEZ; and 2) 18 species were found to have mortality of less than 25 percent in the EEZ, and therefore principal mortality is attributed to state waters; 3) principal are of mortality for six species remains uncertain, and three species have no reported or observed mortality off of California.

4.2 Oregon

Species with Mortality Greater than 25 percent in the EEZ

Off of Oregon, 45 species have greater than 25 percent or more of their mortality attributed to the EEZ (Table 10).[5] The commercial sector has catch records for 42 species and the recreational sector has catch records for 39 species of the total 45 species, respectively. Three of the species in this category were only caught in the recreational sector; whereas, 12 species were only caught in the commercial sector. Detailed information is shown in Appendix A: Oregon

Table 10. Species caught off Oregon where total mortality is greater than 25 percent (%) or more in the EEZ. Species part of a cryptic pair indicated by an *

Species		
• Arrowtooth Flounder	• Greenstriped Rockfish	• Rosethorn Rockfish
• Aurora Rockfish a/	• Harlequin Rockfish a/	• Rosy Rockfish
• Bank Rockfish a/	• Longnose Skate	• Rougheye Rockfish* a/
• Big Skate	• Longspine Thornyhead a/	• Sablefish
• Blackgill Rockfish a/	• Pacific Cod	• Sharpchin Rockfish a/
• Blackspotted Rockfish *	• Pacific Hake	• Shortraker Rockfish a/
• Bocaccio Rockfish	• Pacific Ocean Perch	• Shortspine Thornyhead
• Canary Rockfish	• Pacific Sanddab	• Silvergray Rockfish
• Chilipepper Rockfish	• Pacific Spiny Dogfish	• Speckled Rockfish b/

[5] There is one cryptic pair, rougheye/blackspotted rockfishes, in this category Each species is treated as a single species for the total count.

Species		
• Curlfin Sole a/	• Petrale Sole	• Splitnose Rockfish a/
• Darkblotched Rockfish	• Pygmy Rockfish a/	• Stripetail Rockfish a/
• Flag Rockfish b/	• Redbanded Rockfish	• Widow Rockfish
• Flathead Sole a/	• Redstripe Rockfish	• Yelloweye Rockfish
• Greenblotched Rockfish b/	• Rex Sole a/	• Yellowmouth Rockfish
• Greenspotted Rockfish	• Rock Sole	• Yellowtail Rockfish

a/ species only caught in the commercial sector
b/species only caught in the recreational sector

The majority of morality for species shown in Table 11 is in the 75 to 100 percent bin.. Of the 40 species with mortality greater than 25 percent in the commercial sector, 39 were in the 75 to 100 percent bin and 19 species with mortality greater than 25 percent in the recreational sector 41 were in the 75 to 100 percent bin. These results indicate the principal water area of mortality for this category (mortality of greater than 25 percent in the EEZ) is highly attributed to the EEZ.

Table 11. The number of species, by sector where mortality was greater than 25 percent in the EEZ off Oregon in shown percentage bins. Note, total of 45 species in this category, 42 species had mortality in the commercial sector and 30 species had mortality in the recreational sector.

Sector	25-50%	51-75%	75-100%
Commercial	1	~~0~~2	~~41~~39
Recreational	4	7	~~19~~28

Species with Mortality less than 25 percent in the EEZ

Principal mortality for 15 groundfish species is not attributed to the EEZ off Oregon (Table 12), i.e., , they are principally caught in state water. The commercial sector catches 12 of these species; and the recreational sector catches all 15 of these species. The only species not caught in the EEZ by the commercial sector is kelp and deacon rockfishes; however, deacon is likely not indicated as catch in the PacFIN data due to it being part of a cryptic pair with blue rockfish. Meaning, it is likely deacon rockfish is caught by the commercial fishery however, differentiation between the two species is difficult (K. Lockhart pers. comm., Dec 2025).

Table 12. Species caught off Oregon where total mortality is less than 25 percent (%) or more in the EEZ.

Species		
• Black Rockfish	• Copper Rockfish	• Kelp Rockfish a/
• Blue Rockfish	• Deacon Rockfish a/ b/	• Olive Rockfish
• Brown Rockfish	• Gopher Rockfish	• Quillback Rockfish
• Cabezon	• Grass Rockfish	• Tiger Rockfish
• China Rockfish	• Kelp Greenling	• Vermilion Rockfish

a/ species only caught in the recreational sector

Of the 15 species in this category, the majority had mortality less than 5 percent in the EEZ (Table 13). Only one species with commercial catch had mortality greater than 5 percent in the EEZ and in the recreational sector six species had mortality in the 10-20 percent bin attributed to the EEZ. The results indicate all these species are strongly linked to state waters.

Table 13. The number of species, by sector where mortality was less than 25 percent in the EEZ off Oregon in shown percentage bins. Note, total of 15 species in this category, 13 species had mortality in commercial sector and all 15 species had mortality in the recreational sector.

Sector	0-5%	6-10%	10-20%
Commercial	~~3~~11	1~~0~~	0
Recreational	~~0~~9	~~12~~3	3

Species with Mixed Mortality Results in the EEZ

There are seven species caught in the commercial and recreational sectors off Oregon with mixed mortality results; i.e., where mortality in the EEZ is not above or below the 25 percent threshold for both sectors (Table 14). In this category, between 75 and 100 percent of mortality in the commercial sector is attributed to the EEZ; whereas, in the recreational sector the range is much more constricted, from 5 to 24 percent of mortality can be attributed to the EEZ.

Table 14. Species caught off Oregon in commercial (com) and recreational (rec) where mortality is in the EEZ is above 25 percent (%) for one fishery but below in the other

Species	% of Comm. Mort in EEZ	% of Rec. Mort in EEZ	Species	% of Comm. Mort in EEZ	% of Rec. Mort in EEZ
Butter Sole	100.0%	23.9%	Lingcod	74.5%	9.8%
Cowcod	100.0%	20.0%	Sand Sole	92.9%	22.9%
English Sole	100.0%	4.7%	Starry Flounder	75.4%	23.8%
Dover Sole	99.9%	4.8%			

Following the framework practice recommended for the mixed results species (see California §4.1, Species with Mixed Results) the analysis intimates the seven species shown in Table 15 can be attributed to the commercial sector. Mortality in the commercial sector is highly linked to the EEZ; which indicates the EEZ is likely the principal area of mortality for these species. Therefore, based on this evaluation, these species are recommended to be added to the species list for mortality greater than 25 percent in the EEZ.

Table 15. Identification of principal sector and water area of mortality (mort) off of Oregon for species with mixed mortality in the EEZ using the proportion analysis of commercial sector and recreational sector weight (mt) ratios. C =commercial sector R = recreational sector

Species	Mean comm mort (mt)	Mean rec mort (mt)	Comm/Rec proportion total of mortality	Fishery of principal mortality.	Principal water area of mortality
Butter Sole	0.07	0.01	87.5:1.25	C	EEZ
Cowcod	0.02	.002	90:10	C	EEZ
Dover Sole	3,917.58	0.01	99:1	C	EEZ
English Sole	121.29	0.02	99:1	C	EEZ
Lingcod	353.33	182.83	66:34	C	EEZ
Sand Sole	1.2	0.15	89:11	C	EEZ
Starry Flounder	1.7	0.03	98:2	C	EEZ

Species with No Estimated Mortality in Federal and state Waters off Oregon

Off Oregon, 18 species do not have directed commercial or recreational mortality in the EEZ (Table 16). Of the 18 species, 10 do not have ranges that extend into Oregon.

Table 16. Species with no mortality in the directed commercial or recreational groundfish fishery in the EEZ off of Oregon.

Species	
• Black and Yellow Rockfish	• Leopard Shark
• Bronzespotted Rockfish*	• Light Dusky Rockfish
• Calico Rockfish*	• Mexican Rockfish
• California Scorpionfish*	• Pink Rockfish
• Chameleon Rockfish*	• Pinkrose Rockfish*
• Dwarf-Red Rockfish	• Squarespot Rockfish
• Freckled Rockfish	• Starry Rockfish*
• Halfbanded Rockfish*	• Swordspine Rockfish*
• Honeycomb Rockfish*	• Treefish Rockfish*

* Indicates the range does not extend into Oregon.

Conclusions

A total of 66 of the 86 managed groundfish species are caught off Oregon. Based on the 25 percent threshold and the mixed category analysis, the results show: 1) 52 species have greater than 25 percent of their mortality attributed to the EEZ; 2) 15 species have less than 25 percent of their mortality attributed to the EEZ; and 3) 18 species have no reported or observed mortality in any water area.

4.3 Washington

Washington state waters are closed to all non-tribal commercial groundfish fishing, thus limiting non-tribal commercial fishing to the EEZ. This analysis assumes all non-tribal commercial sector mortality is attributed to the EEZ. As noted above, the mortality estimates for the Washington recreational sector in Washington do not contain a spatial component for identification of water area. Another caveat is that the IPT understands that, prior to 2023, Washington's recreational sampling program did not calculate estimates for all groundfish at the species level. Table 17 shows the species names and groups prior to 2023. Since 2023, all groundfish are estimated. The reason this is important is it may seem like in 2023 new species appeared off the Washington coast, whereas, in reality those species were not estimated to the species level, instead were previously estimated to the grouping they were lumped into. Noting how the Washington recreational sampling program collects data, a key question to consider relates to if species have geographic ranges greater than Washington and if, instead of fishery data, could these species be categorized to water area based on data from Oregon.

When comparing species caught off Washington to California and Oregon water area findings, as well as biological information from the literature review, Washington data reveals similar, but not the same patterns as California and Oregon. To adjust for these differences, the categories are slightly different. The Washington categories are: 1) species with non-tribal commercial mortality only; 2) species with non-tribal commercial and recreational mortality; 3) species with recreational

mortality only; and 4) species with no mortality. See Appendix A: Washington for detailed information

Table 17. Species and group categories with catch estimates for the recreational sector by Washington Department of Fish and Wildlife before 2023 (Source WDFW).

Species/Groupings for WDFW Estimates pre-2023			
Black Rockfish	Copper Rockfish	Lingcod	Tiger Rockfish
Blue Rockfish	Flatfish	Miscellaneous	Tuna
Bocaccio	General Cod	Pacific Cod	Vermilion Rockfish
Cabezon	General Rockfish	Perch	Yelloweye Rockfish
Canary Rockfish	Halibut	Quillback Rockfish	Yellowtail Rockfish
China Rockfish	Kelp Greenling	Sharks and Skates	

Species with Mortality only in the Commercial Sector

There are 20 species where mortality has only been observed in the non-tribal commercial sector (Table 18). As the non-tribal commercial groundfish sector is prohibited from operating in state waters, the mortality for commercially caught species is estimated at 100 percent in the EEZ.

Table 18. Species observed only in the non-tribal commercial sector off Washington in the EEZ .

Species		
• Aurora Rockfish	• Greenspotted Rockfish	• Rex Sole
• Bank Rockfish	• Harlequin Rockfish	• Sharpchin Rockfish
• Big Skate	• Longnose Skate	• Shortraker Rockfish
• Blackgill Rockfish	• Longspine Thornyhead	• Splitnose Rockfish
• Butter Sole	• Pacific Ocean Perch	• Stripetail Rockfish
• Darkblotched Rockfish	• Pacific spiny dogfish	• Yellowmouth Rockfish
• Dover Sole	• Pygmy Rockfish	

Species Caught in Both the Non-Tribal Commercial and Recreational Fisheries

There are 24 species where mortality has been observed in both the non-tribal commercial and the recreational fisheries (Table 19). The non-tribal commercial groundfish mortality is estimated at 100 percent in the EEZ, but the mortality percentage attributed to the EEZ for species caught in the recreational sector is unknown.

Table 19. Species where mortality has been observed in both the non-tribal commercial and the recreational sectors off Washington in the EEZ

Species		
• Arrowtooth Flounder	• Pacific Cod	• Sablefish
• Black Rockfish	• Pacific Hake	• Sand Sole
• Bocaccio Rockfish	• Petrale Sole	• Shortspine Thornyhead
• Canary Rockfish	• Redbanded Rockfish	• Silvergray Rockfish
• Chilipepper Rockfish	• Redstripe Rockfish	• Starry Flounder
• English Sole	• Rock Sole	• Widow Rockfish

Species		
• Greenstriped Rockfish	• Rosethorn Rockfish	• Yelloweye Rockfish
• Lingcod	• Rougheye/Blackspotted Rockfishes	• Yellowtail Rockfish

Species Caught Only in the Recreational Sector

A total of 11 species were observed in the recreational sector only (Table 20). No non-tribal commercial catch was noted for these species. Due to the lack of spatial information related to fishing effort and catch, primary area of mortality cannot be determined.

Table 20. Species with mortality observed only in the recreational sector off of Washington.

Species	
• Blue/Deacon Rockfish	• Kelp Greenling
• Brown Rockfish	• Pacific Sanddab
• Cabezon	• Quillback Rockfish
• China Rockfish	• Tiger Rockfish
• Copper Rockfish	• Vermilion Rockfish
• Grass Rockfish	

Species with No Estimated Mortality off Washington

A total of 32 species have no estimated mortality off of Washington (Table 21). Of these 32, 20 do not have ranges that extend into Washington.

Table 21. Species with no mortality observed in the non-tribal commercial or recreational groundfish fisheries off of Washington.

Species		
• Black and Yellow Rockfish *	• Flathead Sole	• Pink Rockfish
• Bronzespotted Rockfish *	• Freckled Rockfish *	• Pinkrose Rockfish*
• Butter Sole	• Gopher Rockfish*	• Pygmy Rockfish
• Calico Rockfish *	• Greenblotched Rockfish	• Rosy Rockfish
• California Scorpionfish*	• Halfbanded rockfish *	• Speckled Rockfish
• Chameleon Rockfish *	• Honeycomb Rockfish *	• Stripetail Rockfish
• Grass Rockfish	• Kelp Rockfish *	• Squarespot Rockfish *
• Cowcod Rockfish *	• Leopard Shark *	• Starry Rockfish *
• Curlfin Sole	• Light Dusky Rockfish	• Swordspine rockfish *
• Dwarf-Red Rockfish*	• Mexican Rockfish *	• Treefish *
• Flag Rockfish*	• Olive Rockfish *	

*indicates range of species does not extend into Washington

4.3.1 Proposed Method to Address Washington Recreational Species.

Mortality for non-tribal commercial species is estimated at 100 percent in the EEZ, as non-tribal commercial fishing is not allowed in state waters. Washington recreational sector mortality estimates do not have a spatial component. Staff proposes the following methods as potential solutions. Input from the Washington Department of Fish and Wildlife is requested.. The first

method proposes to use Oregon mortality findings as a proxy for Washington. The second method would preliminarily identify all species with mortality off Washington as caught by the fishery, i.e., all species would have their mortality attributed to the EEZ and thus remain in the FMP.

Proposal 1

This proposal would use the Oregon findings as a proxy for Washington. The majority of species caught in Washington are also caught in Oregon. This proposal assumes that species caught off Washington would also primarily caught in the same water area as they are off Oregon, i.e., species with mortality greater than 25 percent in the EEZ off of Oregon would also have mortality greater than 25 percent in the EEZ off of Washington.

The IPT recognizes that many assumptions are made in this attempt to classify Washington species by water area. The premise is life histories of species found off both states are similar. If this assumption holds true, it could indicate they are found in and caught in similar water areas. An aspect that could indicate this assumption may be not as rigid as hoped is discussions with the GAP and other constituents indicated that some of the nearshore species are caught further offshore Washington than in Oregon. Offshore reef habitats found there are at a depth which could support populations of nearshore species (W. Jasper; pers. comm. Dec 2024). Additionally, the lack of nearshore structure in the southern part of Washington may inhibit settlement of nearshore species and force them further offshore. However, the use of the precautionary 25% threshold (as opposed to a threshold closer to 50% as predominance is defined), may provide an appropriate buffer for these geographic and bathymetric differences between nearshore habitat off Washington as compared to Oregon.

Species assumed to have mortality greater than 25 percent in the EEZ

Under Proposal 1, the result shows 38 species could be categorized as having mortality greater than 25 percent off Washington (Table 22). This table shows only the species with mortality off of Washington .

Table 22. Proposal 1 results: Species with mortality greater than 25 percent in the EEZ off Washington when using Oregon data as proxy.

Species		
• Arrowtooth Flounder	• Longnose Skate*	• Rosethorn Rockfish
• Aurora Rockfish*	• Longspine Thornyhead*	• Rougheye Rockfish
• Bank Rockfish*	• Pacific Cod	• Sablefish
• Big Skate*	• Pacific Hake	• Sharpchin Rockfish*
• Blackgill Rockfish*	• Pacific Ocean Perch*	• Shortraker Rockfish*
• Blackspotted Rockfish	• Pacific Sanddab	• Shortspine Thornyhead
• Bocaccio Rockfish	• Pacific Spiny Dogfish*	• Silvergray Rockfish
• Canary Rockfish	• Petrale Sole	• Splitnose Rockfish*
• Chilipepper Rockfish	• Pygmy Rockfish	• Widow Rockfish
• Darkblotched Rockfish*	• Redbanded Rockfish	• Yelloweye Rockfish
• Greenspotted Rockfish*	• Redstripe Rockfish	• Yellowmouth Rockfish*

Species		
• Greenstriped Rockfish	• Rex Sole*	Yellowtail Rockfish
• Harlequin Rockfish*	• Rock Sole	

* indicate mortality estimates are from the commercial sector only, i.e., no recreational mortality.

Species assumed to have mortality less than 25 percent in the EEZ

Using Oregon data as proxy, 12 species could be categorized as species where principal mortality is less than 25 percent (Table 23), i.e., mortality is linked to state waters. Of these species, only black rockfish has mortality in both the commercial and recreational sectors, all other species in this category only have mortality estimates for the recreational sector.

Table 23. Proposal 1 results: Species with mortality less than 25 percent in the EEZ off Washington s using Oregon findings as proxy.

Species	
• Black Rockfish*	• Copper Rockfish
• Blue Rockfish	• Grass Rockfish
• Deacon Rockfish	• Kelp Greenling
• Brown Rockfish	• Quillback Rockfish
• Cabezon	• Tiger Rockfish
• China Rockfish	• Vermilion Rockfish

Species with Mixed Mortality Results in the EEZ

Five species fall into the mixed results category for Washinton based on Oregon data (Table 24).

Table 24. Species caught off (Washington using Oregon data as proxy) in commercial and recreational where mortality is in the EEZ is above 25 percent (%) for one sector but below in the other.

Species	
• Butter Sole	• Sand Sole
• English Sole	• Starry Flounder
• Lingcod	

Each of these species has commercial and a recreational mortality; however, examination of mean catch weight (Table 25) indicates that primary mortality for lingcod, sand sole, and starry flounder is in the recreational sector; whereas, primary mortality for English sole is in the commercial sector. Butter sole does not have mortality weight estimates for the recreational sector; however, 54 fish were observed in 2023. The commercial mean weight is 0.003 mt or 6.6 lbs. If this mean weight is assumed to be the same for recreational catch, it is likely the 54 fish weighed more than 6.6 lbs, thus, the recommendation is that principal mortality for butter sole mortality is linked to the recreational sector.

Table 25. Mixed results species and preliminary method to identify area of principal water area of mortality based on fishery of primary (1°) mortality(mort) off of Washington using Oregon findings as proxy. – indicates not applicable, C indicates commercial, U indicates unknown, R indicates recreational.

Species	Mean comm mort (mt)	Mean rec mort (mt)	Comm/Rec proportion	Fishery of 1° Mort.	Principal water area of mortality
Butter Sole	0.003	*	-	U	?
English Sole	2.45	-	100:0	C	EEZ
Lingcod	61.51	166.63	27:73	R	?
Sand Sole	-	0.27	0:100	R	?
Starry Flounder	0.01	0.06	14:86	R	?

*no weight estimated, total of 61 fish

The only species that could be assigned a water area is English sole, as it is only caught in the commercial sector As for the remaining species, if Oregon is used as proxy, butter and sand soles, lingcod and starry flounder would be considered to have principal mortality in the EEZ; however, due to the unknowns surrounding the recreational fishery water area, these findings require further considerations by Washington.

Species with No Estimated Mortality in the EEZ

The species list of Washington with no estimated mortality is shown above in Table 16. There is no need to use Oregon as proxy data as there are no mortality records for these species.

Proposal 1 Conclusions

A total of 55 of the 86 managed groundfish species are caught off Washington. Using Oregon as results as proxy and based on the 25 percent threshold and the mixed category analysis, the results show: 1) 39 species have greater than 25 percent of their mortality attributed to the EEZ; 2) 12 species have less than 25 percent of their mortality attributed to the EEZ; 3) four species do not have certainty of water area and 3) 31 species have no reported or observed mortality in any water area.

Proposal 2

Proposal 2 is the most precautionary approach and the simplest. In this approach, all species with mortality off of Washington would be considered caught by the fishery until such a time when recreational spatial data for catch is available; meaning that all species would be considered primarily caught in the EEZ and remain in the FMP. The rationale is that there is not enough evidence to show, definitively, the levels of mortality attributed to each water area.

4.3.2 Proposal 1 and Proposal 2 Considerations

Proposal 1 has very similar results as California and Oregon in terms of which species are in each category. There are key uncertainties with using Oregon results as a proxy. The identification of species with mortality greater than 25 percent in the EEZ does not take into account potential differences between how the Oregon and Washington recreational fisheries are prosecuted or managed. While each state may have similar recreational management for groundfish, they are not the same and this component could result in differences in catch diversity. Further, the proxy method does not take into account any ecological differences in where certain rockfishes are fished

in the two states. For example, it may be possible that anglers catch nearshore rockfish further offshore in Washington than they do in Oregon due to coastal and in-water habitat differences. Proposal 1, however, does offer the Council an opportunity to move forward with this action, and evaluate whether and how the currently managed groundfish species should remain in the FMP, on a coastwide basis. The Council could differentiate species that are caught by the fishery off the Washington coast and those that are not, which could lead to changes in the FMP. The question to consider when determining whether to apply Proposal 1 is whether the similarities in life histories, physical location of the fishery (nearshore/offshore), species caught in the EEZ, and other aspects of the fishery in Oregon are sufficiently reflective of Washington to use Oregon as a proxy, or are they so different that this proposal should be rejected.

Proposal 2 reflects the status quo. All groundfish species caught off Washington would be considered caught by the Federal fishery. It is important to note that the Council could modify the list in the future should additional information arise. Identifying all groundfish species caught off Washington as if they all are in the fishery would not result in changes to how the Washington portion of the fishery is managed at present. However, it could perpetuate the issue of species primarily caught outside of the jurisdiction of the Council and NMFS being in the FMP, despite the Council and NMFS having no authority to control their management.

5. Synthesis:

5.1 State by State Comparison

The following discussion relies heavily on the California and Oregon analyses as Washington results are largely uncertain. Each state has slightly different species diversity, in terms of number of species observed in the commercial and/or recreational sectors. California has the highest diversity of species, with a total of 83 species of the 86 managed species observed in the commercial and recreational fisheries combined. Oregon and Washington follow with a total of 69 species and 56 species observed in their commercial and recreational sectors, respectively.

The mortality of each species in the EEZ, by sector, was comparable for Oregon and California. The comparison showed that the species caught in amounts both greater and less than the 25 percent threshold in the EEZ were similar across the two states. The species with known water area in Washington, i.e., the commercially caught species, matched the findings in California and Oregon for those species with greater than 25 percent mortality in the EEZ.[6] The species with mortality greater than 25 percent in the EEZ by state are shown in Table 26.

Table 26. Comparison of species across the three states with mortality greater than 25 percent in the EEZ. Blanks signify species not recorded in state. CA =California, OR =Oregon, WA =Washington

Species	CA	OR	WA
Arrowtooth Flounder	■	■	
Aurora Rockfish	■	■	■
Bank Rockfish	■	■	■
Big Skate	■	■	■
Blackgill Rockfish	■	■	■
Bocaccio Rockfish	■	■	
Bronzespotted rockfish	■		
Butter sole	■	■	■
California Scorpionfish	■		
Canary Rockfish	■	■	
Chilipepper Rockfish	■	■	
Cowcod Rockfish	■	■	
Curlfin Sole	■	■	
Darkblotched Rockfish	■	■	■
Dover Sole	■	■	■
English Sole	■	■	
Flag Rockfish	■	■	
Flathead Sole	■	■	
Freckled Rockfish	■		
Greenblotched Rockfish	■	■	
Greenspotted Rockfish	■	■	■
Greenstriped Rockfish	■	■	

Species	CA	OR	WA
Pacific Hake	■	■	
Pacific Ocean Perch	■	■	■
Pacific Sanddab	■	■	
Pacific Spiny Dogfish	■	■	■
Petrale Sole	■	■	
Pink Rockfish	■		
Pinkrose Rockfish	■		
Pygmy Rockfish	■	■	■
Redbanded Rockfish	■	■	
Redstripe Rockfish	■	■	
Rex Sole	■	■	■
Rosethorn Rockfish	■	■	
Rougheye/Blackspotted Rockfish	■	■	
Sablefish	■	■	
Sharpchin Rockfish	■	■	■
Shortraker Rockfish	■	■	■
Shortspine Thornyhead	■	■	
Silvergray Rockfish	■	■	
Speckled Rockfish	■	■	
Splitnose Rockfish	■	■	■
Squarespot Rockfish	■		
Starry Rockfish	■	■	

[6] Except harlequin rockfish due to range of the species.

Species	CA	OR	WA
Halfbanded Rockfish			
Harlequin Rockfish			
Honeycomb Rockfish			
Longnose Skate			
Longspine Thornyhead			
Mexican Rockfish			
Pacific Cod			C

Species	CA	OR	WA
Stripetail Rockfish			
Swordspine rockfish			
Vermilion/Sunset rockfish			
Widow Rockfish			C
Yelloweye Rockfish			C
Yellowmouth Rockfish			
Yellowtail Rockfish			

The results for species with mortality less than 25 percent in the EEZ was the same in California and Oregon (Table 27). The four species not noted in Oregon is likely due to their geographic range not including that state. Washington is not included as the framework could not discern mortality in state waters

Table 27. Species with less than 25 percent mortality in the EEZ in Oregon and California. Blanks signify species not recorded in state. CA =California, OR =Oregon,

Species	CA	OR
Black and Yellow Rockfish		
Black Rockfish		
Blue/Deacon Rockfish		
Brown Rockfish		
Cabezon		
Calico Rockfish		
Chameleon Rockfish		
China Rockfish		
Copper Rockfish		

Species	CA	OR
Gopher Rockfish		
Grass Rockfish		
Kelp Greenling		
Kelp Rockfish		
Leopard Shark		
Olive Rockfish		
Quillback Rockfish		
Treefish		

California had eight species (Table 7) with mixed mortality (§4.1) and Oregon (§4.2) had seven. The analysis to determine the California and Oregon analytical results, two species (canary rockfish and Pacific spiny dogfish) in California and all of Oregon's species with mixed results were determined to have mortality greater than 25 percent in the EEZ. However, the results of the additional analysis from six of the mixed results California species (lingcod, rock and sand soles, rosy, sunset, tiger, and vermilion rockfishes, and starry flounder) did not agree for both states. In California, mortality for these species was attributed to state waters; whereas in Oregon, their mortality was attributed to the EEZ. Therefore, the principal water area of catch is ambiguous. The species with mixed results, excluding the ones that were identified to the EEZ, are shown in Table 28. Washington data is not included.

Table 28. Species where water area of principal mortality is uncertain.

Species	CA	OR
Lingcod		
Rock Sole		
Rosy Rockfish		
Sand Sole		

Species	CA	OR
Starry Flounder		
Sunset Rockfish		
Tiger Rockfish		
Vermilion Rockfish		

Two species were found to have no estimated mortality across all three states over the study period, dwarf-red and light dusky rockfishes (Table 29). There are no records of the dwarf-red rockfish

being encountered by the fishery. Light dusky rockfish has not been observed since 2003. This species has only been noted twice in the GEMM Product, specifically in the 2002 and 2003 Pacific whiting mothership fishery. With both years combined, the estimated mortality of this species was .008 mt for both years.

Table 29. Species with no reported or observed mortality in state or Federal waters.

Species	CA	OR	WA
Dwarf-Red Rockfish			
Light Dusky Rockfish			

5.2 Proposed Groupings

In the process of comparing the state by state results, it became clear that species could be consolidated into two overarching Groups:

5.2.1 Group A: Species Caught Principally in the EEZ by the Fishery

There are 60 species in Group A. Group A (Table 30) includes the species with greater than 25 percent[7] of their mortality attributed to the EEZ, where one sector had a mortality of zero in the EEZ and the other had mortality above 25percent[8] in the EEZ. Group A also includes species that show mixed results (i.e. where one sector had mortality greater than 25 percent in the EEZ, but the other sector had less than 25 percent in the EEZ) as identified in the California and Oregon sections above. In brief, those species are canary rockfish and Pacific spiny dogfish Species in Group A have principal mortality in the EEZ in both Oregon and California, except for harlequin rockfish, which is only caught off Oregon.

All 60 species are currently managed by the Council. Based on the proposed application of the framework criteria, these species would remain in the FMP and could be defined as stocks , with appropriate stock structure determinations as informed by the literature review. Of Group A, 17 have had their stocks defined and would not need to be reconsidered. It is important to note that all the species with commercial mortality in Washington are represented in this list

Table 30. Group A. Species with mortality greater than or equal to 25 percent in the EEZ off of California and Oregon.

Species		
• Arrowtooth Flounder	• Greenspotted Rockfish	• Rosethorn Rockfish
• Aurora Rockfish	• Greenstriped Rockfish	• Rougheye/Blackspotted Rockfish a/
• Bank Rockfish	• Halfbanded Rockfish	• Sablefish a/
• Big Skate	• Honeycomb Rockfish	• Sharpchin Rockfish
• Blackgill Rockfish	• Harlequin Rockfish	• Shortraker Rockfish
• Bocaccio Rockfish	• Longnose Skate	• Shortspine Thornyhead a/
• Bronzespotted Rockfish	• Longspine Thornyhead	• Silvergray Rockfish

[7] For example, off of California, 98.9 percent of longnose skate commercial fishery mortality and 79.4 percent recreational mortality is in the EEZ. Both are above 25%, and are therefore considered caught by the fishery

[8] For example, off of California, English sole is only caught by the commercial fishery with 100% of its mortality attributed to the EEZ. This species is therefore considered caught by the fishery.

Species		
• Butter Sole	• Mexican Rockfish	• Speckled Rockfish
• California Scorpionfish	• Pacific Cod	• Splitnose Rockfish
• Chilipepper Rockfish a/	• Pacific Hake	• Squarespot Rockfish a/
• Canary Rockfish a/	• Pacific Ocean Perch	• Starry Rockfish
• Cowcod Rockfish	• Pacific Sanddab	• Stripetail Rockfish
• Curlfin Sole	• Pacific Spiny Dogfish a/	• Swordspine Rockfish
• Darkblotched Rockfish	• Petrale Sole a/	• Sunset/Vermilion Rockfish (CA) a/
• Dover Sole a/	• Pink Rockfish	• Widow Rockfish a/
• English Sole a/	• Pinkrose Rockfish	• Yelloweye Rockfish a/
• Flag Rockfish	• Pygmy Rockfish	• Yellowmouth Rockfish
• Flathead Sole	• Redbanded Rockfish	• Yellowtail Rockfish a/
• Freckled Rockfish	• Redstripe Rockfish	
• Greenblotched Rockfish	• Rex Sole a/	

a/ indicates species that have defined stocks

5.2.2 Group B: Species Needing Further Evaluation

In total, 27 species are included in Group B (Table 31). This group includes the species with less than 25 percent of their mortality to the EEZ off Oregon and California (Table 27), those where water area is uncertain and those with no mortality (Table 28), and those with no mortality (Table 29). Of these 27, four have had stocks defined (black, copper, and quillback rockfishes, and lingcod).

All 27 species are currently managed by the Council and this group marks an additional decision point for the Council. The Council has two options to consider for Group B species. The first is to retain them in the FMP, irrespective of the results from the threshold evaluation. The second is to evaluate these species further via the factors outlined at §600.305(c). This evaluation could assist in the decision making regarding whether these species should remain in the FMP and thus have stocks defined, or either be removed from the FMP or identified as EC species.

Table 31. Group B: Species that need further evaluation.

Species		
• Black and Yellow Rockfish	• Deacon Rockfish*	• Olive Rockfish
• Black Rockfish a/	• Dwarf-red Rockfish	• Quillback Rockfish a/
• Blue Rockfish*	• Gopher Rockfish	• Rock Sole
• Brown Rockfish	• Grass Rockfish	• Rosy Rockfish
• Cabezon	• Kelp Greenling	• Sand Sole
• Calico Rockfish	• Kelp Rockfish	• Starry Flounder
• Chameleon Rockfish	• Leopard Shark	• Tiger Rockfish
• China Rockfish	• Light Dusky Rockfish	• Treefish
• Copper Rockfish a/	• Lingcod a/	• Vermilion Rockfish (OR) a/

a/ indicates species that have defined stocks

Species with trace (de minimus) mortality since 2002

At the September 2024 Council meeting, there were discussions with advisory body members regarding average mortality over time for groundfish species. In particular, interest was expressed in identifying species with trace mortality as this information could assist in identifying species that could be removed from the FMP or designated as an EC. The term "trace" was not defined in those discussions; therefore, in this analysis it is defined as those species with less than 5 mt on average for 5 years (2018-23), excluding 2020. For a longer term comparison, the sum of mortality, by species, for the entire span of time in the GEMM reports, the average mortality for that period, and the sum of mortality 2018-23 (excluding 2020) is also presented. Further, a 5-year average ex-vessel revenue from these species is provided as reference to their monetary impact to the fishery. Additionally, the Group (i.e., Groups A, B, and C) the species were categorized into is provided as a reference point to compare these findings to above. A key consideration is these data are on a coastwide scale.

In sum, 16 species have average mortality for 2018-23 (excluding 2020, Table 32) of less than 5 mt. The majority of these species, 11 in total, are linked to Group A (Table 30), where their mortality is 25 percent or more in the EEZ. Six species are linked to Group B (Table 31).

These data are provided as informational

Table 32. Species with average mortality less than five metric tons (mt) for the period 2018-19 & 2021-23 compared to sum of mortality for the same period, the sum of mortality for 2002-23, and the average mortality for 2002-23. Source GEMM (mortality data) and PacFIN (ex-vessel revenue)

Species	Group A or B	Ave 2018-23 mortality , excluding 2020 (mt)	sum 2018-23 mortality, excluding 2020 (mt)	Ave mortality 2002-23 (mt)	Sum mortality 2002-23 (mt)	5yr Ave. Ex-Vessel Revenue ($)
Light Dusky Rockfish	B	0.0	0.0	0.003	0.007	$0
Pygmy Rockfish	A	0.002	0.01	0.01	0.26	$0
Harlequin Rockfish	A	0.01	0.03	0.01	0.23	$0.80
Pinkrose Rockfish	A	0.01	0.04	0.03	0.42	$91.00
Chameleon Rockfish	B	0.01	0.04	0.43	2.55	$13.40
Butter Sole	A	0.01	0.07	1.74	38.37	$0
Freckled Rockfish	A	0.02	0.12	0.06	1.02	$43.40
Bronzespotted Rockfish	A	0.11	0.54	0.10	1.39	$516.40
Pink Rockfish	A	0.27	1.37	0.16	2.92	$2,727.00
Swordspine Rockfish	A	0.28	1.40	0.10	1.68	$8.40
Calico Rockfish	B	0.49	2.46	0.80	16.80	$15.00
Halfbanded Rockfish	A	2.21	11.04	1.74	38.29	$0
Tiger Rockfish	B	2.40	12.01	1.52	33.49	$2,915.00
Honeycomb Rockfish	A	3.31	16.54	3.97	87.40	$428.00
Rock Sole	B	3.59	17.93	6.41	141.11	$1,120.00
Curlfin Sole	A	4.18	20.91	5.57	122.54	$104.00

6. Range of Alternatives

The goal of this step of Phase 2 is to identify the species that will move forward to the stock definitions process. The range of alternatives (ROA) is linked to adoption of the threshold framework for this action.

The results from the analysis, i.e., Group A and Group B, can inform the Council on how to identify species to the alternatives. In other words, just because a species is identified to a particular Group does not mean the Council could not have it analyzed under any of the alternative(s), i.e., Group A species could be analyzed under Alternative 2 and/or Alternative 3 or Group B could be analyzed under Alternative 1. The Groups merely show how the analysis classified the managed species in terms of those with mortality greater than 25 percent in the EEZ. The action alternatives reflect the choice before the Council in respect to the premise of this action and how individual species will be further analyzed, i.e. identify the species as in need of conservation and management and analyze potential stock definitions for it (Alternative 1), remove it from the FMP (Alternative 2), or designate them as an EC species (Alternative 3).

No Action: All species remain in FMP as currently defined and managed. The list of managed species as shown in Table 3-1 would not be modified. The Council would not define stocks of the species in the FMP other than the ones already defined.

Alternative 1: Species identified as in need of conservation and management. Stocks of the species will be defined as one or more stocks, consistent with the options below, and will remain in the FMP.

Option 1: One stock

Option 2: Two stocks

Option 3: Three stocks

Option 4: Four stocks

Alternative 2: Species identified as not in need of conservation and management. Stocks of the species will not be defined and the species will be removed from the FMP.

Alternative 3: Species identified as an ecosystem component (EC) species. Stocks of the species will not be defined, though it will remain in the FMP

Alternatives 1 - 3 represent potential alternative outcomes following the Phase 2 decision-making process for each of the 86 groundfish species currently managed in the FMP. We anticipate that Alternative 1 would likely include the majority of those Group A species identified by applying the 25 percent threshold, as well as those Group B species identified as in need of conservation and management following further analysis using the factors at § 600.305(c). We further anticipate that there could be certain Group A species classified as EC species as a result of this review. All species identified for Alternative 1 would further be defined as one or more stocks for the purposes of management under the FMP. Differences between an EC species and a species removed from the FMP are summarized in Table 33

If a stock is defined as coastwide, portions of the stock could not be removed from the FMP or designated as EC species. The stock, as a whole, would either be actively managed, removed in entirety from the FMP, or designated as an EC species. Whereas, for species that have stocks that are defined at a scale finer than coastwide, stocks within the same species could be evaluated under different alternatives.

Table 33. Summary of differences between ecosystem component species and species removed from the FMP in respect to the Federal management.

	EC Species	Removed Species
Remain in FMP	Yes	No
Monitored	Yes, minimal	No
Can be returned to Federal management	Yes, via §600.305(c) analysis	Yes, via §600.305(c) analysis
Accountability measures	Potentially, see FMP §4.4.4 for shortbelly rockfish	No
Stock Assessment	No	No

6.1 Stock Definitions

Development of the draft stock definition options for the species was informed using the literature review (Agenda Item I.8, Attachment 3, September 2024) and previous actions related to stock definitions. The options shown are reflective of stock structure. There are two overarching themes for the definition options: 1) an aggregated alternative (i.e., coastwide) and 2) disaggregated alternatives (e.g., state by state, north & south of 40°10' N. lat., etc.). Those species with stock structure are more likely to have multiple options; whereas, those species without structure or have unknown structure are likely to have fewer alternatives. As indicated by the literature review, stock structure for many groundfish is largely unknown. For these species, the IPT proposes a default definition of Option 1, single area, single stock. The area is based on the range of the species

The Council may consider additional action options for these species, as appropriate. Each action alternative is designed to define the stock and allow NMFS to determine stock status, i.e., overfished/not-overfished and depletion relative to the management target (B_{MSY}) and the MSST, as described in Sections 4.3 through 4.5 of the FMP.

For the purpose of status determination, the stock definition is the scale at which NMFS will determine stock status (i.e., "overfished"/"not overfished" and depletion relative to biomass reference points). Assessment results and harvest specifications OFL/ABC/ACL would be reported at the geographic scale of the stock

Table 34 provides the stock definition options for the 43 species in Group A. Appendix B provides additional information for considerations related to stock delineations. If the Council adds additional species to this list, stock delineations consistent with the literature review will be analyzed. Potential stock delineations offered for Council and advisory body consideration. All species shown are categorized under Option 1 or Option 1 and 2. The Council could choose to consider other delineations based on their management policy. Options 1 and 2 are based on the literature review.

Stocks of species defined through either Amendment 31 or 35 are omitted from the tables. The species shown are those that were not part of A31 or A35.

Option 1: A single stock, single area within the Fishery Management Unit (FMU). A single stock means there is no evidence of or unknown stock structure. The stock unit could be coastwide or limited to a single state based on its known range.

Option 2: Two Stocks within the FMU, delineated by specific latitude (e.g., north/south of 42° N. lat., north/south of 40°10′ N. lat., etc.

Option 3: Three Stocks within the FMU, delineated at state boundaries (e.g., a California stock, an Oregon stock, and a Washington stock) and/or latitudes. Each species is defined as a state-specific stock, i.e., a California stock, an Oregon stock, and a Washington stock.

Option 4: Four Stocks within the FMU delineated at specific latitudes and state boundaries (e.g., Washington stock, an Oregon stock, a 42° to 40°10′ N. lat. stock and a south of 40°10′ N. lat. stock).

Table 34. Potential stock definitions options (Opt) for species where mortality in the EEZ is greater than 25 percent . Species defined under Amendments 31 and 35 are not shown. Population structure (Pop. Struct.) is denoted by U =unknown, Y =yes, or N = no. Options relevant to species are noted by a grayed cell and an "*" Options are based on the literature review source information Agenda Item H.8, Attachment 3, March 2025. Empty columns provided in case the Council recommends other options than indicated by the literature review. Potential Stock delineations boundaries are based on literature review and are offered for Council consideration only.

Species	Pop. Struct	Opt 1	Opt 2	Opt 3	Opt 4	Potential Stock Delineations	Notes
Arrowtooth Flounder	U	*				Coastwide	
Aurora Rockfish	U	*				Coastwide	
Bank Rockfish	U	*				Coastwide	
Big Skate	N	*				Coastwide	
Blackgill Rockfish	U	*				Coastwide	
Bocaccio Rockfish	N	*				Coastwide	Range = CA
Bronzespotted Rockfish	U	*				Coastwide or California-only	
Butter Sole	U	*				Coastwide	
California Scorpionfish	U	*				Coastwide or California-only	Range = CA
Cowcod	Y	*	*			**Opt1.** Coastwide or California/Oregon ; **Opt 2.** California and Oregon	Range = CA & OR
Curlfin Sole	U	*				Coastwide	
Darkblotched Rockfish	U	*				Coastwide	
Flag Rockfish	U	*	*			**Opt1.** Coastwide or California/Oregon ; **Opt 2.** California and Oregon	Range = CA & OR
Flathead Sole	U	*				Coastwide	
Freckled Rockfish	U	*				Coastwide or California-only	Range = CA
Greenblotched Rockfish	U	*				Coastwide	
Greenspotted Rockfish	U	*				Coastwide	
Greenstriped Rockfish	U	*				Coastwide	
Halfbanded Rockfish	U	*				Coastwide	
Honeycomb Rockfish	U	*				Coastwide or California-only	
Harlequin Rockfish	U	*	*			**Opt1.** Coastwide or Oregon/Washington. **Opt 2**. Oregon and Washington	Range = OR & WA
Longnose Skate	U	*				Coastwide	
Longspine Thornyhead	U	*				Coastwide	
Mexican Rockfish	U	*				Coastwide or California-only	Range = CA
Pacific Cod	U	*				Coastwide	

Species	Pop. Struct	Opt 1	Opt 2	Opt 3	Opt 4	Potential Stock Delineations	Notes
Pacific Hake	N	*				Coastwide	
Pacific Ocean Perch	U	*				Coastwide	
Pacific Sanddab	N	*				Coastwide	
Pink Rockfish	U	*	*			**Opt1.** Coastwide or California/Oregon; **Opt 2.** California and Oregon	Range = CA & OR
Pinkrose Rockfish	U	*				Coastwide or California-only	Range = CA
Pygmy Rockfish	U	*				Coastwide	
Redbanded Rockfish	U	*				Coastwide	
Redstripe Rockfish	U	*				Coastwide	
Rosethorn Rockfish	U	*				Coastwide	
Sharpchin Rockfish	U	*				Coastwide	
Shortraker Rockfish	U	*				Coastwide	
Silvergray Rockfish	U	*				Coastwide	
Speckled Rockfish	U	*				Coastwide	
Splitnose Rockfish	N	*				Coastwide	
Starry Rockfish	U	*				Coastwide or California-only	Range = CA
Stripetail Rockfish	N	*				Coastwide	
Swordspine rockfish	U	*				Coastwide or California-only	Range = CA
Yellowmouth Rockfish	U	*				Coastwide	

Appendix A: Framework Analysis -Detailed Results.

Data

Commercial Sector Data

National Marine Fisheries Service (NMFS) staff developed a model to estimate the distribution of commercial sector mortality between Federal/state waters off the U.S. West Coast (Agenda Item I.8.a, NMFS Report 1, September 2024), which was endorsed by the Council's Science and Statistical Committee (SSC, Agenda Item I.8.a, Supplemental SSC Report 1, September 2024). The methodology is incorporated by reference. In brief, the model utilized four sources of data (1) the Groundfish Estimated Multiyear Mortality (GEMM) product (2) the Pacific Coast Fisheries Information Network (PacFIN) database, and (3) haul-level West Coast Groundfish Observer Program(WCGOP) data, and (4) haul-distributed electronic monitoring (EM) data. The most recent five-year period of complete set of data available was used for the analysis (2017- 2021).

Recreational Sector Data

Estimated recreational mortality by water area and state is available via the Recreational Fishery Information Network (RecFIN) resource and the GEMM for groundfish for all three states. Recreational sector data for a five year period (2018-19, 2021-23)[9] per the SSC's September 2024 recommendation was used to determine the species specific mortality by Federal/state waters and by state,.

A key aspect of recreational sector weight data. Based on field sampling protocols it is possible for all species enumerated/sampled to not be weighed. Correspondingly, it is possible to have an estimated number of fish but not have a corresponding weight estimate. Therefore, estimated number of fish offers a more robust set of data for analysis than does weight for the recreational sector. It is important to note, that very few species have missing weights.

There are other caveats to recreational data specific to state. California is the only state to report mortality estimates by water area (i.e., state or EEZ). Oregon and Washington do not. Oregon; however, does collects water area information related to catch of as part of their sampling protocols, which makes it possible to estimate proportion of mortality by water area.

Data Tables

The following provides the definitions for columns (variables) and their function

Each table presents the complete results of the analysis for California, Oregon, and Washington. The same variables are used for each state. The first four columns are used to understand the mortality of each sector's total mortality in the EEZ. The percentage of mortality reflects the estimated percentage of total mortality by sector by species.

[9] 2020 was excluded due to the anomalous recreational fishery impacts due to Covid

% in EEZ Com: This column shows the percentage of mortality for each species caught by the commercial sector in the EEZ. This information was obtained from Agenda Item I.8.a, NMFS Report 1, September 2024)..

Comm mt EEZ mean: This column shows the annual mean weight for each species in the EEZ. These data are a function of multiplying the percentage of commercial mortality in the EEZ against the mean mortality of each species, as presented in Agenda Item I.8.a, NMFS Report 1, September 2024).

% in EEZ Rec: This column shows the percentage of mortality for each species caught by the recreational sector in the EEZ for the study period (2018-19, 2021-21). These data are based on numbers of fish, not weight. These data were obtained from RecFIN. Number are a more reliable estimate as not all catch is weighed and thus, no estimated derived.

- California: These data are a function of dividing estimated mortality in numbers of fish for the species caught in the EEZ by all waters (EEZ+ State) mortality in numbers of fish.
- Oregon: These data are a function of dividing sample data in numbers of fish for the species caught in the EEZ by all species waters (EEZ+ State) sample data in numbers of fish
- Washinton: These data could not be calculated as Washington does not collect data related to area of mortality in terms of EEZ or state waters

Rec Mt EEZ mean: This column reports estimated mortality in terms of weight for each species in the EEZ.

- California: California provides estimates for EEZ and state waters. The values from the study years were averaged. Not all species have weights, those species are identified by an "*."
- Oregon: Oregon does not estimate by water area but for all waters as a whole (i.e., state and EEZ), therefore, the mean is calculated by multiplying the percent of mortality (based on the sample proportions by water area) against the total estimated mortality for all waters.
- Washington: These data could not be calculated. Washington does not provide estimates by water area.

These next two columns are used to understand the proportion of mortality by sector in the EEZ. shows the proportion (percentage) of total commercial mortality in the EEZ relative to the recreational percentage and is based on weight as the common metric. This information can identify which sector is responsible for principal mortality in the EEZ. These data are calculated by dividing the mean weight of (sector specific) mortality by species in the EEZ divided by total mean weight EEZ mortality

EEZ prop C: Percentage of mortality in EEZ attributed to the commercial sector

EEZ prop R: Percentage of mortality in EEZ attributed to the recreational sector. This proportion could not be calculated for Washinton for reasons noted above.

These next two columns are used to understand the proportion of mortality by sector in the in all waters and shows the proportion (percentage) of total commercial mortality in the EEZ relative to recreational percentage and is based on weight as the common metric. This information can identify which sector is responsible for the principal mortality in all waters.

All water Prop C: Percentage of mortality in all waters attributed to the commercial sector

All water Prop R: Percentage of mortality in all waters attributed to the recreational sector Washinton could not be calculated.

Appendix A: California

Table A 1. Species with greater than 25 percent (%) of mortality attributed to the EEZ off California for both sectors. Columns described above. Commercial =C, Recreational = R, metric tons = mt, * =no weight estimate for species, column could not be calculated. "-" indicates no data for that species, i.e., no mortality in study period.

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R
Arrowtooth Flounder	99.4%	48.38	89.6%	*	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Aurora Rockfish	92.8%	9.47	-	-	100.0%	0.0%	100.0%	0.0%
Bank Rockfish	99.1%	33.07	80.6%	3.28	90.7%	9.3%	89.1%	10.9%
Big Skate	98.8%	26.03	71.2%	*	100.0%	0.0%	100.0%	0.0%
Blackgill Rockfish	83.7%	35.83	93.3%	*	100.0%	0.0%	100.0%	0.0%
Bocaccio Rockfish	97.1%	291.04	46.2%	65.15	81.71%	18.29%	68.0%	32.0%
Bronzespotted rockfish	-	-	86.1%	*	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Butter sole	100.0%	0.00	-	-	100.0%	0.0%	100.0%	0.0%
California Scorpionfish	25.8%	0.20	78.8%	220.40	0.2%	99.9%	0.3%	99.7%
Chilipepper Rockfish	99.5%	523.89	80.4%	32.10	94.2%	5.8%	93.0%	7.0%
Cowcod Rockfish	100.0%	0.94	70.8%	11.54	7.5%	92.5%	5.4%	94.6%
Curlfin Sole	98.9%	0.46	-	-	100.0%	0.0%	100.0%	0.0%
Darkblotched Rockfish	99.2%	23.42	-	-	100.0%	0.0%	100.0%	0.0%
Dover Sole	99.9%	1585.49	-	-	100.0%	0.0%	100.0%	0.0%
English Sole	99.2%	97.40	-	-	100.0%	0.0%	100.0%	0.0%
Flag Rockfish	72.6%	0.15	45.8%	4.04	3.6%	96.4%	2.3%	97.7%
Flathead Sole	100.0%	0.00	-	-	100.0%	0.0%	100.0%	0.0%
Freckled Rockfish	100.0%	0.00	30.9%	0.01	34.0%	66.0%	13.7%	86.3%
Greenblotched Rockfish	68.1%	0.50	91.3%	8.68	5.5%	94.5%	7.2%	92.8%
Greenspotted Rockfish	90.8%	4.17	62.3%	20.99	16.6%	83.4%	12.0%	88.0%
Greenstriped Rockfish	93.4%	6.15	77.5%	3.16	66.1%	33.9%	61.8%	38.2%
Halfbanded rockfish	-	-	56.1%	2.26	0.0%	100.0%	0.0%	100.0%
Honeycomb Rockfish	42.9%	0.01	47.0%	1.73	0.6%	99.4%	0.7%	99.3%
Longnose Skate	98.9%	136.19	79.4%	-	100.0%	0.0%	100.0%	0.0%

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R
Longspine Thornyhead	98.7%	217.74	-	-	100.0%	0.0%	100.0%	0.0%
Mexican Rockfish	76.9%	0.41	94.8%	9.32	4.2%	95.8%	5.1%	94.9%
Pacific Cod	100.0%	0.25	-	-	100.0%	0.0%	100.0%	0.0%
Pacific Hake	99.6%	84.72	75.1%	0.20	99.8%	0.2%	99.7%	0.3%
Pacific Ocean Perch	96.2%	0.35	-	-	100.0%	0.0%	100.0%	0.0%
Pacific Sanddab	91.2%	48.52	54.1%	16.04	75.2%	24.8%	64.2%	35.8%
Petrale Sole	99.5%	632.11	47.2%	3.94	99.4%	0.6%	98.7%	1.3%
Pink Rockfish	100.0%	0.01	-	-	100.0%	0.0%	100.0%	0.0%
Pinkrose Rockfish	100.0%	0.00	100.0%	*	100.0%	0.0%	100.0%	0.0%
Pygmy Rockfish	100.0%	trace	-	-	100.0%	0.0%	100.0%	#DIV/0!
Redbanded Rockfish	96.1%	9.75	100.0%	*	100.0%	0.0%	100.0%	0.0%
Redstripe Rockfish	-	-	42.1%	*	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Rex Sole	100.0%	81.50	-	-	100.0%	0.0%	100.0%	0.0%
Rosethorn Rockfish	60.4%	0.13	88.6%	0.06	68.5%	31.5%	76.2%	23.8%
Rougheye/Blackspotted Rockfish	94.6%	0.95	-	-	100.0%	0.0%	100.0%	0.0%
Sablefish	97.2%	1405.96	84.0%	3.77	99.7%	0.3%	99.7%	0.3%
Sharpchin Rockfish	99.9%	0.03	-	-	100.0%	0.0%	100.0%	0.0%
Shortraker Rockfish	100.0%	0.08	-	-	100.0%	0.0%	100.0%	0.0%
Shortspine Thornyhead	94.3%	232.44	-	-	100.0%	0.0%	100.0%	0.0%
Silvergray Rockfish	100.0%	0.38	100.0%	*	100.0%	0.0%	100.0%	0.0%
Speckled Rockfish	85.9%	0.55	62.4%	1.62	25.3%	74.7%	7.8%	92.2%
Splitnose Rockfish	99.8%	15.36	-	-	100.0%	0.0%	100.0%	0.0%
Squarespot Rockfish	46.9%	0.04	64.9%	10.57	0.3%	99.7%	0.5%	99.5%
Starry Rockfish	56.2%	0.83	34.4%	15.31	5.2%	94.8%	3.2%	96.8%
Stripetail Rockfish	99.9%	18.77	76.0%	0.04	99.8%	0.2%	99.7%	0.3%
Swordspine rockfish	-	-	89.4%	0.26	0.0%	100.0%	0.0%	100.0%
Vermilion/Sunset rockfish	66.1%	36.47	27.9%	83.38	30.4%	69.6%	15.6%	84.4%
Widow Rockfish	99.4%	146.14	31.1%	4.21	97.2%	2.8%	91.6%	8.4%

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R
Yelloweye Rockfish	70.5%	1.02	37.2%	10.12	9.2%	90.8%	5.1%	94.9%
Yellowmouth Rockfish	100.0%	0.15	-	-	100.0%	0.0%	100.0%	0.0%
Yellowtail Rockfish	64.4%	12.17	29.4%	29.57	29.2%	70.8%	15.8%	84.2%

Table A 2. Species <u>with less</u> than 25 percent (%) of mortality attributed to the EEZ off California for both sectors. Columns described above. Commercial =C, Recreational = R, metric tons = mt, * =no weight estimate for species, column could not be calculated. "-" indicates no data for that species, i.e., no mortality in study period

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R
Black and Yellow Rockfish	2.2%	0.36	4.3%	0.21	63.2%	36.8%	76.9%	23.1%
Black Rockfish	0.9%	0.38	8.2%	18.49	2.0%	97.9%	15.7%	84.3%
Blue/Deacon Rockfish	5.6%	1.00	7.0%	13.47	6.9%	93.1%	8.4%	91.6%
Brown Rockfish	5.1%	1.01	17.6%	17.48	5.5%	94.5%	16.6%	83.4%
Cabezon	5.1%	1.18	7.9%	4.18	21.9%	78.0%	30.4%	69.6%
Calico Rockfish	15.8%	0.002	15.4%	0.16	1.8%	98.2%	1.7%	98.3%
Chameleon Rockfish	8.8%	0.001	-	-	100.0%	0.0%	100.0%	0.0%
China Rockfish	4.4%	0.09	13.3%	1.73	4.8%	95.2%	13.2%	86.8%
Copper Rockfish	14.0%	1.99	15.7%	18.81	9.6%	90.4%	10.6%	89.4%
Gopher Rockfish	2.3%	0.64	3.6%	2.11	23.3%	76.7%	32.3%	67.7%
Grass Rockfish	0.2%	0.02	9.2%	0.42	4.4%	95.58%	68.1%	31.9%
Kelp Greenling	-	-	5.9%	0.74	0.0%	100.0%	15.4%	84.6%
Kelp Rockfish	-	-	7.9%	0.47	0.0%	100.0%	14.3%	85.7%
Leopard Shark	25.0%	0.15	3.4%	10.76	1.4%	98.6%	0.2%	99.8%
Olive Rockfish	17.8%	0.35	10.4%	4.41	7.3%	92.7%	4.4%	95.6%
Quillback Rockfish	15.1%	0.55	21.7%	9.28	5.6%	94.4%	28.2%	71.8%
Treefish Rockfish	4.3%	0.11	12.6%	1.01	9.7%	90.3%	23.9%	76.1%

Table A 3. Species where one sector's mortality is above 25 percent and the other sector is below 25 percent (%) of mortality threshold attributed to the EEZ off California. Sector of principal (princ.) mortality indicated at rightmost column of table. Columns described above. Commercial =C, Recreational = R, metric tons = mt, * =no weight estimate for species, column could not be calculated. "-" indicates no data for that species, i.e., no mortality in study period/

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R	Sector of princ. mort	Water Area Indicated
Canary Rockfish	89.3%	107.96	20.61%	16.62	86.7%	13.3%	60.0%	40.0%	C	EEZ
Lingcod	81.0%	189.62	12.81%	53.12	78.1%	21.9%	36.1%	63.9%	R	State
Rock Sole	64.5%	0.21	22.26%	0.38	35.5%	64.5%	16.0%	84.0%	R	State
Rosy Rockfish	17.1%	0.09	25.88%	4.12	2.2%	97.8%	3.3%	96.7%	R	State
Sand Sole	61.3%	0.11	11.64%	0.03	76.4%	23.6%	38.0%	62.0%	R	State
Spiny Dogfish Shark	99.2%	121.60	21.38%	4.01	96.8%	3.2%	93.5%	6.5%	C	EEZ
Starry Flounder	80.5%	0.52	18.34%	0.12	80.6%	19.4%	48.6%	51.4%	R	mix
Tiger Rockfish	33.0%	0.02	22.50%	0.15	11.1%	88.9%	7.9%	92.1%	R	State

Table A 4. Species no mortality in the study period in California. Dash indicates no data or proportion could not be calculated.

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R	Notes
Dwarf-Red Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Harlequin Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	Range = OR/WA
Light Dusky Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	

The following figures show the number of species by 25 percent bins in the commercial (FIG) and recreational (FIG) sectors.

Figure A 1. Number of species per 25 percent (%) bins in the commercial fishery off of California. These figures omit the species with mixed mortality and no mortality, i.e., only the species with mortality greater than or less than 25 percent in the EEZ are shown.

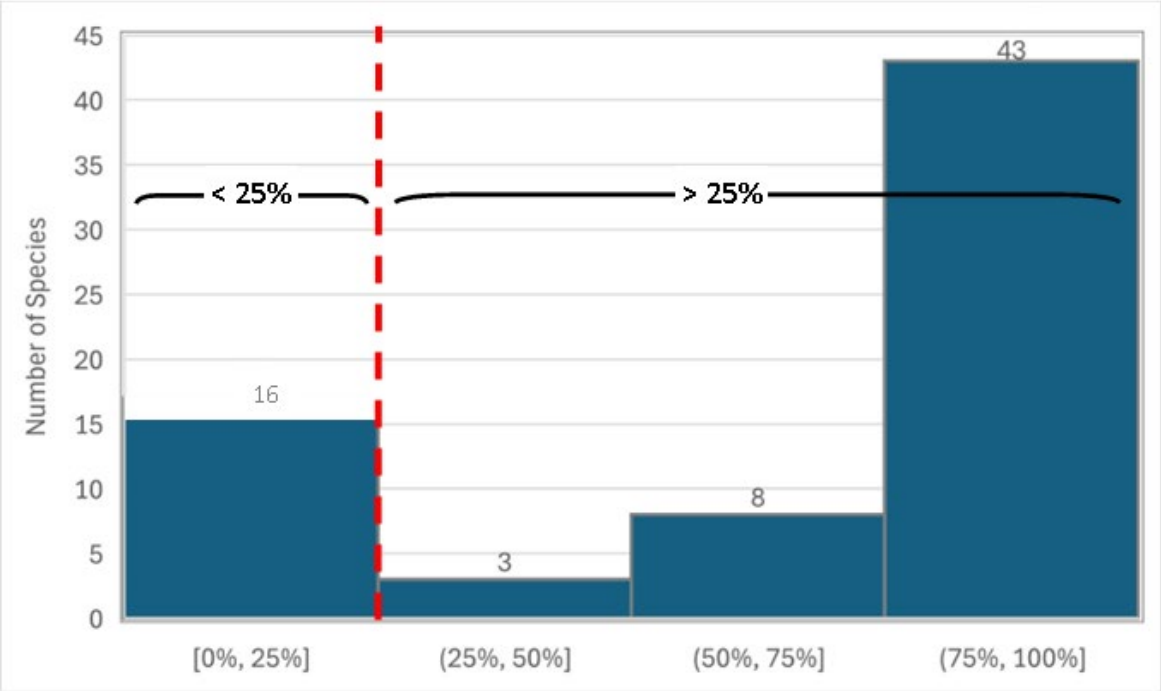
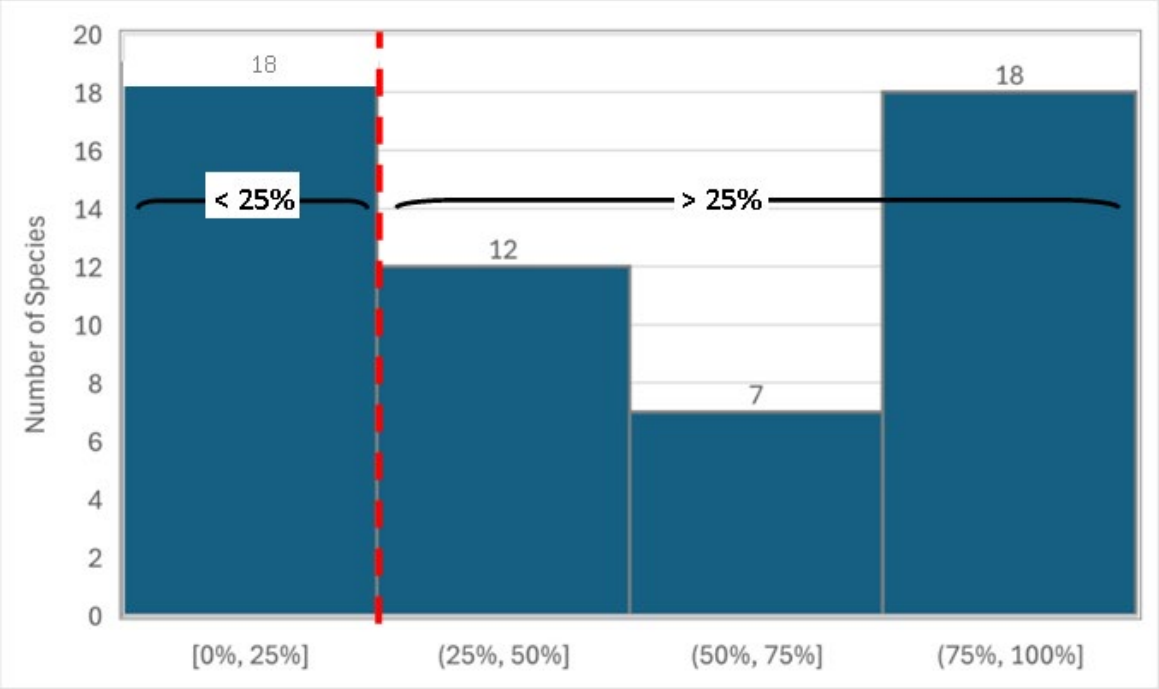


Figure A 2. Number of species per 25 percent (%) bins in the recreational fishery off of California. These figures omit the species with mixed mortality and no mortality, i.e., only the species with mortality greater than or less than 25 percent in the EEZ are shown.



Appendix A: Oregon

Table A 5. Species with greater than 25 percent (%) of mortality attributed to the EEZ off Oregon for both sectors. Columns described above. Commercial =C, Recreational = R, metric tons = mt. "-" indicates no data for that species, i.e., no mortality in study period.

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R
Arrowtooth Flounder	99.5%	873.00	91.0%	0.05	100.0%	0.0%	100.0%	0.0%
Aurora Rockfish	100.0%	22.96	-	-	100.0%	0.0%	100.0%	0.0%
Bank Rockfish	99.9%	1.93	-	-	100.0%	0.0%	100.0%	0.0%
Big Skate	99.2%	132.58	78.2%	0.06	100.0%	0.0%	99.9%	0.1%
Blackgill Rockfish	95.9%	4.14	-	-	100.0%	0.0%	100.0%	0.0%
Bocaccio Rockfish	99.4%	24.09	91.4%	1.12	95.6%	4.4%	95.2%	4.8%
Canary Rockfish	97.7%	211.62	28.1%	13.18	94.1%	5.9%	82.2%	17.8%
Chilipepper Rockfish	100.0%	40.88	91.4%	0.05	99.9%	0.1%	99.9%	0.1%
Curlfin Sole	100.0%	0.09	-	-	100.0%	0.0%	100.0%	0.0%
Darkblotched Rockfish	99.8%	233.53	87.0%	0.01	100.0%	0.0%	100.0%	0.0%
Flag Rockfish	-	-	73.7%	0.01	0.0%	100.0%	0.0%	100.0%
Flathead Sole	100.0%	23.17	-	-	100.0%	0.0%	100.0%	0.0%
Greenblotched Rockfish	-	-	96.3%	0.03	0.0%	100.0%	0.0%	100.0%
Greenspotted Rockfish	90.7%	0.29	87.5%	0.30	48.6%	51.4%	47.7%	52.3%
Greenstriped Rockfish	99.8%	37.15	94.7%	0.13	99.6%	0.4%	99.6%	0.4%
Harlequin Rockfish	100.0%	0.01	-	-	100.0%	0.0%	100.0%	0.0%
Longnose Skate	99.6%	488.18	66.4%	0.10	100.0%	0.0%	100.0%	0.0%
Longspine Thornyhead	100.0%	182.52	-	-	100.0%	0.0%	100.0%	0.0%
Pacific Cod	100.0%	11.81	85.9%	0.06	99.5%	0.5%	99.4%	0.6%
Pacific Hake	100.0%	117,441.16	100.0%	0.06	100.0%	0.0%	100.0%	0.0%
Pacific Ocean Perch	100.0%	280.30	-	-	100.0%	0.0%	100.0%	0.0%
Pacific Sanddab	100.0%	42.31	78.5%	0.17	99.6%	0.4%	99.5%	0.5%
Petrale Sole	100.0%	1,794.29	70.1%	2.26	99.9%	0.1%	99.8%	0.2%
Redbanded Rockfish	96.3%	16.57	84.8%	0.02	99.9%	0.1%	99.9%	0.1%

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R
Redstripe Rockfish	100.0%	35.41	98.7%	0.07	99.8%	0.2%	99.8%	0.2%
Rex Sole	100.0%	338.71	-	-	100.0%	0.0%	100.0%	0.0%
Rock Sole	99.8%	0.76	25.9%	0.004	99.5%	0.5%	98.2%	1.8%
Rosethorn Rockfish	99.3%	6.58	55.2%	0.03	99.6%	0.4%	99.3%	0.7%
Rosy Rockfish	30.4%	0.001	57.2%	0.02	2.0%	98.0%	3.7%	96.3%
Rougheye/Blackspotted Rockfish	94.0%	41.94	-	-	100.0%	0.0%	100.0%	0.0%
Sablefish	99.2%	2,484.83	84.6%	1.98	99.9%	0.1%	99.9%	0.1%
Sharpchin Rockfish	100.0%	32.46	-	-	100.0%	0.0%	100.0%	0.0%
Shortraker Rockfish	99.9%	5.39	-	-	100.0%	0.0%	100.0%	0.0%
Shortspine Thornyhead	100.0%	415.09	-	-	100.0%	0.0%	100.0%	0.0%
Silvergray Rockfish	99.8%	37.22	96.4%	0.63	98.3%	1.7%	98.3%	1.7%
Speckled Rockfish	-	-	40.0%	0.001	0.0%	100.0%	0.0%	100.0%
Spiny Dogfish Shark	99.2%	335.05	74.6%	0.03	100.0%	0.0%	100.0%	0.0%
Splitnose Rockfish	100.0%	79.94	-	-	100.0%	0.0%	100.0%	0.0%
Stripetail Rockfish	100.0%	33.91	-	-	100.0%	0.0%	100.0%	0.0%
Widow Rockfish	100.0%	7,465.65	84.4%	4.81	99.9%	0.1%	99.9%	0.1%
Yelloweye Rockfish	71.9%	1.02	29.5%	1.27	44.6%	55.4%	24.9%	75.1%
Yellowmouth Rockfish	100.0%	17.95	76.9%	0.06	99.6%	0.4%	99.5%	0.5%
Yellowtail Rockfish	100.0%	2,470.22	61.4%	28.06	98.9%	1.1%	98.2%	1.8%

Table A 6. Species <u>with less</u> than 25 percent (%) of mortality attributed to the EEZ off Oregon for both sectors. Columns described above. Commercial =C, Recreational = R, metric tons = mt. * =no weight estimate for species, column could not be calculated. "-" indicates no data for that species, i.e., no mortality in study period

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R
Black Rockfish	2.4%	116.27	2.7%	8.53	24.7%	75.3%	26.7%	73.3%
Blue Rockfish	2.4%	7.15	3.1%	0.15	53.7%	46.3%	60.0%	40.0%
Brown Rockfish a/	-	-	13.1%	0.03	0%	100.0%	0%	80.5%

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R
Cabezon	4.2%	27.25	2.9%	0.41	73.5%	26.5%	65.9%	34.1%
China Rockfish	3.5%	6.51	3.5%	0.09	71.4%	28.6%	71.1%	28.9%
Copper Rockfish	2.4%	2.06	4.9%	0.34	12.6%	87.4%	22.7%	77.3%
Deacon Rockfish	0.6%	0.01	3.5%	0.55	1.8%	98.2%	7.1%	92.8%
Gopher Rockfish	1.2%	0.05	1.9%	0.001	49.9%	50.1%	61.4%	38.6%
Grass Rockfish	-	-	10.3%	0.01	0.0%	100.0%	59.2%	40.8%
Kelp Greenling	3.4%	9.79	3.9%	0.13	72.1%	27.9%	74.6%	25.4%
Kelp Rockfish	-	-	7.1%	0.0009	0.0%	100.0%	0.0%	100.0%
Olive Rockfish a/	1.5%	0.02	3.7%	0.0002	90.0%	10.0%	70.0%	30.0%
Quillback Rockfish	5.2%	2.51	6.8%	0.43	23.4%	76.6%	28.6%	71.4%
Tiger Rockfish	3.8%	0.30	18.8%	0.19	5.7%	94.3%	23.0%	77.0%
Vermilion Rockfish	4.9%	3.24	8.6%	0.59	21.1%	78.9%	32.0%	68.0%

Table A 7. Species where one sector's mortality is above 25 percent and the other sector is below 25 percent (%) of mortality threshold attributed to the EEZ off Oregon for both sectors. Sector of principal mortality indicated at rightmost column of table. Columns described above. Commercial =C, Recreational = R, metric tons = mt. "-" indicates no data for that species, i.e., no mortality in study period/

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R	Sector of princ. mort	Water area indicated
Butter Sole	100.0%	0.01	23.9%	0.002	78.5%	21.5%	46.7%	53.3%	R	Mix
Cowcod	100.0%	0.02	20.0%	0.0004	98.4%	1.6%	92.3%	7.7%	C	EEZ
Dover Sole	100.0%	3,917.58	4.7%	0.0003	100.0%	0.0%	100.0%	0.0%	C	EEZ
English Sole	99.9%	121.29	4.8%	0.001	100.0%	0.0%	100.0%	0.0%	C	EEZ
Lingcod	74.5%	263.23	9.8%	17.90	93.6%	6.4%	65.9%	34.1%	C	EEZ
Sand Sole	92.9%	1.11	22.9%	0.03	97.1%	2.9%	89.1%	10.9%	C	EEZ
Starry Flounder	75.4%	1.28	23.8%	0.007	99.5%	0.5%	98.4%	1.6%	C	EEZ

Table A 8. Species no mortality in the study period in Oregon. Dash indicates no data or proportion could not be calculated.

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R	Notes
Black and Yellow Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Bronzespotted rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Calico Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
California Scorpionfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Chameleon Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Dwarf-Red Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Freckled Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Halfbanded rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Honeycomb Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Leopard Shark	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Light Dusky Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Mexican Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Pink Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Pinkrose Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Pygmy Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Squarespot Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Starry Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Swordspine rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Treefish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA

The following figures show the number of species by 25 percent bins in the commercial (FIG) and recreational (FIG) sectors.

Figure A 3. Number of species per 25 percent (%) bins in the commercial fishery off of Oregon. These figures omit the species with mixed mortality and no mortality, i.e., only the species with mortality greater than or less than 25 percent in the EEZ are shown.

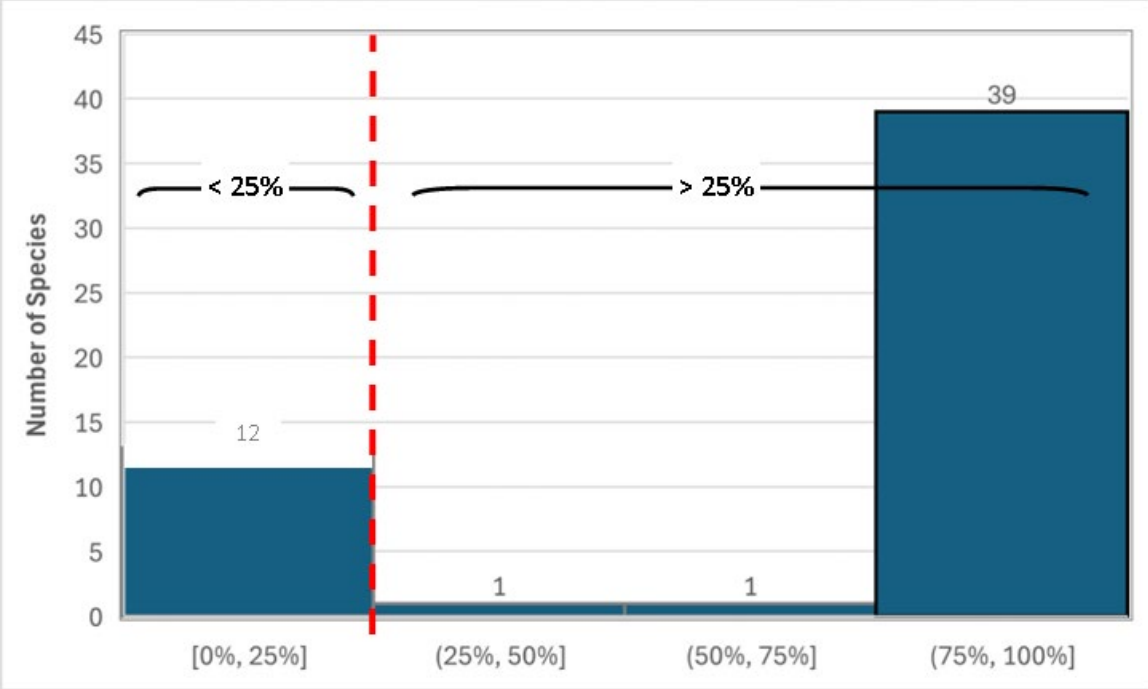
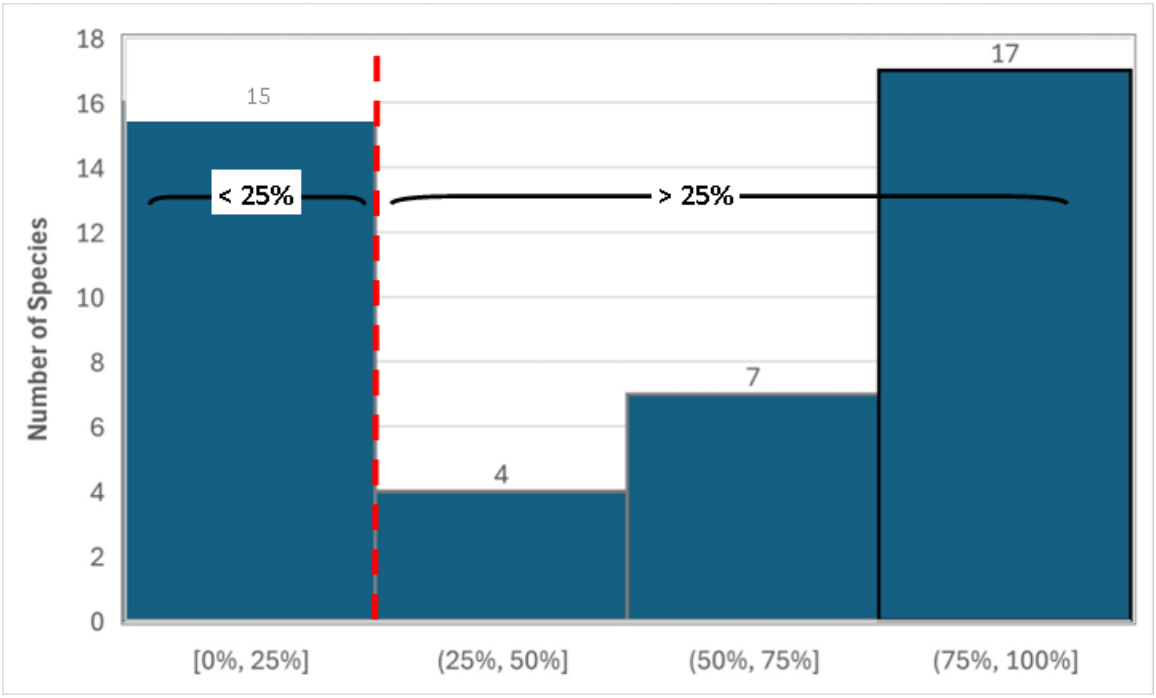


Figure A 4. Number of species per 25 percent (%) bins in the recreational fishery off of Oregon. These figures omit the species with mixed mortality and no mortality, i.e., only the species with mortality greater than or less than 25 percent in the EEZ are shown.



Appendix A: Washington

As noted, Washington does not attribute recreational mortality to water area, i.e., greater/less than 3nm. The commercial sector is restricted to the EEZ off of Washington, therefore the percentage of commercial mortality is assumed to be 100 percent in the EEZ off Washington. The tables for California and Oregon shown above could not be replicated. These tables represent mortality in the 1) mortality in both commercial and recreational fisheries off Washington, 2) mortality only in the commercial sector off Washington, 3) mortality only in the recreational sector off Washington, and 4) species with no mortality in the study period.

Table A 9. Species with mortality in both the commercial and recreational sector off Washington. The percentage (%) of recreational mortality in the EEZ is reported as unknown (U). Mean mortality of recreational mortality in all waters is shown. Sector of principal mortality is identified

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec mean weight (mt)	All Waters Prop C	All Waters Prop R	Sector of princ. mort
Arrowtooth Flounder	100.0%	31.35	U	0.71	97.8%	2.2%	C
Black Rockfish	100.0%	0.002	U	193.41	0.0%	100.0%	R
Bocaccio Rockfish	95.0%	5.54	U	5.33	51.0%	49.0%	C
Canary Rockfish	99.6%	43.78	U	23.20	65.4%	34.6%	C
Chilipepper Rockfish	99.4%	0.01	U	0.001	89.3%	10.7%	C
English Sole	100.0%	2.45	U	0.002	99.9%	0.1%	C
Greenstriped Rockfish	97.9%	1.34	U	0.04	97.2%	2.8%	C
Lingcod	98.8%	61.51	U	166.63	27.0%	73.0%	R
Pacific Cod	100.0%	1.11	U	1.84	37.7%	62.3%	R
Pacific Hake	99.8%	19,818.74	U	0.01	100.0%	0.0%	C
Petrale Sole	99.9%	151.70	U	0.51	99.7%	0.3%	C
Redbanded Rockfish	96.6%	11.58	U	0.34	97.2%	2.8%	C
Redstripe Rockfish	99.1%	3.17	U	0.001	100.0%	0.0%	C
Rock Sole	100.0%	0.00	U	0.14	2.7%	97.3%	R
Rosethorn Rockfish	99.9%	7.10	U	0.002	100.0%	0.0%	C
Rougheye/Blackspotted Rockfish	98.8%	24.74	U	0.01	100.0%	0.0%	C
Sablefish	99.1%	641.67	U	10.47	98.4%	1.6%	C
Sand Sole	100.0%	0.00	U	0.27	0.7%	99.3%	R
Shortspine Thornyhead	100.0%	26.26	U	0.01	100.0%	0.0%	C

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec mean weight (mt)	All Waters Prop C	All Waters Prop R	Sector of princ. mort
Silvergray Rockfish	99.3%	16.69	U	0.34	98.0%	2.0%	C
Starry Flounder	100.0%	0.01	U	0.06	18.6%	81.4%	R
Widow Rockfish	100.0%	1,316.42	U	3.40	99.7%	0.3%	C
Yelloweye Rockfish	80.0%	0.27	U	3.23	7.6%	92.4%	R
Yellowtail Rockfish	99.8%	489.68	U	60.92	88.9%	11.1%	C

Table A 10. Species with mortality only in the commercial sector off Washington. Commercial mortality in EEZ is assumed to be 100 percent (%). No recreational mortality is noted for these species. Dash indicates no data or proportion could not be calculated.

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R
Aurora Rockfish	100.0%	3.35	0.0%	-	100.0%	-	100.0%	-
Bank Rockfish	100.0%	0.05	0.0%	-	100.0%	-	100.0%	-
Big Skate	100.0%	8.60	0.0%	-	100.0%	-	100.0%	-
Blackgill Rockfish	100.0%	0.08	0.0%	-	100.0%	-	100.0%	-
Darkblotched Rockfish	100.0%	12.71	0.0%	-	100.0%	-	100.0%	-
Dover Sole	100.0%	250.35	0.0%	-	100.0%	-	100.0%	-
Greenspotted Rockfish	100.0%	0.00	0.0%	-	100.0%	-	100.0%	-
Harlequin Rockfish	100.0%	0.01	0.0%	-	100.0%	-	100.0%	-
Longnose Skate	100.0%	67.43	0.0%	-	100.0%	-	100.0%	-
Longspine Thornyhead	100.0%	3.71	0.0%	-	100.0%	-	100.0%	-
Pacific Ocean Perch	100.0%	44.47	0.0%	-	100.0%	-	100.0%	-
Pacific spiny dogfish shark	100.0%	89.89	0.0%	-	100.0%	-	100.0%	-
Pygmy Rockfish	100.0%	trace	0.0%	-	100.0%	-	100.0%	-
Rex Sole	100.0%	7.26	0.0%	-	100.0%	-	100.0%	-
Sharpchin Rockfish	100.0%	1.32	0.0%	-	100.0%	-	100.0%	-
Shortraker Rockfish	100.0%	3.92	0.0%	-	100.0%	-	100.0%	-
Splitnose Rockfish	100.0%	8.57	0.0%	-	100.0%	-	100.0%	-

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R
Yellowmouth Rockfish	100.0%	4.70	0.0%	-	100.0%	-	100.0%	-

Table A 11. Species with recreational mortality only off of Washington. Percentage of recreational mortality in EEZ is unknown. Mean weight for all waters is shown. Dash indicates no data or proportion could not be calculated.

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	TOTAL Rec mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R
Blue/Deacon Rockfish	0.0%	-	U	1.02	-	U	-	100.0%
Brown Rockfish	0.0%	-	U	0.11	-	U	-	100.0%
Cabezon	0.0%	-	U	7.64	-	U	-	100.0%
China Rockfish	0.0%	-	U	1.74	-	U	-	100.0%
Copper Rockfish	0.0%	-	U	2.28	-	U	-	100.0%
Grass Rockfish	0.0%	-	U	0.01	-	U	-	100.0%
Kelp Greenling	0.0%	-	U	1.17	-	U	-	100.0%
Pacific Sanddab	0.0%	-	U	3.13	-	U	-	100.0%
Quillback Rockfish	0.0%	-	U	2.05	-	U	-	100.0%
Tiger Rockfish	0.0%	-	U	0.43	-	U	-	100.0%
Vermilion Rockfish	0.0%	-	U	1.38	-	U	-	100.0%

Table A 12. Species no mortality in the study period in Washington. Dash indicates no data or proportion could not be calculated.

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R	Notes
Black and Yellow Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA/OR
Bronzespotted rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Butter Sole	0.0%	-	0.0%	-	0.0%	-	0.0%	-	

Species	% in EEZ Comm	Comm EEZ mean weight (mt)	% in EEZ Rec	Rec EEZ mean weight (mt)	EEZ Prop C	EEZ Prop R	All Waters Prop C	All Waters Prop R	Notes
Calico Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
California Scorpionfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Chameleon Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Cowcod	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA/OR
Curlfin Sole	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Dwarf-Red Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Flag Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Flathead Sole	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Freckled Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA/OR
Gopher Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Greenblotched Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Halfbanded rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Honeycomb Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Kelp Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA/OR
Leopard Shark	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA/OR
Light Dusky Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Mexican Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Olive Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA/OR
Pink Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Pinkrose Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Rosy Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Speckled Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	
Squarespot Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Starry Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Stripetail Rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	-
Swordspine rockfish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA
Treefish	0.0%	-	0.0%	-	0.0%	-	0.0%	-	range = CA

Appendix B: Stock Structure Information

The following information is a synthesis of stock structure information for each species as detailed in the literature review (Agenda Item I.8, Attachment 3, September 2024), management information, and stock assessment information. Only the species and options are presented in Chapter 5. These data are for reference and may assist the Council when considering the stocks of species. Species from A31 and A35 are omitted. In regard to population structure, if population structure is uncertain, the default of a coastwide stock (Option 1) is used. Options are based on potential stock delineations, Option 1 is single area, Option 2 is two areas, and so forth. All species shown corresponded to either one area or two area (i.e., Option 1 and Option 2) based on the literature review. Option 3 (three area) and 4 (four area) are not shown for space, however, , the Council could consider other delineations as appropriate.

Table B 1. Stock structure information for species where mortality in the EEZ is greater than 25 percent including ROA options (opt). Adjunct information related to the population structure (U=unknown, N = None, Y = yes), current annual catch limit (ACL) scale, current NMFS status area, assessment year, category assigned to assessment, and notes also provided. Species defined under Amendments 31 and 35 are not shown.

Species	Pop. Struct	Opt 1	Opt 2	Potential Stock Delineations	Current ACL Scale	NMFS Status Area	Assess Yr	Category	Notes
Arrowtooth Flounder	U	*		Coastwide	Coastwide	Pacific Coast	2017	2	
Aurora Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Pacific Coast	2013	1	
Bank Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Slope N/S 40 10 Complex	2011	3	
Big Skate	N	*		Coastwide	Coastwide	Pacific Coast	2019	2	
Blackgill Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Southern California	2011 (N 4010), 2017 (S 4010)	3 (N4010) 1 (S 4010)	
Bocaccio Rockfish	N	*		Coastwide	North/South of 40° 10′ N. lat.	Southern California / N of 40° 10′ N. lat.	2011 (N 4010) 2017 (S 4010)	3 (N4010), 1 (S 4010)	
Bronzespotted Rockfish	U	*		Coastwide or California only	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	range = CA

Species	Pop. Struct	Opt 1	Opt 2	Potential Stock Delineations	Current ACL Scale	NMFS Status Area	Assess Yr	Category	Notes
Butter Sole	U	*		Coastwide	Coastwide	Other Flatfish complex	-	3	
California Scorpionfish	U	*		Coastwide or California only	Coastwide	Southern California	2017	-	range = CA
Cowcod	Y	*	*	**Opt1.** Coastwide or California/Oregon **Opt 2.** California and Oregon	North/South of 34° 27′ N. lat.	Southern California	2019	2 (S 3427) 3 (N 3427)	range = CA & OR
Curlfin Sole	U	*		Coastwide	Coastwide	Other Flatfish complex	-	3	
Darkblotched Rockfish	U	*		Coastwide	Coastwide	Pacific Coast	2017	1	
Flag Rockfish	U	*	*	**Opt1.** Coastwide or California/Oregon **Opt 2.** California and Oregon	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	range = CA & OR
Flathead Sole	U	*		Coastwide	Coastwide	Other Flatfish complex	-	3	
Freckled Rockfish	U	*		Coastwide or California only	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	-	3	range = CA
Greenblotched Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	
Greenspotted Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Pacific Coast	2011	3 OR/WA) 2 CA	
Greenstriped Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Pacific Coast	2009	3	
Halfbanded Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	-	3	range = CA
Harlequin Rockfish	U	*	*	Coastwide or California only	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	-	3	range = OR & WA
Honeycomb Rockfish	U	*		**Opt1.** Coastwide or Oregon/Washington. **Opt 2**. Oregon and Washington	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	range = CA
Longnose Skate	U	*		Coastwide	Coastwide	Pacific Coast	2019	2	

Species	Pop. Struct	Opt 1	Opt 2	Potential Stock Delineations	Current ACL Scale	NMFS Status Area	Assess Yr	Category	Notes
Longspine Thornyhead	U	*		Coastwide	North/South of 34° 27′ N. lat.	Pacific Coast	2013	2	
Mexican Rockfish	U	*		Coastwide or California only	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	range = CA
Pacific Cod	U	*		Coastwide	Coastwide	Pacific Coast	-	3	
Pacific Hake	N	*		Coastwide	Coastwide	Pacific Coast	2023	-	
Pacific Ocean Perch a/	U	*		Coastwide	North/South of 40° 10′ N. lat.	Pacific Coast	2017	2 (N 4010) 3 (S 4010)	
Pacific Sanddab	N	*		Coastwide	Coastwide	Pacific Coast	2011	3	
Pink Rockfish	U	*	*	**Opt1.** Coastwide or California/Oregon **Opt 2.** California and Oregon	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	range = CA & OR
Pinkrose Rockfish	U	*		Coastwide or California only	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	range = CA
Pygmy Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	-	3	
Redbanded Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Slope N/S 40 10 Complex	2011	3	
Redstripe Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	
Rosethorn Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	
Sharpchin Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Slope N/S 40 10 Complex	2013	2	
Shortraker Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Slope N/S 40 10 Complex	2011	3	
Silvergray Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	
Speckled Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	
Splitnose Rockfish	N	*		Coastwide	North/South of 40° 10′ N. lat.	Slope N/S 40 10 Complex	2011	3	

Species	Pop. Struct	Opt 1	Opt 2	Potential Stock Delineations	Current ACL Scale	NMFS Status Area	Assess Yr	Category	Notes
Starry Rockfish	U	*		Coastwide or California only	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	range = CA
Stripetail Rockfish	N	*		Coastwide	North/South of 40° 10′ N. lat.	Pacific Coast	2011	3	
Swordspine rockfish	U	*		Coastwide or California only	North/South of 40° 10′ N. lat.	Shelf N/S 40 10 Complex	2011	3	range = CA
Yellowmouth Rockfish	U	*		Coastwide	North/South of 40° 10′ N. lat.	Slope N/S 40 10 Complex	2011	3	

APPENDIX C

Estimation of recent groundfish catch distribution between federal and state waters off the U.S. West Coast (v2, final)

Sean E. Matson, PhD, NMFS West Coast Region, Groundfish Branch

September, 2023; update last revised January 24, 2025

Contents

Summary

The current analysis is an update of a preliminary version presented to the SSC in May, 2023, which estimated recent commercial groundfish catch distributions between federal and state waters, as proportions for a few nearshore species. The SSC provided feedback, and the analysis has since been expanded to include more than 90 groundfish species; it uses more recent data and additional sources, includes revised uncertainty, responses to SSC comments, and expanded findings. Methods remain functionally similar to the preliminary version, with several incremental changes/improvements.

This exercise is only intended to provide information about recent spatial distribution of *commercial fishery catch* occurring between federal and state territorial waters (jurisdictions), and not to make any inferences about population distribution. This analysis is intended as one piece of information among a mosaic, to assist the Council and NMFS in Phase 2 of the Council stock definitions process, in which location of fishing activity relative to jurisdiction is one of several important issues.

The vast majority of species off each state showed non-zero proportions in federal waters. Figures 1 through 3, and Table 1 show estimated mean annual proportions of catch in the federal EEZ, for FMP groundfish species, off each state, together with bootstrapped 95% confidence limits, among selected shoreside commercial groundfish fishery sectors.

For Washington state, the overwhelming majority of species showed high proportions of fishery catch in the federal EEZ at or near 1 (Figure 1); with just one species at zero, and only four others in between. This result owes in large part to the lack of a commercial nearshore fishery.

Results for California were a picture of variability (Figure 3, Table 1, Table 3a); a broad and diverse range of jurisdictional proportions among species, together with wide confidence intervals due to interannual variation. If the most recent five years were used to infer the near future, the results indicate a high degree of uncertainty in many jurisdictional catch proportions.

Oregon results were comparatively intermediate (Figure 2) between Washington and California, in terms of both range of proportion estimates, and interannual variation; but most proportions tended toward zero or one, with fewer intermediate values (U-shaped). This may be due to close mirroring of the 3 nm line (jurisdictional boundary) and the shoreward boundary of the non-trawl rockfish conservation area (RCA) off of Oregon. Catch distribution among sectors by species in Oregon showed highest proportions in catch share sectors, as well as nearshore.

There were a few species-state combinations with low sample sizes for proportion estimation, stemming from zero catch within a stratum. Although analysis of a longer time series may potentially be of benefit for some of these species-state combinations, if estimation of proportions is the ultimate goal, even coastwide some frequently show a fraction of a metric ton caught per year (GEMM product, WCGOP). Extremely low or zero catch of a species is also relevant information.

Table 4 shows annually summarized boundaries (fm) for the non-trawl RCA off the West Coast of the United States, over the past ten years, 2017 through June of 2024. The structure of the RCA was quite constant over the years included in the analysis (2017-2021), and through 2023, but has changed somewhat in 2024 north of 34°27’ N lat., in order to decrease fishing in much of the southern nearshore, while at the same time opening more of the central shelf (seaward side of RCA) to fishing. Changes made effective April 1, 2024 added a latitudinal stratum from 37°07’ - 34°27’ N. lat. to enable finer control of trip limits, and promote conservation of quillback rockfish and vermilion/sunset rockfish off California, while balancing fishing opportunity.

Management measures aimed at reducing nearshore catch, if successful, could potentially inflate estimates for proportion of catch in Federal jurisdiction for certain species straddling the nearshore and shelf (e.g. lingcod, starry flounder, etc.; Love 2011), compared with values seen in this analysis. The results off Washington state, with no nearshore (commercial) fishery, offer a coarse example of this effect, where values for these species were dramatically higher, compared with both California and Oregon.

Nearshore sector catch has been discussed early in this process as an intuitive indicator of catch in state waters. Thus, proportional catch in the nearshore sector was explored for concordance with jurisdictional catch proportions. Results indicate that although well correlated, the proportion of catch in the nearshore sector among all sectors could serve as an indication, but not a precise proxy or predictor for proportion of catch in state or federal waters.

Changes from previous version

The current version of the analysis implements the following changes, compared with the preliminary analysis presented to the SSC in late May of 2023.

1) All data were updated to 2017-2021, compared with 2016 through 2020 previously.

2) One data source was added, the Fishery Observation Science (FOS) granular Electronic Monitoring (EM) data set, which enables complete coverage with fine location of hauls in all shorebased Catch Shares sectors, including bottom trawl, midwater trawl (shorebased whiting), midwater trawl (non-whiting, rockfish), and fixed gear. This makes a total of four data sources used; WCGOP GEMM product, WCGOP OBproc observer data product, FOS EMproc data product, and PacFIN landings, from the shorebased groundfish comprehensive table.

3) In the current version (v2) full implementation of FOS commercial groundfish sector definitions in PacFIN, which became available after the preliminary document, enabled the consistent, direct matching of data among the four sources, rather than using translation tables among different sector definition schema (necessary in previous version), resulting in less error.

4) The number of species included was extended to 94 groundfish fishery management plan (FMP) species or species categories, present with positive catch, and which could be matched across the four data sources.

5) Only the proportion of catch in the federal Exclusive Economic Zone (EEZ), was estimated, by state, rather than the corresponding proportion in state jurisdiction as well; this enabled estimation of annual means of proportions at the final step, and expression of uncertainty at the same step, rather than with estimating mean catch previously.

6) Bootstrapped confidence intervals were added to express uncertainty in mean proportions, for the same strata among years.

7) Figures were added to show proportions and confidence intervals of all species within each state, as well as annual proportions by species and state.

8) All data management and analysis was coded in R, with the exception of GIS haul location binning, which was performed in ArcGIS Pro, then read into R. Code is available upon request. Much of the data

is publicly available, although portions of the raw data are confidential. Aggregated summaries of much of the data are provided within this document in tables and appendices.

9) The five-year data window was moved forward one year, to 2017-2021, years which were available across all sources at the time of analysis. This portrays a current picture of the evolving fishery, and to maintains consistent sector definitions across all years in the analysis, which change significantly over time to keep pace with the changing fishery.

10) The current list of major shoreside commercial, directed groundfish sectors (FOS definitions) included in this analysis is: Catch Shares, Catch Shares EM, Midwater Hake, Midwater Hake EM, Midwater Rockfish, Midwater Rockfish EM, Nearshore, Limited Entry Sablefish, LE Fixed Gear DTL, and OA Fixed Gear. FOS sector definitions appear in Somers et al. (2023).

Introduction

The Council is working to refine stock, and stock complex definitions within the Pacific Coast Groundfish Fishery Management Plan (FMP). One facet of this effort will be aided by improving our understanding of the spatial distribution of groundfish species catch, in terms of distance from shore. Groundfish species currently included in the FMP are caught to varying degrees in state territorial waters (0-3 nautical miles (nmi) from shore), versus the Exclusive Economic Zone (EEZ) (3-200 nmi from shore) along the West Coast. Although the preferred depth range is known for many groundfish species, depth bins map to different distances from shore with changing latitude, according to variation in benthic topography, and thus depth is not a suitable proxy for territorial waters boundary lines coastwide. We developed the approach in this document to estimate species-specific proportions of catch that occurs within federal waters, for FMP groundfish species using commercial fishery-dependent data, for each West Coast state; California, Oregon, and Washington. We expect this information to support scoping of future plans for stock definitions and area-specific fishery management by federal and state agencies.

A preliminary exploration of the method and results for three nearshore species was presented to the SSC for review and comment in late May of 2023. Since then, the number of species was expanded to more than 90 FMP groundfish species, and SSC comments and suggestions have been incorporated. The current results were produced during fall of 2023.

Updated results appear in Figures 1 through 3, and Tables 1 through 3. Estimates are inclusive of shoreside commercial, non-whiting groundfish fishery sectors only (no recreational, research, or tribal fishery data are included).

Currently, the primary data sources for location-specific catch for shoreside non-whiting groundfish sectors are observer and electronic monitoring (EM) data. The commercial fishery sectors that fish in the nearshore have been subject to partial observer coverage. Fishery sectors show dramatically different amounts of catch, and those distributions vary according to species; therefore we needed to scale catch estimates by relative catch among fishery sectors, as well as within each state and area. No one data source had sufficient information alone to accomplish this, so four sources were utilized in concert as described below in the Methods section, in collaboration, and with guidance from the West Coast Groundfish Observer Program (WCGOP).

Methods

Data sources used

Four sources of data were used, which included (1) the Groundfish Expanded Multiyear Mortality (GEMM) product from WCGOP (summarizes Somers et al. 2022), (2) the Pacific Coast Fisheries Information Network (PacFIN) database, and (3) haul-level WCGOP observer data (OBproc data product), (4) haul-distributed EM data from FOS.

(1) The GEMM product provided coastwide annual estimates of total catch by species and sector. This provided the total amounts of annual catch to be distributed among states, and between state and federal waters, informed by data sources (2) and (3) below.

(2) The PacFIN database provided annual groundfish landings data by species, sector and state. These data were used to estimate the among-state distribution of catch of each species, from annual GEMM estimates.

It was considered the best available means to apportion GEMM coastwide total catch among states using the state agency field within PacFIN, which is based on port of landing, since PacFIN represents the most complete source of state-specific catch data, with all trips represented (haul-specific observer data is limited to observed hauls only, see below). In rare instances, near state borders (e.g. Astoria), some catch may be landed across state borders. Use of PacFIN catch area codes (latitudinal areas) was investigated as a potential solution, but abandoned after conversation with PacFIN staff about usefulness, due to completeness and verification of the fields.

The recent addition of the Fishery Observation Science (FOS) sector field to PacFIN data was also available in the comprehensive fish ticket table in the database, as well as state agency, at the time of query. The FOS sector field has made utilization of landings data more efficient, and less challenging to align fishery sectors among data sources in a standardized form among analysts.

(3) Haul-level groundfish observer data from WCGOP (OBproc data product) provided fine scale location data for the portion of hauls that were observed, and enabled determination of which jurisdiction polygon each haul was located. FOS sectors were also available in the haul-level observer data. This data source is limited to observed hauls only, observation rates vary substantially among sectors, and can only cover a small fraction of total hauls in most sectors.

(4) Haul-distributed electronically monitored data from FOS (EMproc data product) provided fine scale location data for hauls that were electronically monitored (EM), and enabled estimation of which jurisdictional polygons each haul fell. FOS sectors were also available in the haul-level observer data. This data source is limited to electronically monitored hauls only, monitoring rates have been growing since 2015. The shoreside whiting IFQ sector is greater than 90 percent EM, rather than observed, and rates are increasing for non-whiting trawl.

PacFIN landings were queried on March 23, 2022 (SQL script appears in Appendix A). Haul-level observer data were received on March 22, 2022. The GEMM data product used was updated to the September 2022 version, provided for the September, 2022 PFMC (Pacific Fishery Management Council) meeting.

Approach overview

The basic approach was to distribute total catch estimates for each species from the GEMM data product in two stages; first, among states using PacFIN landings, and second, between EEZ and state waters polygons off the coast of each state using haul-level observer and EM data.

WCGOP representatives (Dr. Kayleigh Somers, together with Jon McVeigh) outlined a specific approach and provided haul-level observer data. Haul locations were assigned to within or outside of state jurisdiction or federal (EEZ) polygons, using ArcGIS Pro. PacFIN landings data were queried using Oracle SQL Developer. Final estimates of annual proportions of catch inside each of six jurisdictional bins, for FMP groundfish species (two off each state), in commercial fisheries were produced using R, as well as graphics. Some graphics and ancillary analyses were produced with JMP.

The most recent five-year period of data available at the time from all three sources was used for the analysis, from 2017 through 2021; a five-year a period is customary for many management action-focused analyses, e.g. harvest specifications impact projections modeling, salmon bycatch modeling for groundfish sectors, etc. The current estimates include up to 94 FMP groundfish species and species complexes or categories, where catch was present.

Summarized algorithm:

To estimate average annual proportions of catch made shoreward vs seaward of 3 nmi (as defined by official jurisdictional polygons), of select nearshore species, for each state, in commercial fisheries, we used the following algorithm, when we:

A) Calculated among-state distributions of PacFIN landings by species, sector and year and applied them to **apportion among states**, the coastwide catch from GEMM for each species, by sector and year.

$$(TC)_{sp,y,sec,st} = (TC)_{sp,y,sec} \cdot \frac{(L)_{sp,y,sec,st}}{(L)_{sp,y,sec}} \qquad \text{Equation (A)}$$

Where *TC* is GEMM total catch estimates (mt), *L* is amount of PacFIN landings (mt); *sp* in the subscript stands for species, *y* for year, *sec* for year and *st* for state.

B) Used haul-specific observer data to **spatially distribute** the state-distributed GEMM catch estimates from (1) **between areas** (jurisdictional polygons), within each state, for each year.

$$(TC)_{sp,y,sec,st,a} = (TC)_{sp,y,sec,st} \cdot \frac{(OBS)_{sp,y,sec,st,a}}{(OBS)_{sp,y,sec,st}} \qquad \text{Equation (B)}$$

Where *TC* is GEMM total catch estimates (mt), *OBS* is haul level catch observed by WCGOP or monitored using EM (mt), *sp* in the subscript stands for species, *y* for year, *sec* for sector, *st* for state and *a* for area (in this case federal jurisdictional area).

C) Next, **summed over sectors**, to aggregate distributed catch to the species-state-area-year level $\left((TC)_{sp,y,st,a}\right)$, distributed catch, resulting in annual catch among years, within state and area strata (juristictional polygons), for each species.

$$\left((TC)_{sp,y,st,a}\right) = \sum_{sec=1}^{10} (TC)_{sp,y,sec,st,a} \qquad \text{Equation (C)}$$

D) **Calculated proportions** of catch (in federal EEZ), between areas and within state, from those annual distributed catch estimates, for each species and for each year; and finally calculated mean of proportion (in federal EEZ) values among years for each species.

$$(\overline{TCP})_{sp,y,st,a} = \sum_{y=1}^{5} \left(\frac{(TC)_{sp,y,st,a}}{(TC)_{sp,y,st}} \right) / n_y \qquad \text{Equation (D)}$$

And estimated uncertainty as bootstrapped 95 percent confidence intervals.

Detailed steps:

The estimations proceeded at the species-sector-year level, according to the following steps:

1) Aggregate GEMM data to the species-sector-year level, and PacFIN to the species-sector-state-year level (from step A in Summarized Algorithm, above).
2) Calculate annual coastwide total catch by species and sector, from GEMM data (summary step A).
3) Calculate annual proportion of landings within each state, for each species, by sector from PacFIN data (summary step A).
    - Multiply coastwide catch (GEMM) by state-specific landings proportions (PacFIN), to yield state-distributed catch.
4) Calculate state-specific annual sums of observed or electronically monitored catch in state vs federal EEZ polygons (observer/OBproc, or electronically monitored/EMproc), by species and year (summary step B), after spatial binning w/ArcGIS Pro.
5) Calculate annual proportions (area proportions, within each state) from sums (4) – summary step B.
6) Multiply state-specific, distributed, annual catch (3) by area (3 nmi) proportions (7) – summary step B. Maintain year fidelity.
    - Result is annual estimates of area-within-state distributed, species-specific catch.
7) Aggregate catch from Step 6 among sectors, to year-state-area level (summary step C).
8) Calculate annual proportions in federal EEZ from distributed (area w/in state) catch to proportions, for each species (Table 1) – summary step D.
9) Calculate annual means of (area w/in state) proportions in federal EEZ (7), and estimate uncertainty (CI) – summary step D.

Annual catch for each species was aggregated by sector (in addition to state), to scale catch estimates by relative catch among fishery sectors, since fishery sectors exhibit substantial differences in amounts of catch, and those distributions vary by species.

Gear type, within sector, was initially considered as a more granular stratification to add precision, but was ultimately abandoned as over-stratifying, given existing challenges of merging several different data sources (see Detailed Steps) at the present level of aggregation.

Results and discussion

Figures 1 through 3 and Table 1 show estimated mean annual proportions of catch of FMP groundfish species in the federal EEZ off each West Coast state, with bootstrapped 95% confidence limits, among selected commercial shoreside groundfish fishery sectors. Dashes indicates no estimate; resulting from zero total catch off the state in that year, across both federal and state jurisdictions, thus a zero denominator for the proportion.

For Washington state, the overwhelming majority of species showed high proportions of fishery catch in the federal EEZ at or near 1 (Figure 1); with just one species at zero, and only four others in between. This result owes in large part to the lack of a commercial nearshore fishery; and also the importance of catch shares, midwater hake, midwater rockfish, and LE sablefish sectors off Washington state, as seen in mean catch proportions by sector in Table 3c.

Results for California showed a picture of variability (Figure 3, Table 1, Table 3a); a broad range of jurisdictional proportions among species, together with wide confidence intervals due to interannual variation. Among sectors, the highest proportions of catch tended to appear in catch shares and nearshore sectors, with little to no midwater catch, and lower proportions among fixed gear sablefish sectors and open access (Table 3a). If the most recent five years were used to infer the near future, the results indicate a high degree of uncertainty in many jurisdictional catch proportions.

Oregon results were comparatively intermediate (Figure 2) between Washington and California, in terms of both range of proportion estimates, and interannual variation, but most proportions tended toward zero or one, with fewer intermediate values. This may be due to close mirroring of the 3 nm line and the shoreward boundary of the non-trawl rockfish conservation area (RCA). Catch distribution among sectors by species in Oregon showed highest proportions in catch share sectors, as well as nearshore, with intermediate proportions of catch in midwater sectors (Table 3b).

Figures 4 through 6 show estimated annual proportions of catch in the federal EEZ off California, Oregon, and Washington. Proportions are shown together with annual catch (mt), by groundfish FMP species, among selected shoreside commercial groundfish fishery sectors. Dot size varies with amount of annual catch. These figures highlight numbers of years for which proportions could be estimated (non-zero catch); as well as the relative amount of catch per year, among all species in the figure; and whether proportions are stable over the five years examined, highly variable, or appear to be trending. Appendix B presents mean annual total catch (mt) and coefficient of variance (CV), including estimated discard mortality (GEMM) by species, apportioned by state according to landings distributions (PacFIN). Estimates include only the specific, major commercial groundfish sectors listed in the Methods section.

Figures 4 through 6 also reveal a few species-state combinations with low sample sizes for proportion estimation; few years with non-zero catch. Examples with two or less annual estimates each include Black skate, Calico rockfish, and Pink rockfish off California; Black rockfish, Harlequin rockfish, and Tiger rockfish off Washington (only a few fish in one year). Although analysis of a longer time series may potentially be of benefit for some of these species-state combinations, if estimation of proportions is the ultimate goal, even coastwide some frequently show a fraction of a metric ton caught per year (GEMM product, WCGOP). Extremely low or zero catch of a species is also relevant information.

Table 2 shows the same information as Table 1, but sorted by increasing value of the proportion caught in the federal EEZ, making it easy to see where each species falls along the distribution between jurisdictions, from one end of the continuum to the other. Species generally show expected general distributional patterns among the nearshore, shelf and slope (Love et al. 2011, PFMC 2018, Matson and

Gertseva 2020). Table 2 highlights that the overwhelming majority of species off each state show non-zero federal proportions.

Table 3 (a, b, and c) shows proportional distribution of average annual catch (2017-2021), for FMP groundfish species, among the major (commercial shorebased) fishery sectors, by state, as heatmaps, making it simple to gain a quick impression of a species fishery catch distribution among sectors, within state. Note that nearshore commercial fishing is not permitted off Washington. Distribution of catch among sectors varies widely according to species.

Table 4 shows annually summarized boundaries (fm) for the non-trawl Rockfish Conservation Area (RCA) off the West Coast of the United States, over the past ten years, 2017 through June of 2024. The structure of the RCA was quite constant over the years included in the analysis (2017-2021), and through 2023, but has changed somewhat in 2024 north of 34°27' N lat., to decrease fishing in much of the southern nearshore, while at the same time opening more of the central shelf (seaward side of RCA) to fishing. Changes made effective April 1, 2024 added a latitudinal stratum from 37°07' - 34°27' N. lat. to enable finer control of trip limits, and promote conservation of quillback rockfish and vermillion/sunset rockfish off California, while balancing fishing opportunity.

Management measures aimed at reducing nearshore catch, if successful, could potentially inflate aggregate estimates for proportion of catch in Federal jurisdiction for certain species straddling the nearshore and shelf (e.g. lingcod, starry flounder; Love 2011), compared with estimates seen in this analysis. Results off Washington state, with no nearshore (commercial) fishery, offers a potential straightforward example of this effect, where values for these species were dramatically higher, compared with both California and Oregon. The proportion in federal waters (pFed) for lingcod was 0.988 (95% CI = 0.955-1.00) off WA, versus 0.812 (95% CI = 0.778-0.864) off CA, and 0.745 (95% CI = 0.713-0.788) off OR. pFed for starry flounder was 1.00 (95% CI = 1.00-1.00) off WA (but n=1), 0.805 (95% CI = 0.686-0.940) off CA, and 0.754 off OR (95% CI = 0.460-0.999).

Nearshore catch has been discussed as an intuitive indicator of catch in state waters. Thus, proportional catch in the nearshore sector was explored for concordance with jurisdictional catch proportions. The proportion caught in federal waters was used here, since that is what we used for the main portion of the analysis. Figure 7 shows proportions of catch in the nearshore sector (x-axis), versus proportions of catch in federal jurisdiction, and frequency distributions for each variable, in a brief exploration of suitability of proportional nearshore catch as a proxy for proportion of federal jurisdiction in off California and Oregon, respectively. There is no commercial nearshore fishery off Washington. Non-parametric correlation values for California were: Spearman's $p = -0.844$ ($p<0.0001$), Kendall's Tau = -0.694 ($p<0.0001$); and for Oregon were: Spearman's $p = -0.819$ ($p<0.0001$), Kendall's Tau = -0.689 ($p<0.0001$). Results indicate that although well correlated, the proportion of nearshore catch could serve as a rough indication, but not a precise proxy or predictor for proportion of catch in state or federal waters. Figure 7 also shows histograms of catch proportions in the nearshore sector, and in federal waters, which were U-shaped for both states, but showing a particular lack of intermediate values for Oregon.

The Slope rockfish unidentified category off Washington was unpopulated for all but one year (2020) where there was a small amount of discard (37 lb) assigned to state jurisdiction, which appears most likely to be in error; thus it was shown as no estimate.

Comparisons with previous version

Current estimates track closely with the three species examined in the preliminary analysis, despite changes to years in data, and addition of the EM data source, including two FOS fishery sectors. For example, the mean proportion of China rockfish catch in federal waters off California was previously estimated at 0.036, and currently at 0.044; off Oregon previously at 0.016, and currently at 0.035; inestimable off Washington due to zero catch. For Copper rockfish off California, the mean federal proportion in previous version of the analysis was 0.143, and is currently 0.140; off Oregon, it was 0.023, and is currently 0.024, off Washington it is still inestimable. Lastly, for quillback rockfish off California, the current federal proportion is estimated at 0.139, while the previous estimate was 0.151; off Oregon it was 0.027, and is currently 0.052; off Washington the previous estimate was 1.0, but with only trace catch of 0.0001 mt, and is currently inestimable.

Proportional estimates in the literature with which to compare or validate those in Table 1, including China, copper, and quillback rockfish, have so far not been found. However, the high proportions indicated in state territorial waters, which encompass the region occupied by the latter three species, are in agreement with accepted classification of these three species as nearshore rockfish, used in West Coast groundfish management.

Further, China rockfish are reported as having an overall depth distribution of 0-70 fm with highest density from 2-50 fm; copper rockfish's overall, and highest density depth distribution are both reported as 0-100 fm (PFMC 2018), or 0-150 fm with most from 0-35 fm (Love 2011); and quillback rockfish are reported as having an overall depth distribution of 0-150 fm, with highest density between 22-33 fm (PFMC 2018; Love 2011). These relative depth ranges among the three species are generally in keeping with the proportional estimates in Table 1a. The relative proportions for California, with China rockfish showing >0.96 within 3 nmi from shore, and copper and quillback rockfish showing a less abrupt nearshore distribution (both at approximately 0.86 inside 3 nmi, within California), also reflect relative depth distributions from PFMC (2018), with tails of copper and quillback distributions running deeper than for China rockfish. Nearshore rockfish south of 40°10' N. lat. are further subdivided into shallow nearshore and deeper nearshore rockfish, with China rockfish included the former, and copper and quillback in the latter, which is in agreement with our results.

Uncertainty

The most immediate source of variability in the proportional estimates relevant to the goals of the analysis is interannual variation in catch distribution under the current stratification. This is reflected in confidence intervals around the mean proportion estimates. The results show substantial interannual variability in proportion of catch both among states (stratified) and among years, particularly off California, less so off Oregon, and least off Washington.

Other sources of uncertainty are more difficult to estimate and propagate. Landings are typically treated as known (e.g. in most stock assessments), and a great deal of confidence is placed in landings estimates from single species categories since 1981. Some uncertainty in the distributional proportions stems from sample size within strata, as number of observed hauls/sets. Such uncertainty would be quite low for the current IFQ fishery, due to complete coverage as the sum of human and electronic monitoring (EM data are now included in this version). However other fishery sectors, with lower and variable observer coverage, would incur greater uncertainty, particularly for less common species. Fishery sectors that operate closer to shore, including the nearshore fishery, tend to have lower observer coverage rates,

particularly the nearshore, LE fixed gear (non-sablefish), and open access fixed gear fisheries, which typically have single-digit coverage rates (Somers et al. 2023). The nearshore sector tends to include species with the highest proportions of catch within state jurisdiction. Limited entry, fixed gear fisheries have intermediate coverage rates, including the tier fishery. Propagating and expressing that uncertainty as part of confidence intervals surrounding the spatial distribution proportions would be challenging, and a solution has not been determined for the current analysis.

Uncertainty in location of catch was minimized by using precise location, haul-level observer data from the WCGOP. Federal observer data have long been accepted the best available data for many analytical purposes for groundfish management, and were logically the best available for this purpose as well; highly scrutinized at multiple levels, with rigorous qa/qc practices, and reasonable coverage rates (Somers et al. 2023). Logbook data, while considered, were not utilized because of the limited years of data available, and the limitation on logbook data to the EEZ, except off Oregon where a state requirement is in place. Additionally, logbook data are not subject to the same qa/qc procedures as observer data, at this time. Observers are assigned to a full range of vessel sizes among the groundfish fishery sectors, even as small as 18 feet in length.

Granular haul-level observer data also match precisely to fish tickets and utilize exactly the same sector definitions as the other three sources of data in our present analysis. Uncertainty in sector assignment and error in matching sectors across multiple data sources was minimized by using the WCGOP/FOS suite of sector definitions. This suite of sector definitions was chosen for its standardized and consistent nature across all four data sources used and promoted reliable matching among data sources, crucial to the most accurate analysis possible. The elimination of errors and orphaned data, and reduction in manual qa/qc effort, due to slight mismatches in sector assignment was dramatically evident between the preliminary analysis, presented in June 2023 (when FOS sectors were not yet fully populated in PacFIN), and the final analysis, presented in September of 2024 (when FOS sector definitions were available among all sources). Utilization of the WCGOP/FOS sector definitions provided a practicable level of stratification, without over-stratifying the larger groundfish fishery to the point where estimation power would be compromised.

Last, one source of uncertainty involves trace amounts of catch in which a species was identified as caught in waters off Washington state, but landed in Oregon. These cases could plausibly arise from at least one of two scenarios 1) catch landed in Astoria, OR was caught north of the state border, or 2) an error in the latitude recorded for the location listed for the haul in observer data. This created an irresolvable disagreement in the algorithm for assignment of such catch amounts to jurisdiction polygons off Oregon state, and these trace, cross-border catch amounts were excluded from the calculations. All cases were from catch share sectors (catch share, midwater rockfish, and midwater hake). Among cases at the year-species-state-sector stratum level, approximately three percent (70) involved 1kg or more, although 67 of those 70 involved less than one percent (between 0.01 percent to 0.95 percent) of the stratum catch. Three cases (0.15 percent of cases) involved larger than 1 percent (1.24 to 2.56 percent) of the Oregon catch at the year-species-state-sector stratum level, and those were also inconsequential to the final result. Only one outlier case, which involved 0.31 mt of butter sole in one year from the catch shares sector, made up 61 percent of the stratum catch in that year, and the spatial proportion for that year was omitted, since this amount was potentially enough to compromise the estimate for this low catch species.

Responses to SSC comments – June 2023

After reviewing the report "*Preliminary estimation of nearshore groundfish catch distribution shoreward and seaward of 3 nmi to inform future fishery management planning*" in June of 2023, the SSC provided specific comments. Responses appear below.

Key questions

1) *Is the goal to describe the distribution of the catch or the distribution of the population?*

   The goal of this specific exercise is to estimate the proportion of recent (e.g. over the recent 5-year period) groundfish *fishery catch* that has been occurring within federal waters (federal jurisdiction). *The current exercise only concerns where the fish have been caught in the fishery, and is not an attempt to estimate distribution of populations/stocks themselves, nor to make any inferences regarding population distribution or abundance*. Understanding what fraction of the commercial groundfish fishery catch for a given species occurs in federal jurisdiction, is one important piece of the stock definitions process, in considering which fisheries and stocks can be managed by the federal government consistent with the authority laid out in the Magnuson-Stevens Act. Again, the goal is not to make inferences about the population itself.

2) *Is the goal to describe the unfished, current, or future distribution of the catch or population?*

   One goal is to estimate the recent *fishery catch* distribution, both in and of itself, and second, as an indication of likely near-future distribution of *fishery catch*, while the fishery continues to operate under similar conditions; again, only relative to federal versus state waters/jurisdiction. This analysis can be repeated periodically, in response to changing conditions which influence the fishery, to determine whether the current conditions remain consistent, or to what degree they change in the future. The goal is not to make inferences about the population itself.

3) *What are the key sources of variability relevant to the goals of the analysis and how should they be propagated?*

   (Repeated from Discussion) Perhaps the most immediate and relevant source of variability in the proportional estimates, relevant to the goals of the analysis, is interannual variation in catch distribution under the current stratification scheme. This is reflected in the confidence intervals around the mean proportion estimates. The results show substantial interannual variability in proportion of catch both among states (stratified) and among years, particularly off California, less so off Oregon, and least off Washington.

   Other sources of uncertainty are more difficult to estimate and propagate. Landings are typically treated as known (e.g. in most stock assessments), and a great deal of confidence is placed in landings estimates from single species categories on the West Coast since 1981. Some uncertainty in the distributional proportions stems from sample size within strata, as number of observed hauls/sets. Such uncertainty would be quite low for the current IFQ fishery, due to complete coverage as the sum of human and electronic monitoring (EM data are now included in this version). However other fishery sectors, with lower and variable observer coverage, would incur greater uncertainty, particularly for less common species. Fishery sectors that operate closer to shore, including the nearshore fishery, tend to have lower observer coverage rates, particularly the nearshore, LE fixed gear (non-sablefish), and open access fixed gear fisheries, which typically have single-digit coverage rates (Somers et al. 2022). The nearshore sector tends to include

species with the highest proportions of catch within state jurisdiction. Limited entry, fixed gear fisheries have intermediate coverage rates, including the tier fishery. Propagating and expressing that uncertainty as part of confidence intervals surrounding the spatial distribution proportions would be challenging, and a solution has not been determined for the current analysis.

Last, one source of uncertainty involves trace amounts of catch in which a species was identified as caught in waters off Washington state, but landed in Oregon. These cases could plausibly arise from at least one of two scenarios 1) catch landed in Astoria, OR was caught north of the state border, 2) an error in the latitude recorded for the location listed for the haul in observer data. This created an irresolvable disagreement in the algorithm for assignment of such catch amounts to jurisdiction polygons off Oregon state, and these trace, cross-border catch amounts were excluded from the calculations. All cases were from catch share sectors (catch share, midwater rockfish, and midwater hake). Among cases at the year-species-state-sector stratum level, approximately three percent of cases (70) involved 1kg or more, although 67 of those 70 involved less than one percent (between 0.01 percent to 0.95 percent) of the stratum catch. Three cases (0.15 percent of cases) involved larger than 1 percent (1.24 to 2.56 percent) of the Oregon catch at the year-species-state-sector stratum level, and those were also inconsequential to the final result. Only one outlier case, which involved 0.31 mt of butter sole in one year from the catch shares sector, made up 61 percent of the stratum catch in that year, and the spatial proportion for that year was omitted, since this amount was potentially enough to compromise the estimate for this low catch species.

4) Additional comments

a) "*The SSC recommends that, depending on the analysis objectives, the analysts consider using more than five years of data*"

Our current approach is to capture the most recent picture of the state of the fishery, thus the five-year window. In this version, data sources were expanded to include EM, for both IFQ non-whiting, and whiting trawl, in order to be more inclusive across the broader fishery. Increasing proportions of IFQ landings, particularly shorebased whiting IFQ have been electronically monitored over time. The five-year window of data was pushed forward one year, to the most recent available at the time, in order to reflect the current state and behavior of the fishery, and the near future. The analysis could be updated in the future to periodically reassess as the fishery changes.

b) "*Representing year-specific catch distributions (as tables or figures) in conjunction with relevant fisheries regulations would facilitate the identification of their potential impacts on catch distribution*."

A table summarizing non-trawl RCA boundaries is provided, with some accompanying discussion, given its influence on area of catch for shelf and nearshore groundfishes in particular.

c) "*The SSC recommends that the unit of observation and associated measurement of variability be either the proportion of the catch or population inside state waters, given that this is likely the value that will be used to differentiate state and federal stocks*."

This is an excellent idea; although we simply estimated its complement, the proportion of catch in federal waters. Expressing jurisdictional distribution of catch from this

perspective made it easier to discuss relation to 50 CFR 600.305(c)(1), where "[...] Any stocks that are predominately caught in Federal waters and are overfished or subject to overfishing, or likely to become overfished or subject to overfishing, are considered to require conservation and management.", a central point in the topic. The mean among years, and 95 percent confidence intervals, as well as individual year estimates were estimated and plotted as requested.

d) "*The analysts could consider weighting annual proportions by the amount of annual catch when quantifying uncertainty.*"

We considered weighting mean annual proportions by annual catch; and whether a particular year with higher catch would deserve more weight in expressing average spatial distribution of that catch. We concluded that given normal interannual variability within the short time scale chosen for the current version of this exercise (due to the desire to capture the most recent picture of the state of the fishery), it was reasonable to calculate unweighted means for the central tendency of the catch distribution and its variability. One consideration was that a comparatively lower amount of catch in one year doesn't necessarily diminish the importance of its spatial distribution.

Another possibility considered but not ultimately adopted for weighting proportions was progressively increasing the weight of more recent years of data.

e) "*In addition, it would be useful to have a visual representation of proportions through time to understand variability*."

Done. Added as figures 4-6.

f) *"The SSC recommends that the analysts consider the use of species distribution models (SDMs) to estimate population or catch distributions if estimating the proportion of the population occurring inside state waters remains an objective of the analysis."*

We conducted a preliminary investigation of population distribution between jurisdictions using sdmTMB to estimate abundance indices from fishery-independent surveys. Please see the accompanying document for that analysis.

g) "*The SSC highlighted the potential for remotely operated vehicle (ROV) surveys and other nearshore fishery-independent surveys to inform the mapping of population distributions, though limited by a lack of sampling in Federal waters limiting application of species distribution modeling*."

As the SSC stated, the lack of sampling in federal waters is a substantial limitation of ROV survey data. It is a substantial challenge to locate surveys with sufficient overlap spanning between both federal and state waters, sufficient to inform distributional estimates. We have currently preliminarily explored the NWFSC shelf-slope trawl survey, whose coverage is skewed toward federal waters, although coastwide, as well as the NWFSC California Bight longline survey, which is limited to Southern California, but shows a more balanced effort distribution between jurisdictions.

h) "*The SSC highlights that the distribution and intensity of historical fishing effort may have impacted the distribution of the population and that additional analyses on this interaction may be warranted."*

This is an excellent recommendation for future research, and although we are open to collaborate with the science centers on an analysis to address questions such as this, it would need to be prioritized appropriately. Also see response to comment 4b. To the extent that the future allowable fishing areas closely resemble the current and recent historical fishing effort, then the impact of past closed areas would be less of a concern relative the question of commercial catch distribution in federal waters.

Responses to September, 2024 SSC comments:

After reviewing the current report "*Estimation of recent groundfish catch distribution between federal and state waters off the U.S. West Coast (v2)*" in September of 2024, the SSC provided a few additional specific comments. Those comments and responses appear below.

1) *The SSC finds the approach of stratifying by sector and summing to be appropriate given different levels of observer coverage across sectors.*

   For sectors with incomplete observer coverage, an evaluation of potential bias between observed and unobserved trips would be helpful to ensure that the data used are representative. Logbook data could be helpful in this analysis.

   From the relevant discussion during the presentation, the specific concern for bias between observed and unobserved trips appeared to surround a theoretical potential, within sectors such as directed open access, for disproportionate observer coverage on larger vessels; for overemphasis on larger vessels capable of fishing farther from shore. After speaking with the WCGOP, we learned that observers are regularly assigned to vessels as small as 18 feet in length. WCGOP was not aware of problems with being accommodated on small vessels in any fleets.

   Further, the effect of such a theoretical bias in vessel size would be to slightly inflate the estimated proportion of catch in federal waters, which could make it slightly more likely to maintain the status quo of federal management. Discussion of such a theoretical source of unaccounted for uncertainty is appropriate for the Uncertainty section of this document and has been added there.

   In order to investigate such a hypothesis in detail, we would need another reliable means to assign precise location of catch. Federal observer data have long been accepted the best available data for many analytical purposes for groundfish management, and logically the best available for this purpose as well; highly scrutinized at multiple levels, with rigorous qa/qc practices, and reasonable coverage rates (Somers et al. 2023). Granular, haul-level observer data also match precisely to fish tickets and utilize exactly the same sector definitions as the other three sources of data in our present analysis, necessary for to prevent production of error, and unnecessarily lost information produced by mismatches.

   In contrast, logbook data were not utilized because of the limited years of data available for the non-trawl fleet in particular, and the limitation on logbook data to the EEZ, except off Oregon where a state requirement is in place. Additionally, logbook data are not subject to the same qa/qc procedures as observer data, at this time. Thus, attempting to compare observed trips to unobserved, using locations from logbook records could introduce additional potential for error.

Additionally, the substantial time required for such an analysis (attempting to identify, qa/qc and match enough suitable precise location data to test the observed vs unobserved hypothesis) for all species, appears outsized considering the low risk of error in the current approach, and lack of suitable data to inform such an analysis. If new information were uncovered to show that it was necessary, this topic could potentially be examined in more depth for a short list of species later in the council process.

2) *The nearshore live fish fixed-gear fishery was not separated from the rest of the nearshore fixed gear fishery in this analysis, and a potential for differences between these fleets should be explored.*

The portion of fish landed live within the Nearshore (NS) sector is not a distinction made within the WCGOP/FOS sector definitions, and so was not separated in this analysis. Division of the Nearshore sector into live and dead disposition components was not readily available in the observer data on hand, nor was it reported in the observer coverage report. Annual observer coverage for the NS sector as a whole was a mean of 7 percent over the years analyzed (Somers et al. 2023), and dividing this sector further would decrease statistical power to estimate jurisdictional proportions.

The WCGOP/FOS suite of sector definitions used in the analysis was chosen primarily for its standardized and consistent nature across all four data sources used. This dramatically minimizes error and promotes reliable matching among data sources, which is crucial to the most accurate analysis possible. The elimination of errors and orphaned data, and reduction in manual qa/qc effort, due to slight mismatches in sector assignment was dramatically evident between the preliminary analysis, presented in June 2023 (when FOS sectors were not yet fully populated in PacFIN), and the final analysis, presented in September of 2024 (when FOS sector definitions were available among all sources).

That said, an examination of PacFIN landings by disposition, of live versus dead fish in the nearshore sector revealed many high-level similarities between live vs dead landed portions of the sector. There was a fairly even split between live vs dead landed, although live landings showed a consistent majority by mean annual weight of approximately 60:40 by percent, respectively. The two dispositions showed similar distributions of species landed, sharing 14 of the top 20 species shared, and a Spearman's ρ (rho) of 0.5852 ($p<0.0001$), when all species were ranked by mean annual landings. Black rockfish was by far the number one highest weight landed species (both live and dead), at roughly double the second ranked species, lingcod. These similarities support suitability of combining the live and dead landings within one sector for purposes of our analysis.

Taking into account a) the need to make consistent sector splits among the four datasets and the utility of the FOS sectors for seamlessly achieving this, together with b) the similarities between the live and dead landed portions of the NS sector, as well as c) the limited available observations of the NS sector (mean coverage of 7 percent in the years analyzed), further splitting it into live and dead portions would be to the detriment of the analysis rather than benefit, introducing more potential for error and orphaned information, without analytical necessity.

Many sectors of the groundfish fishery (not only NS) exhibit within each one a variety of differing target strategies, and the sector definitions created by the WCGOP/FOS do an excellent job of making the practical compromises in stratifying the larger fishery sufficiently by recognizing those differences important for analysis, while preserving sufficient sample size for reliable estimation. There are practical limits for how far each sector can be subdivided for an accurate analysis.

Given the information presented, conducting a time-consuming highly detailed analysis of live vs dead catch appears superfluous for purposes of the current all-species analysis. If new information were uncovered to suggest further necessity, the topic could potentially be examined in more depth for a short list of species later in the council process.

3) *The sdmTMB modeling package, which was used for survey data, could be used to model catch location using location-specific observer data.*

   This is a great suggestion for further research/analysis if needed later in the process, for just a few species. The current analysis is sufficient for purposes of making a broad cut, and excluding a large number of species from further consideration of action under this issue. Such an analysis could conceivably be practicable to more fully analyze a short list of species at a later point in the Council process, to inform more precise decision making as needed.

Acknowledgements

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Figures and tables

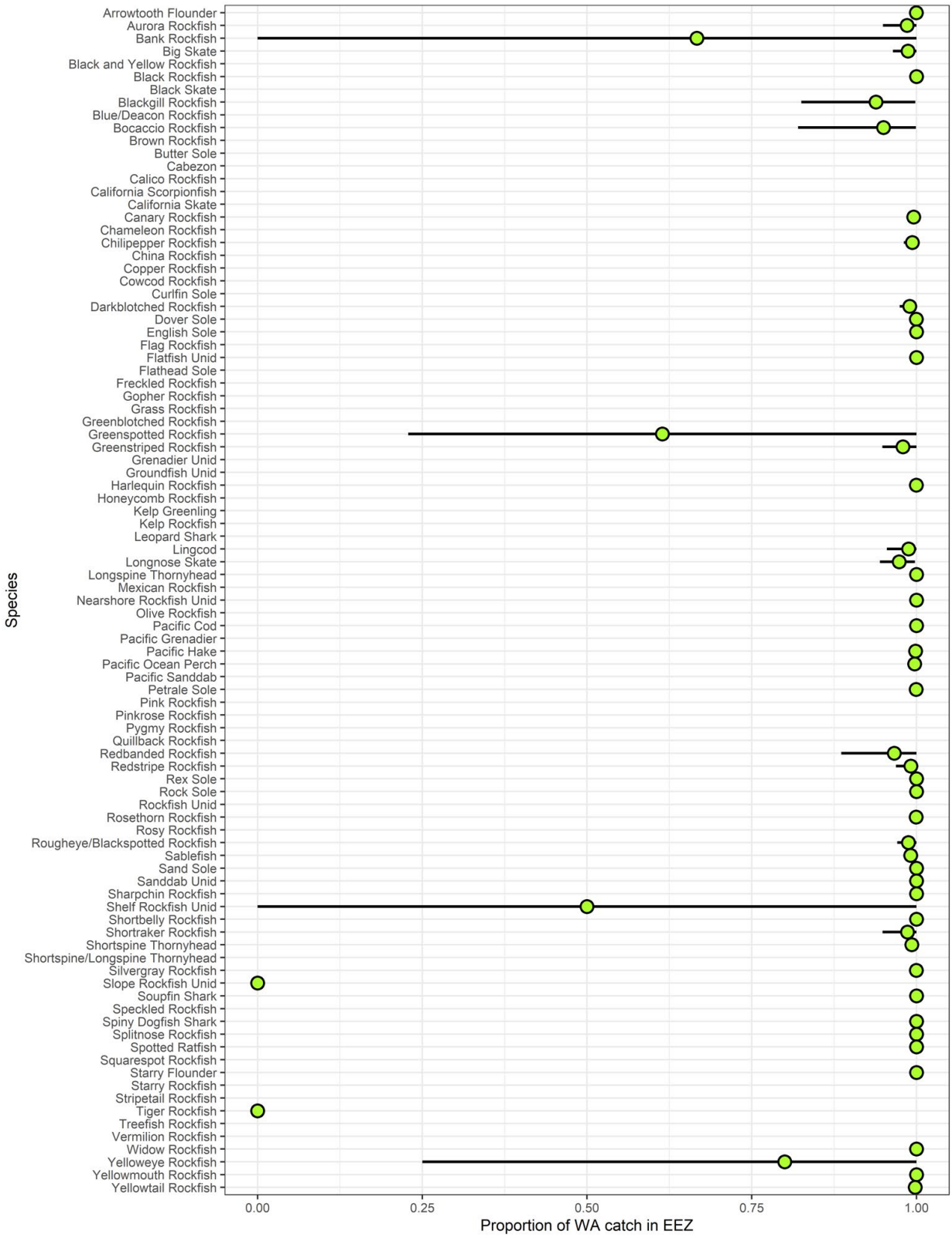

Figure 1. Estimated proportions of FMP groundfish catch and categories by species/complex, in the federal EEZ off **Washington**, versus state waters, with 95% CI.

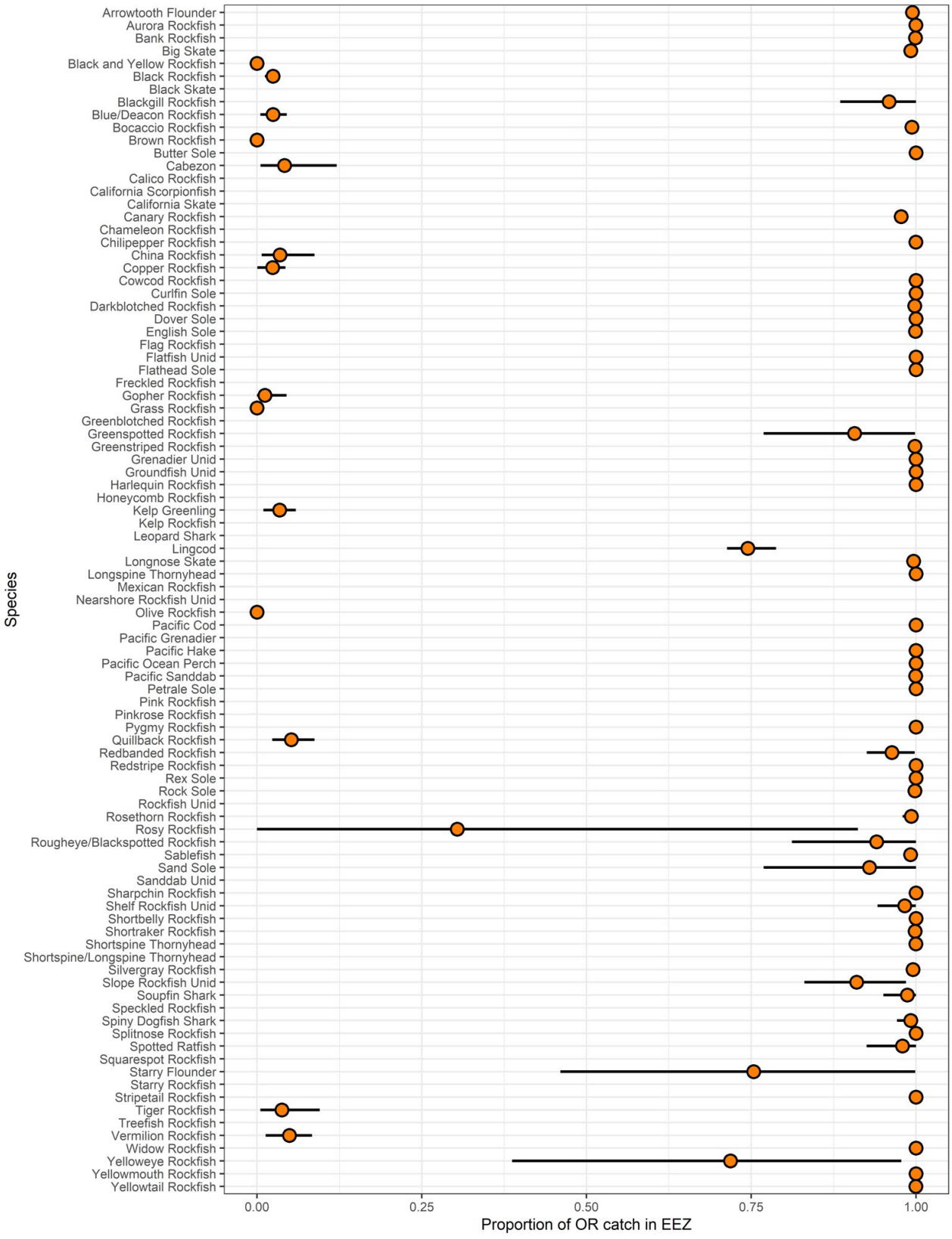

Figure 2. Estimated proportions of FMP groundfish catch by species and complex/category, in the federal EEZ off **Oregon**, versus state waters, with 95% CI.

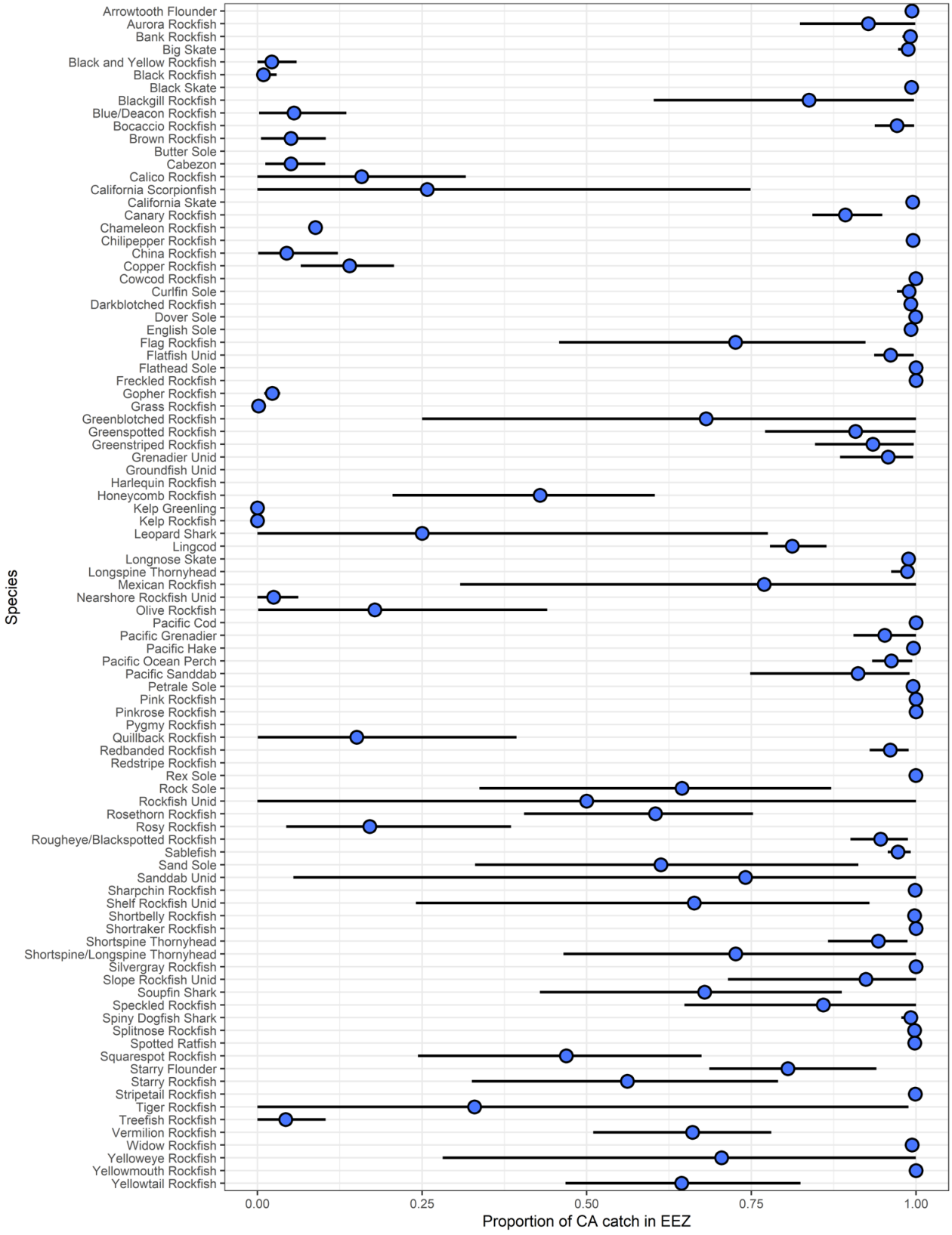

Figure 3. Estimated proportions of FMP groundfish catch by species/complex, in the federal EEZ off **California**, versus state waters, with 95% CI.

Table 1. Estimated mean (annual) proportions of catch in the federal EEZ, and 95% confidence limits, by groundfish FMP species, for selected shoreside commercial groundfish fishery sectors, by area within state (sorted alphabetically by species). Dash indicates no estimate, and zero total catch for the state in that year, across both federal and state jurisdictions, thus a zero denominator for the proportion.

	California			Oregon			Washington		
Species	Low CL	Mean	High CL	Low CL	Mean	High CL	Low CL	Mean	High CL
Arrowtooth Flounder	0.985	0.994	1.000	0.987	0.995	1.000	0.999	1.000	1.000
Aurora Rockfish	0.824	0.928	0.999	0.999	1.000	1.000	0.949	0.986	1.000
Bank Rockfish	0.979	0.991	1.000	0.997	0.999	1.000	0.000	0.667	1.000
Big Skate	0.973	0.988	0.998	0.981	0.992	0.997	0.964	0.987	1.000
Black and Yellow Rockfish	0.000	0.022	0.060	0.000	0.000	0.000	-	-	-
Black Rockfish	0.000	0.009	0.029	0.012	0.024	0.034	1.000	1.000	1.000
Black Skate	0.986	0.993	1.000	-	-	-	-	-	-
Blackgill Rockfish	0.602	0.837	0.997	0.885	0.959	1.000	0.825	0.938	0.998
Blue/Deacon Rockfish	0.003	0.056	0.135	0.005	0.024	0.045	-	-	-
Bocaccio Rockfish	0.937	0.971	0.997	0.985	0.994	1.000	0.820	0.950	0.999
Brown Rockfish	0.005	0.051	0.104	0.000	0.000	0.000	-	-	-
Butter Sole	-	-	-	1.000	1.000	1.000	-	-	-
Cabezon	0.012	0.051	0.103	0.006	0.042	0.121	-	-	-
California Scorpionfish	0.000	0.258	0.749	-	-	-	-	-	-
California Skate	0.985	0.995	1.000	-	-	-	-	-	-
Canary Rockfish	0.843	0.893	0.949	0.972	0.977	0.983	0.993	0.996	0.998
Chilipepper Rockfish	0.986	0.995	0.999	0.999	1.000	1.000	0.981	0.994	1.000
China Rockfish	0.001	0.044	0.122	0.007	0.035	0.087	-	-	-
Copper Rockfish	0.066	0.140	0.208	0.001	0.024	0.043	-	-	-
Cowcod Rockfish	0.999	1.000	1.000	1.000	1.000	1.000	-	-	-
Curlfin Sole	0.971	0.989	0.999	1.000	1.000	1.000	-	-	-
Darkblotched Rockfish	0.982	0.992	0.998	0.996	0.998	1.000	0.974	0.990	1.000
Dover Sole	0.999	0.999	1.000	1.000	1.000	1.000	0.999	1.000	1.000
English Sole	0.982	0.992	0.999	0.997	0.999	1.000	1.000	1.000	1.000
Flag Rockfish	0.458	0.726	0.923	-	-	-	-	-	-
Flatfish Unid	0.937	0.961	0.997	1.000	1.000	1.000	1.000	1.000	1.000
Flathead Sole	1.000	1.000	1.000	1.000	1.000	1.000	-	-	-
Gopher Rockfish	0.010	0.023	0.035	0.000	0.012	0.045	-	-	-
Grass Rockfish	0.000	0.002	0.007	0.000	0.000	0.000	-	-	-
Greenblotched Rockfish	0.250	0.681	1.000	-	-	-	-	-	-
Greenspotted Rockfish	0.771	0.908	0.999	0.769	0.907	0.999	0.229	0.614	1.000
Greenstriped Rockfish	0.847	0.934	0.997	0.997	0.998	1.000	0.948	0.979	1.000
Grenadier Unid	0.885	0.958	0.996	1.000	1.000	1.000	-	-	-
Groundfish Unid	-	-	-	1.000	1.000	1.000	-	-	-
Harlequin Rockfish	-	-	-	1.000	1.000	1.000	1.000	1.000	1.000
Honeycomb Rockfish	0.205	0.429	0.603	-	-	-	-	-	-
Kelp Greenling	0.000	0.000	0.000	0.010	0.034	0.059	-	-	-
Kelp Rockfish	0.000	0.000	0.000	-	-	-	-	-	-
Leopard Shark	0.000	0.250	0.775	-	-	-	-	-	-
Lingcod	0.778	0.812	0.864	0.713	0.745	0.788	0.955	0.988	1.000
Longnose Skate	0.978	0.989	0.997	0.993	0.996	1.000	0.944	0.974	0.998
Longspine Thornyhead	0.962	0.987	0.997	1.000	1.000	1.000	1.000	1.000	1.000
Mexican Rockfish	0.308	0.769	1.000	-	-	-	-	-	-
NS Rockfish Unid	0.000	0.025	0.062	-	-	-	1.000	1.000	1.000
Olive Rockfish	0.001	0.178	0.440	0.000	0.000	0.000	-	-	-
Pacific Cod	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

	California			Oregon			Washington		
Species	Low CL	Mean	High CL	Low CL	Mean	High CL	Low CL	Mean	High CL
Pacific Grenadier	0.905	0.953	1.000	-	-	-	-	-	-
Pacific Hake	0.988	0.996	0.999	1.000	1.000	1.000	0.996	0.998	1.000
Pacific Ocean Perch	0.933	0.962	0.994	1.000	1.000	1.000	0.993	0.997	1.000
Pacific Sanddab	0.748	0.912	0.990	0.998	1.000	1.000	-	-	-
Petrale Sole	0.990	0.995	0.999	1.000	1.000	1.000	0.999	0.999	1.000
Pink Rockfish	1.000	1.000	1.000	-	-	-	-	-	-
Quillback Rockfish	0.001	0.151	0.393	0.023	0.052	0.087	-	-	-
Redbanded Rockfish	0.930	0.961	0.989	0.925	0.963	0.998	0.886	0.966	1.000
Redstripe Rockfish	-	-	-	1.000	1.000	1.000	0.969	0.991	1.000
Rex Sole	0.999	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Rock Sole	0.337	0.645	0.871	0.996	0.998	1.000	1.000	1.000	1.000
Rockfish Unid	0.000	0.500	1.000	-	-	-	-	-	-
Rosethorn Rockfish	0.405	0.604	0.752	0.980	0.993	0.999	0.998	0.999	1.000
Rosy Rockfish	0.044	0.171	0.385	0.000	0.304	0.912	-	-	-
Rgheye/Blksp Rockfish	0.900	0.946	0.988	0.812	0.940	1.000	0.971	0.988	1.000
Sablefish	0.957	0.972	0.992	0.983	0.992	0.999	0.983	0.991	0.997
Sand Sole	0.330	0.613	0.913	0.769	0.929	1.000	1.000	1.000	1.000
Sanddab Unid	0.055	0.741	1.000	-	-	-	1.000	1.000	1.000
Sharpchin Rockfish	0.996	0.999	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Shelf Rockfish Unid	0.241	0.663	0.929	0.942	0.983	1.000	0.000	0.500	1.000
Shortbelly Rockfish	0.995	0.998	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Shortraker Rockfish	1.000	1.000	1.000	0.996	0.999	1.000	0.948	0.986	1.000
Shortspine Thornyhead	0.866	0.943	0.987	1.000	1.000	1.000	0.983	0.993	1.000
Shortspine/Longspine Thornyhead	0.465	0.726	1.000	-	-	-	-	-	-
Silvergray Rockfish	1.000	1.000	1.000	0.988	0.995	1.000	0.999	1.000	1.000
Slope Rockfish Unid*	0.714	0.924	1.000	0.830	0.910	0.985	-	-	-
Soupfin Shark	0.429	0.679	0.887	0.950	0.987	1.000	1.000	1.000	1.000
Speckled Rockfish	0.648	0.859	1.000	-	-	-	-	-	-
Spiny Dogfish Shark	0.978	0.992	0.999	0.971	0.992	1.000	1.000	1.000	1.000
Splitnose Rockfish	0.994	0.998	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Spotted Ratfish	0.995	0.998	1.000	0.925	0.979	1.000	1.000	1.000	1.000
Squarespot Rockfish	0.244	0.469	0.674	-	-	-	-	-	-
Starry Flounder	0.686	0.805	0.940	0.460	0.754	0.999	1.000	1.000	1.000
Starry Rockfish	0.326	0.562	0.790	-	-	-	-	-	-
Stripetail Rockfish	0.998	0.999	1.000	1.000	1.000	1.000	-	-	-
Tiger Rockfish	0.000	0.330	0.989	0.005	0.038	0.095	0.000	0.000	0.000
Treefish Rockfish	0.000	0.043	0.104	-	-	-	-	-	-
Vermilion Rockfish	0.510	0.661	0.780	0.013	0.049	0.083	-	-	-
Widow Rockfish	0.989	0.994	0.997	1.000	1.000	1.000	1.000	1.000	1.000
Yelloweye Rockfish	0.281	0.705	1.000	0.387	0.719	0.978	0.250	0.800	1.000
Yellowmouth Rockfish	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Yellowtail Rockfish	0.468	0.644	0.825	0.999	1.000	1.000	0.993	0.998	1.000
Calico Rockfish	0.000	0.158	0.316	-	-	-	-	-	-
Pygmy Rockfish	-	-	-	1.000	1.000	1.000	-	-	-
Freckled Rockfish	1.000	1.000	1.000	-	-	-	-	-	-
Chameleon Rockfish	0.088	0.088	0.088	-	-	-	-	-	-
Pinkrose Rockfish	1.000	1.000	1.000	-	-	-	-	-	-

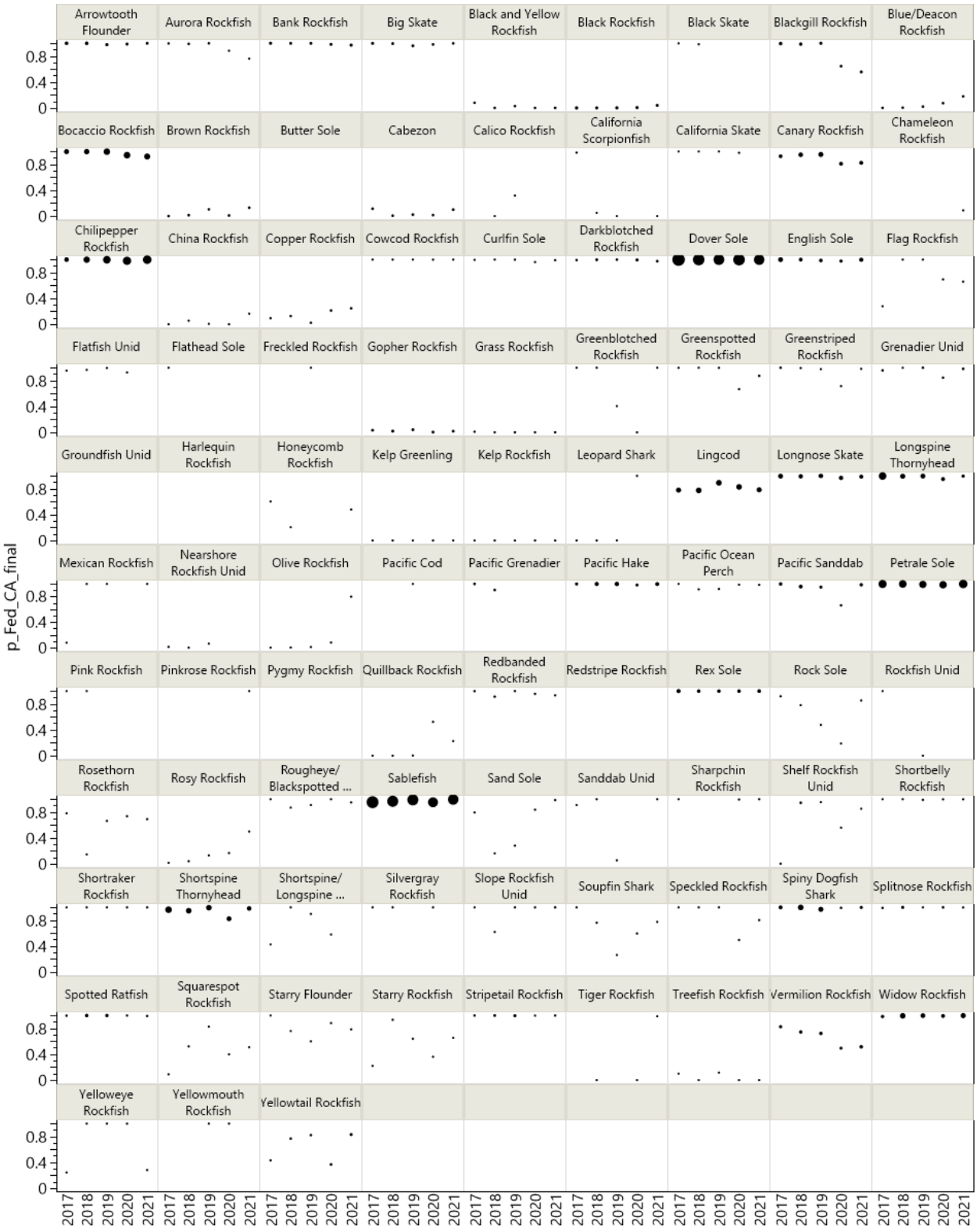

Figure 4. Estimated annual proportions of catch in the federal EEZ off **California,** and annual catch (mt), by groundfish FMP species, for selected shoreside commercial groundfish fishery sectors. Dot size represents relative amount of annual catch; scale is approximately zero (minimum) to 2,000 mt, maximum.

Figure 5. Estimated annual proportions of catch in the federal EEZ off **Oregon**, and annual catch (mt), by groundfish FMP species, for selected shoreside commercial groundfish fishery sectors. Dot size represents relative amount of annual catch; scale is to 10,000 mt, maximum (Pacific hake removed to preserve variability in scale).

Figure 6. Estimated annual proportions of catch in the federal EEZ off **Washington**, and annual catch (mt), by groundfish FMP species, for selected shoreside commercial groundfish fishery sectors. Dot size represents relative amount of annual catch; scale is to 2,000 mt, maximum (Pacific hake removed to preserve variability in scale).

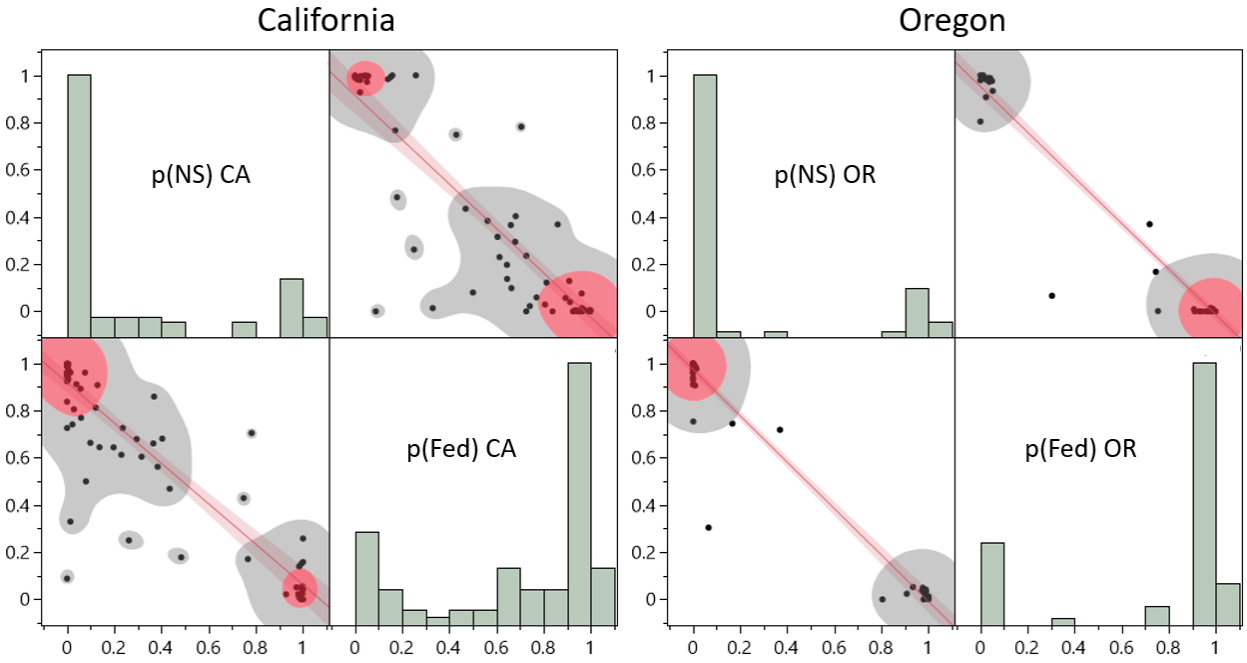

Figure 7. Proportions of catch in the nearshore sector (x-axis), versus estimated proportions of catch in federal jurisdiction, and frequency distributions for each variable, in an exploration of suitability of proportional nearshore catch as a proxy for proportion of federal jurisdiction in off California and Oregon, respectively. There is no commercial nearshore fishery off Washington. Non-parametric correlation values for California were: Spearman p = -0.844 ($p<0.0001$), Kendall's Tau = -0.694 ($p<0.0001$); and for Oregon were: Spearman p = -0.819 ($p<0.0001$), Kendall's Tau = -0.689 ($p<0.0001$). Results indicate that although well (negatively) correlated, the proportion of nearshore catch could serve as a rough approximation, but not a precise proxy or predictor for proportion of catch in state or federal waters. Shaded zones indicate sample density.

Table 2. Sorted ascending, estimated mean (annual) proportions of catch in the federal EEZ, and 95% confidence limits, by groundfish FMP species, for selected shoreside commercial groundfish fishery sectors, by area within state. Dash indicates no estimate, and zero total catch for the state in that year, across both federal and state jurisdictions, thus a zero denominator for the proportion.

California				Oregon				Washington			
Species (CA)	Low CL	Mean	High CL	Species (OR)	Low CL	Mean	High CL	Species (WA)	Low CL	Mean	High CL
Kelp Greenling	0.000	0.000	0.000	Blk & Ylw Rockfish	0.000	0.000	0.000	Tiger Rockfish	0.000	0.000	0.000
Kelp Rockfish	0.000	0.000	0.000	Brown Rockfish	0.000	0.000	0.000	Shelf Rockfish Unid	0.000	0.500	1.000
Grass Rockfish	0.000	0.002	0.007	Grass Rockfish	0.000	0.000	0.000	Greenspotted Rockfish	0.229	0.614	1.000
Black Rockfish	0.000	0.009	0.029	Olive Rockfish	0.000	0.000	0.000	Bank Rockfish	0.000	0.667	1.000
Blk & Ylw Rockfish	0.000	0.022	0.060	Gopher Rockfish	0.000	0.012	0.045	Yelloweye Rockfish	0.250	0.800	1.000
Gopher Rockfish	0.010	0.023	0.035	Copper Rockfish	0.001	0.024	0.043	Blackgill Rockfish	0.825	0.938	0.998
NS Rockfish Unid	0.000	0.025	0.062	Black Rockfish	0.012	0.024	0.034	Bocaccio Rockfish	0.820	0.950	0.999
Treefish Rockfish	0.000	0.043	0.104	Blue/Deacon Rockfish	0.005	0.024	0.045	Redbanded Rockfish	0.886	0.966	1.000
China Rockfish	0.001	0.044	0.122	Kelp Greenling	0.010	0.034	0.059	Longnose Skate	0.944	0.974	0.998
Brown Rockfish	0.005	0.051	0.104	China Rockfish	0.007	0.035	0.087	Greenstriped Rockfish	0.948	0.979	1.000
Cabezon	0.012	0.051	0.103	Tiger Rockfish	0.005	0.038	0.095	Aurora Rockfish	0.949	0.986	1.000
Blue/Deacon Rockfish	0.003	0.056	0.135	Cabezon	0.006	0.042	0.121	Shortraker Rockfish	0.948	0.986	1.000
Chameleon Rockfish	0.088	0.088	0.088	Vermilion Rockfish	0.013	0.049	0.083	Big Skate	0.964	0.987	1.000
Copper Rockfish	0.066	0.140	0.208	Quillback Rockfish	0.023	0.052	0.087	Rgheye/Blksp Rockfish	0.971	0.988	1.000
Quillback Rockfish	0.001	0.151	0.393	Rosy Rockfish	0.000	0.304	0.912	Lingcod	0.955	0.988	1.000
Calico Rockfish	0.000	0.158	0.316	Yelloweye Rockfish	0.387	0.719	0.978	Darkblotched Rockfish	0.974	0.990	1.000
Rosy Rockfish	0.044	0.171	0.385	Lingcod	0.713	0.745	0.788	Sablefish	0.983	0.991	0.997
Olive Rockfish	0.001	0.178	0.440	Starry Flounder	0.460	0.754	0.999	Redstripe Rockfish	0.969	0.991	1.000
Leopard Shark	0.000	0.250	0.775	Greenspotted Rockfish	0.769	0.907	0.999	Shortspine Thornyhead	0.983	0.993	1.000
California Scorpionfish	0.000	0.258	0.749	Slope Rockfish Unid	0.830	0.910	0.985	Chilipepper Rockfish	0.981	0.994	1.000
Tiger Rockfish	0.000	0.330	0.989	Sand Sole	0.769	0.929	1.000	Canary Rockfish	0.993	0.996	0.998
Honeycomb Rockfish	0.205	0.429	0.603	Rgheye/Blksp Rockfish	0.812	0.940	1.000	Pacific Ocean Perch	0.993	0.997	1.000
Squarespot Rockfish	0.244	0.469	0.674	Blackgill Rockfish	0.885	0.959	1.000	Yellowtail Rockfish	0.993	0.998	1.000
Rockfish Unid	0.000	0.500	1.000	Redbanded Rockfish	0.925	0.963	0.998	Pacific Hake	0.996	0.998	1.000
Starry Rockfish	0.326	0.562	0.790	Canary Rockfish	0.972	0.977	0.983	Rosethorn Rockfish	0.998	0.999	1.000

California				Oregon				Washington			
Species (CA)	Low CL	Mean	High CL	Species (OR)	Low CL	Mean	High CL	Species (WA)	Low CL	Mean	High CL
Rosethorn Rockfish	0.405	0.604	0.752	Spotted Ratfish	0.925	0.979	1.000	Petrale Sole	0.999	0.999	1.000
Sand Sole	0.330	0.613	0.913	Shelf Rockfish Unid	0.942	0.983	1.000	Arrowtooth Flounder	0.999	1.000	1.000
Yellowtail Rockfish	0.468	0.644	0.825	Soupfin Shark	0.950	0.987	1.000	Dover Sole	0.999	1.000	1.000
Rock Sole	0.337	0.645	0.871	Sablefish	0.983	0.992	0.999	Silvergray Rockfish	0.999	1.000	1.000
Vermilion Rockfish	0.510	0.661	0.780	Spiny Dogfish Shark	0.971	0.992	1.000	Harlequin Rockfish	1.000	1.000	1.000
Shelf Rockfish Unid	0.241	0.663	0.929	Big Skate	0.981	0.992	0.997	Widow Rockfish	1.000	1.000	1.000
Soupfin Shark	0.429	0.679	0.887	Rosethorn Rockfish	0.980	0.993	0.999	Spiny Dogfish Shark	1.000	1.000	1.000
Greenblotched Rockfish	0.250	0.681	1.000	Bocaccio Rockfish	0.985	0.994	1.000	Splitnose Rockfish	1.000	1.000	1.000
Yelloweye Rockfish	0.281	0.705	1.000	Arrowtooth Flounder	0.987	0.995	1.000	Longspine Thornyhead	1.000	1.000	1.000
Flag Rockfish	0.458	0.726	0.923	Silvergray Rockfish	0.988	0.995	1.000	Black Rockfish	1.000	1.000	1.000
Ssp/Lsp Thornyhead	0.465	0.726	1.000	Longnose Skate	0.993	0.996	1.000	English Sole	1.000	1.000	1.000
Sanddab Unid	0.055	0.741	1.000	Darkblotched Rockfish	0.996	0.998	1.000	Flatfish Unid	1.000	1.000	1.000
Mexican Rockfish	0.308	0.769	1.000	Rock Sole	0.996	0.998	1.000	NS Rockfish Unid	1.000	1.000	1.000
Starry Flounder	0.686	0.805	0.940	Greenstriped Rockfish	0.997	0.998	1.000	Pacific Cod	1.000	1.000	1.000
Lingcod	0.778	0.812	0.864	Shortraker Rockfish	0.996	0.999	1.000	Rex Sole	1.000	1.000	1.000
Blackgill Rockfish	0.602	0.837	0.997	Bank Rockfish	0.997	0.999	1.000	Rock Sole	1.000	1.000	1.000
Speckled Rockfish	0.648	0.859	1.000	English Sole	0.997	0.999	1.000	Sand Sole	1.000	1.000	1.000
Canary Rockfish	0.843	0.893	0.949	Pacific Sanddab	0.998	1.000	1.000	Sanddab Unid	1.000	1.000	1.000
Greenspotted Rockfish	0.771	0.908	0.999	Yellowtail Rockfish	0.999	1.000	1.000	Sharpchin Rockfish	1.000	1.000	1.000
Pacific Sanddab	0.748	0.912	0.990	Aurora Rockfish	0.999	1.000	1.000	Shortbelly Rockfish	1.000	1.000	1.000
Slope Rockfish Unid	0.714	0.924	1.000	Chilipepper Rockfish	0.999	1.000	1.000	Soupfin Shark	1.000	1.000	1.000
Aurora Rockfish	0.824	0.928	0.999	Shortspine Thornyhead	1.000	1.000	1.000	Spotted Ratfish	1.000	1.000	1.000
Greenstriped Rockfish	0.847	0.934	0.997	Widow Rockfish	1.000	1.000	1.000	Starry Flounder	1.000	1.000	1.000
Shortspine Thornyhead	0.866	0.943	0.987	Petrale Sole	1.000	1.000	1.000	Yellowmouth Rockfish	1.000	1.000	1.000
Rgheye/Blksp Rockfish	0.900	0.946	0.988	Curlfin Sole	1.000	1.000	1.000	Slope Rockfish Unid*	-	-	-
Pacific Grenadier	0.905	0.953	1.000	Butter Sole	1.000	1.000	1.000	Blk & Ylw Rockfish	-	-	-
Grenadier Unid	0.885	0.958	0.996	Stripetail Rockfish	1.000	1.000	1.000	Black Skate	-	-	-
Redbanded Rockfish	0.930	0.961	0.989	Pacific Hake	1.000	1.000	1.000	Blue/Deacon Rockfish	-	-	-

California				Oregon				Washington			
Species (CA)	Low CL	Mean	High CL	Species (OR)	Low CL	Mean	High CL	Species (WA)	Low CL	Mean	High CL
Flatfish Unid	0.937	0.961	0.997	Longspine Thornyhead	1.000	1.000	1.000	Brown Rockfish	-	-	-
Pacific Ocean Perch	0.933	0.962	0.994	Rex Sole	1.000	1.000	1.000	Butter Sole	-	-	-
Bocaccio Rockfish	0.937	0.971	0.997	Splitnose Rockfish	1.000	1.000	1.000	Cabezon	-	-	-
Sablefish	0.957	0.972	0.992	Dover Sole	1.000	1.000	1.000	California Scorpionfish	-	-	-
Longspine Thornyhead	0.962	0.987	0.997	Pacific Ocean Perch	1.000	1.000	1.000	California Skate	-	-	-
Big Skate	0.973	0.988	0.998	Grenadier Unid	1.000	1.000	1.000	China Rockfish	-	-	-
Longnose Skate	0.978	0.989	0.997	Flathead Sole	1.000	1.000	1.000	Copper Rockfish	-	-	-
Curlfin Sole	0.971	0.989	0.999	Shortbelly Rockfish	1.000	1.000	1.000	Cowcod Rockfish	-	-	-
Bank Rockfish	0.979	0.991	1.000	Pacific Cod	1.000	1.000	1.000	Curlfin Sole	-	-	-
Spiny Dogfish Shark	0.978	0.992	0.999	Sharpchin Rockfish	1.000	1.000	1.000	Flag Rockfish	-	-	-
Darkblotched Rockfish	0.982	0.992	0.998	Cowcod Rockfish	1.000	1.000	1.000	Flathead Sole	-	-	-
English Sole	0.982	0.992	0.999	Flatfish Unid	1.000	1.000	1.000	Gopher Rockfish	-	-	-
Black Skate	0.986	0.993	1.000	Groundfish Unid	1.000	1.000	1.000	Grass Rockfish	-	-	-
Arrowtooth Flounder	0.985	0.994	1.000	Harlequin Rockfish	1.000	1.000	1.000	Greenblotched Rockfish	-	-	-
Widow Rockfish	0.989	0.994	0.997	Redstripe Rockfish	1.000	1.000	1.000	Grenadier Unid	-	-	-
California Skate	0.985	0.995	1.000	Yellowmouth Rockfish	1.000	1.000	1.000	Groundfish Unid	-	-	-
Chilipepper Rockfish	0.986	0.995	0.999	Pygmy Rockfish	1.000	1.000	1.000	Honeycomb Rockfish	-	-	-
Petrale Sole	0.990	0.995	0.999	Black Skate	-	-	-	Kelp Greenling	-	-	-
Pacific Hake	0.988	0.996	0.999	California Scorpionfish	-	-	-	Kelp Rockfish	-	-	-
Shortbelly Rockfish	0.995	0.998	1.000	California Skate	-	-	-	Leopard Shark	-	-	-
Splitnose Rockfish	0.994	0.998	1.000	Flag Rockfish	-	-	-	Mexican Rockfish	-	-	-
Spotted Ratfish	0.995	0.998	1.000	Greenblotched Rockfish	-	-	-	Olive Rockfish	-	-	-
Sharpchin Rockfish	0.996	0.999	1.000	Honeycomb Rockfish	-	-	-	Pacific Grenadier	-	-	-
Stripetail Rockfish	0.998	0.999	1.000	Kelp Rockfish	-	-	-	Pacific Sanddab	-	-	-
Dover Sole	0.999	0.999	1.000	Leopard Shark	-	-	-	Pink Rockfish	-	-	-
Rex Sole	0.999	1.000	1.000	Mexican Rockfish	-	-	-	Quillback Rockfish	-	-	-
Cowcod Rockfish	0.999	1.000	1.000	NS Rockfish Unid	-	-	-	Rockfish Unid	-	-	-
Flathead Sole	1.000	1.000	1.000	Pacific Grenadier	-	-	-	Rosy Rockfish	-	-	-

California				Oregon				Washington			
Species (CA)	Low CL	Mean	High CL	Species (OR)	Low CL	Mean	High CL	Species (WA)	Low CL	Mean	High CL
Pacific Cod	1.000	1.000	1.000	Pink Rockfish	-	-	-	Ssp/Lsp Thornyhead	-	-	-
Pink Rockfish	1.000	1.000	1.000	Rockfish Unid	-	-	-	Speckled Rockfish	-	-	-
Shortraker Rockfish	1.000	1.000	1.000	Sanddab Unid	-	-	-	Squarespot Rockfish	-	-	-
Silvergray Rockfish	1.000	1.000	1.000	Ssp/Lsp Thornyhead	-	-	-	Starry Rockfish	-	-	-
Yellowmouth Rockfish	1.000	1.000	1.000	Speckled Rockfish	-	-	-	Stripetail Rockfish	-	-	-
Freckled Rockfish	1.000	1.000	1.000	Squarespot Rockfish	-	-	-	Treefish Rockfish	-	-	-
Pinkrose Rockfish	1.000	1.000	1.000	Starry Rockfish	-	-	-	Vermilion Rockfish	-	-	-
Butter Sole	-	-	-	Treefish Rockfish	-	-	-	Calico Rockfish	-	-	-
Groundfish Unid	-	-	-	Calico Rockfish	-	-	-	Pygmy Rockfish	-	-	-
Harlequin Rockfish	-	-	-	Freckled Rockfish	-	-	-	Freckled Rockfish	-	-	-
Redstripe Rockfish	-	-	-	Chameleon Rockfish	-	-	-	Chameleon Rockfish	-	-	-
Pygmy Rockfish	-	-	-	Pinkrose Rockfish	-	-	-	Pinkrose Rockfish	-	-	-

Table 3 (a, b, and c). Proportional distribution of average annual catch (2017-2021), for FMP groundfish species, among selected (commercial shorebased) observed sectors, by state; shown as heatmaps (green-to-red scale; green = low, red = high values).

3.a. California; proportional distribution of average annual catch among sectors, sorted alphabetically by species.

Species / Sector (CA)	Catch Shares	Catch Shares EM	LE Fixed Gear DTL	Limited Entry Sablefish	Midwater Hake	Midwater Hake EM	Midwater Rockfish	Midwater Rockfish EM	Nearshore	OA Fixed Gear
Arrowtooth Flounder	0.147	0.842	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.004
Aurora Rockfish	0.554	0.358	0.079	0.006	0.000	0.000	0.000	0.000	0.000	0.002
Bank Rockfish	0.877	0.083	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.012
Big Skate	0.831	0.135	0.027	0.005	0.000	0.000	0.000	0.000	0.001	0.002
Black and Yellow Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.928	0.072
Black Rockfish	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.983	0.016
Black Skate	0.337	0.266	0.353	0.020	0.000	0.000	0.000	0.000	0.000	0.024
Blackgill Rockfish	0.227	0.229	0.305	0.166	0.000	0.000	0.000	0.000	0.000	0.073
Blue/Deacon Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.998	0.002
Bocaccio Rockfish	0.503	0.417	0.049	0.003	0.000	0.000	0.000	0.003	0.007	0.018
Brown Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.995	0.004
Butter Sole	-	-	-	-	-	-	-	-	-	-
Cabezon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.972	0.028
Calico Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
California Scorpionfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
California Skate	0.363	0.554	0.083	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Canary Rockfish	0.834	0.058	0.000	0.002	0.000	0.000	0.000	0.003	0.057	0.046
Chameleon Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Chilipepper Rockfish	0.623	0.351	0.019	0.001	0.000	0.000	0.000	0.002	0.000	0.003
China Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.996	0.004
Copper Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.984	0.016
Cowcod Rockfish	0.219	0.781	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Curlfin Sole	0.565	0.435	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Darkblotched Rockfish	0.654	0.315	0.010	0.015	0.000	0.000	0.000	0.000	0.000	0.006
Dover Sole	0.513	0.484	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000
English Sole	0.599	0.401	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Flag Rockfish	0.092	0.008	0.258	0.005	0.000	0.000	0.000	0.000	0.236	0.401
Flatfish Unid	0.009	0.852	0.064	0.000	0.000	0.000	0.000	0.000	0.014	0.061
Flathead Sole	0.072	0.928	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Freckled Rockfish	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gopher Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.980	0.020

Species / Sector (CA)	Catch Shares	Catch Shares EM	LE Fixed Gear DTL	Limited Entry Sablefish	Midwater Hake	Midwater Hake EM	Midwater Rockfish	Midwater Rockfish EM	Nearshore	OA Fixed Gear
Grass Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.990	0.010
Greenblotched Rockfish	0.029	0.025	0.008	0.000	0.000	0.000	0.000	0.000	0.403	0.535
Greenspotted Rockfish	0.233	0.079	0.165	0.016	0.000	0.000	0.000	0.001	0.129	0.377
Greenstriped Rockfish	0.709	0.221	0.020	0.007	0.000	0.000	0.000	0.002	0.005	0.037
Grenadier Unid	0.000	0.044	0.485	0.137	0.000	0.000	0.000	0.000	0.000	0.334
Groundfish Unid	-	-	-	-	-	-	-	-	-	-
Harlequin Rockfish	-	-	-	-	-	-	-	-	-	-
Honeycomb Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.748	0.252
Kelp Greenling	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.994	0.006
Kelp Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
Leopard Shark	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.262	0.735
Lingcod	0.588	0.152	0.011	0.013	0.000	0.000	0.000	0.000	0.122	0.113
Longnose Skate	0.501	0.436	0.045	0.012	0.000	0.000	0.000	0.000	0.002	0.004
Longspine Thornyhead	0.284	0.643	0.064	0.005	0.000	0.000	0.000	0.003	0.000	0.001
Mexican Rockfish	0.207	0.006	0.002	0.000	0.000	0.000	0.000	0.000	0.059	0.726
Nearshore Rockfish Unid	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.998	0.000
Olive Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.484	0.516
Pacific Cod	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pacific Grenadier	0.454	0.078	0.180	0.243	0.000	0.000	0.000	0.000	0.000	0.045
Pacific Hake	0.635	0.341	0.005	0.005	0.000	0.000	0.000	0.013	0.000	0.001
Pacific Ocean Perch	0.448	0.466	0.004	0.059	0.000	0.000	0.000	0.000	0.000	0.023
Pacific Sanddab	0.283	0.625	0.029	0.000	0.000	0.000	0.000	0.000	0.039	0.022
Petrale Sole	0.599	0.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Pink Rockfish	0.297	0.703	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pinkrose Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Pygmy Rockfish	-	-	-	-	-	-	-	-	-	-
Quillback Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.992	0.008
Redbanded Rockfish	0.212	0.232	0.060	0.352	0.000	0.000	0.000	0.000	0.076	0.068
Redstripe Rockfish	-	-	-	-	-	-	-	-	-	-
Rex Sole	0.705	0.295	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rock Sole	0.214	0.505	0.000	0.000	0.000	0.000	0.000	0.000	0.138	0.143
Rockfish Unid	0.920	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.080	0.000
Rosethorn Rockfish	0.016	0.160	0.043	0.380	0.000	0.000	0.000	0.000	0.316	0.085
Rosy Rockfish	0.000	0.003	0.027	0.006	0.000	0.000	0.000	0.000	0.767	0.198
Rougheye/Blackspotted Rockfish	0.236	0.138	0.031	0.485	0.000	0.000	0.000	0.000	0.000	0.111

Species / Sector (CA)	Catch Shares	Catch Shares EM	LE Fixed Gear DTL	Limited Entry Sablefish	Midwater Hake	Midwater Hake EM	Midwater Rockfish	Midwater Rockfish EM	Nearshore	OA Fixed Gear
Sablefish	0.162	0.162	0.278	0.254	0.000	0.000	0.000	0.000	0.008	0.136
Sand Sole	0.159	0.611	0.000	0.000	0.000	0.000	0.000	0.000	0.230	0.000
Sanddab Unid	0.067	0.111	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.800
Sharpchin Rockfish	0.227	0.773	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Shelf Rockfish Unid	0.367	0.051	0.269	0.008	0.000	0.000	0.000	0.000	0.099	0.207
Shortbelly Rockfish	0.328	0.667	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000
Shortraker Rockfish	0.588	0.387	0.000	0.025	0.000	0.000	0.000	0.000	0.000	0.000
Shortspine Thornyhead	0.201	0.291	0.439	0.056	0.000	0.000	0.000	0.001	0.003	0.011
Shortspine/Longspine Thornyhead	0.000	0.000	0.680	0.194	0.000	0.000	0.000	0.000	0.000	0.126
Silvergray Rockfish	0.043	0.957	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Slope Rockfish Unid	0.026	0.002	0.000	0.895	0.000	0.000	0.000	0.000	0.000	0.077
Soupfin Shark	0.108	0.338	0.008	0.000	0.000	0.000	0.000	0.000	0.295	0.252
Speckled Rockfish	0.000	0.000	0.177	0.036	0.000	0.000	0.000	0.000	0.369	0.419
Spiny Dogfish Shark	0.811	0.058	0.054	0.057	0.000	0.000	0.000	0.000	0.001	0.019
Splitnose Rockfish	0.762	0.233	0.002	0.000	0.000	0.000	0.000	0.000	0.001	0.002
Spotted Ratfish	0.711	0.283	0.006	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Squarespot Rockfish	0.000	0.000	0.270	0.000	0.000	0.000	0.000	0.000	0.435	0.295
Starry Flounder	0.076	0.895	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.000
Starry Rockfish	0.000	0.000	0.370	0.000	0.000	0.000	0.000	0.000	0.384	0.246
Stripetail Rockfish	0.929	0.071	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Tiger Rockfish	0.000	0.000	0.000	0.986	0.000	0.000	0.000	0.000	0.014	0.000
Treefish Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
Vermilion Rockfish	0.002	0.002	0.246	0.004	0.000	0.000	0.000	0.000	0.366	0.380
Widow Rockfish	0.050	0.015	0.003	0.001	0.000	0.000	0.115	0.788	0.004	0.023
Yelloweye Rockfish	0.014	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.782	0.192
Yellowmouth Rockfish	0.060	0.940	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Yellowtail Rockfish	0.305	0.016	0.015	0.101	0.000	0.000	0.000	0.043	0.197	0.323

3.b. Oregon; proportional distribution of average annual catch among sectors, sorted alphabetically by species.

Species/ Sector (OR)	Catch Shares	Catch Shares EM	LE Fixed Gear DTL	Limited Entry Sablefish	Midwater Hake	Midwater Hake EM	Midwater Rockfish	Midwater Rockfish EM	Nearshore	OA Fixed Gear
Arrowtooth Flounder	0.930	0.010	0.012	0.033	0.004	0.003	0.000	0.000	0.000	0.006
Aurora Rockfish	0.992	0.007	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Bank Rockfish	0.338	0.006	0.000	0.012	0.099	0.361	0.155	0.029	0.000	0.001
Big Skate	0.943	0.000	0.003	0.017	0.007	0.007	0.003	0.001	0.001	0.017
Black and Yellow Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
Black Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.986	0.014
Black Skate	-	-	-	-	-	-	-	-	-	-
Blackgill Rockfish	0.782	0.022	0.083	0.106	0.000	0.000	0.000	0.000	0.000	0.007
Blue/Deacon Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.982	0.011
Bocaccio Rockfish	0.153	0.000	0.000	0.009	0.340	0.102	0.209	0.179	0.000	0.007
Brown Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.804	0.196
Butter Sole	0.963	0.000	0.000	0.000	0.000	0.037	0.000	0.000	0.000	0.000
Cabezon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.988	0.012
Calico Rockfish	-	-	-	-	-	-	-	-	-	-
California Scorpionfish	-	-	-	-	-	-	-	-	-	-
California Skate	-	-	-	-	-	-	-	-	-	-
Canary Rockfish	0.325	0.000	0.000	0.004	0.243	0.221	0.091	0.097	0.015	0.004
Chameleon Rockfish	-	-	-	-	-	-	-	-	-	-
Chilipepper Rockfish	0.337	0.000	0.000	0.003	0.090	0.493	0.047	0.029	0.000	0.001
China Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.987	0.013
Copper Rockfish	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.908	0.091
Cowcod Rockfish	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Curlfin Sole	0.966	0.019	0.000	0.000	0.005	0.005	0.005	0.000	0.000	0.000
Darkblotched Rockfish	0.661	0.012	0.004	0.006	0.160	0.152	0.001	0.000	0.000	0.003
Dover Sole	0.967	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
English Sole	0.977	0.018	0.000	0.000	0.002	0.000	0.002	0.001	0.000	0.000
Flag Rockfish	-	-	-	-	-	-	-	-	-	-
Flatfish Unid	0.984	0.000	0.000	0.000	0.011	0.002	0.002	0.000	0.000	0.000
Flathead Sole	0.995	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000
Freckled Rockfish	-	-	-	-	-	-	-	-	-	-
Gopher Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000

Species/ Sector (OR)	Catch Shares	Catch Shares EM	LE Fixed Gear DTL	Limited Entry Sablefish	Midwater Hake	Midwater Hake EM	Midwater Rockfish	Midwater Rockfish EM	Nearshore	OA Fixed Gear
Grass Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.979	0.021
Greenblotched Rockfish	-	-	-	-	-	-	-	-	-	-
Greenspotted Rockfish	0.917	0.002	0.000	0.044	0.000	0.000	0.000	0.000	0.009	0.029
Greenstriped Rockfish	0.962	0.000	0.000	0.023	0.009	0.002	0.002	0.001	0.000	0.001
Grenadier Unid	0.891	0.109	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Groundfish Unid	0.000	0.000	0.000	0.000	0.800	0.199	0.000	0.001	0.000	0.000
Harlequin Rockfish	0.015	0.000	0.000	0.000	0.043	0.545	0.239	0.159	0.000	0.000
Honeycomb Rockfish	-	-	-	-	-	-	-	-	-	-
Kelp Greenling	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.989	0.006
Kelp Rockfish	-	-	-	-	-	-	-	-	-	-
Leopard Shark	-	-	-	-	-	-	-	-	-	-
Lingcod	0.662	0.004	0.002	0.024	0.020	0.016	0.006	0.002	0.168	0.096
Longnose Skate	0.933	0.017	0.005	0.025	0.001	0.000	0.001	0.000	0.000	0.016
Longspine Thornyhead	0.907	0.093	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mexican Rockfish	-	-	-	-	-	-	-	-	-	-
Nearshore Rockfish Unid	-	-	-	-	-	-	-	-	-	-
Olive Rockfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
Pacific Cod	0.959	0.000	0.000	0.000	0.009	0.018	0.008	0.005	0.000	0.000
Pacific Grenadier	-	-	-	-	-	-	-	-	-	-
Pacific Hake	0.001	0.000	0.000	0.000	0.519	0.478	0.000	0.001	0.000	0.000
Pacific Ocean Perch	0.705	0.005	0.000	0.000	0.127	0.063	0.097	0.003	0.000	0.000
Pacific Sanddab	0.983	0.000	0.000	0.000	0.015	0.001	0.000	0.000	0.000	0.000
Petrale Sole	0.983	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pink Rockfish	-	-	-	-	-	-	-	-	-	-
Pinkrose Rockfish	-	-	-	-	-	-	-	-	-	-
Pygmy Rockfish	0.000	0.000	0.000	0.000	0.000	0.618	0.000	0.382	0.000	0.000
Quillback Rockfish	0.031	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.934	0.029
Redbanded Rockfish	0.446	0.021	0.081	0.368	0.012	0.009	0.000	0.001	0.000	0.061
Redstripe Rockfish	0.017	0.028	0.000	0.000	0.190	0.248	0.261	0.257	0.000	0.000
Rex Sole	0.978	0.018	0.000	0.000	0.002	0.000	0.001	0.000	0.000	0.000
Rock Sole	0.990	0.001	0.000	0.000	0.001	0.002	0.004	0.000	0.002	0.000
Rockfish Unid	-	-	-	-	-	-	-	-	-	-
Rosethorn Rockfish	0.734	0.000	0.012	0.019	0.026	0.000	0.204	0.002	0.000	0.002

Species/ Sector (OR)	Catch Shares	Catch Shares EM	LE Fixed Gear DTL	Limited Entry Sablefish	Midwater Hake	Midwater Hake EM	Midwater Rockfish	Midwater Rockfish EM	Nearshore	OA Fixed Gear
Rosy Rockfish	0.000	0.000	0.000	0.733	0.000	0.000	0.000	0.000	0.066	0.201
Rougheye/Blackspotted Rockfish	0.352	0.004	0.091	0.192	0.260	0.026	0.000	0.000	0.000	0.075
Sablefish	0.559	0.086	0.015	0.255	0.039	0.014	0.000	0.000	0.000	0.032
Sand Sole	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sanddab Unid	-	-	-	-	-	-	-	-	-	-
Sharpchin Rockfish	0.553	0.013	0.000	0.000	0.192	0.129	0.101	0.012	0.000	0.000
Shelf Rockfish Unid	0.936	0.000	0.000	0.010	0.012	0.019	0.014	0.001	0.001	0.008
Shortbelly Rockfish	0.006	0.000	0.000	0.000	0.460	0.367	0.050	0.117	0.000	0.000
Shortraker Rockfish	0.926	0.013	0.002	0.039	0.013	0.003	0.001	0.002	0.000	0.002
Shortspine Thornyhead	0.940	0.045	0.000	0.002	0.009	0.003	0.000	0.000	0.000	0.001
Shortspine/Longspine Thornyhead	-	-	-	-	-	-	-	-	-	-
Silvergray Rockfish	0.854	0.000	0.000	0.006	0.033	0.058	0.030	0.014	0.000	0.006
Slope Rockfish Unid	0.321	0.048	0.082	0.133	0.000	0.338	0.015	0.028	0.000	0.035
Soupfin Shark	0.000	0.000	0.000	0.000	0.011	0.755	0.110	0.113	0.011	0.000
Speckled Rockfish	-	-	-	-	-	-	-	-	-	-
Spiny Dogfish Shark	0.117	0.000	0.008	0.218	0.324	0.230	0.001	0.087	0.000	0.014
Splitnose Rockfish	0.363	0.003	0.000	0.000	0.185	0.420	0.019	0.010	0.000	0.000
Spotted Ratfish	0.935	0.038	0.009	0.000	0.000	0.000	0.010	0.008	0.000	0.000
Squarespot Rockfish	-	-	-	-	-	-	-	-	-	-
Starry Flounder	0.999	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Starry Rockfish	-	-	-	-	-	-	-	-	-	-
Stripetail Rockfish	0.979	0.010	0.000	0.000	0.006	0.000	0.003	0.001	0.000	0.000
Tiger Rockfish	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.973	0.023
Treefish Rockfish	-	-	-	-	-	-	-	-	-	-
Vermilion Rockfish	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.976	0.022
Widow Rockfish	0.006	0.000	0.000	0.000	0.056	0.086	0.441	0.411	0.000	0.000
Yelloweye Rockfish	0.076	0.000	0.000	0.467	0.036	0.002	0.001	0.001	0.369	0.047
Yellowmouth Rockfish	0.683	0.059	0.000	0.052	0.074	0.027	0.093	0.011	0.000	0.002
Yellowtail Rockfish	0.107	0.000	0.000	0.000	0.282	0.193	0.255	0.162	0.000	0.000

3.c. Washington; proportional distribution of average annual catch among sectors, sorted alphabetically by species.

Species / Sector (Washington)	Catch Shares	Catch Shares EM	LE Fixed Gear DTL	LE Sablefish	Midwater Hake	Midwater Hake EM	Midwater Rockfish	Midwater Rockfish EM	Nearshore	OA Fixed Gear
Arrowtooth Flounder	0.869	0.002	0.000	0.013	0.001	0.109	0.003	0.000	0.000	0.002
Aurora Rockfish	0.861	0.001	0.000	0.024	0.000	0.104	0.001	0.007	0.000	0.003
Bank Rockfish	0.855	0.000	0.003	0.142	0.000	0.000	0.000	0.000	0.000	0.000
Big Skate	0.837	0.000	0.006	0.094	0.003	0.057	0.002	0.002	0.000	0.000
Black and Yellow Rockfish	-	-	-	-	-	-	-	-	-	-
Black Rockfish	0.445	0.000	0.000	0.000	0.000	0.000	0.000	0.555	0.000	0.000
Black Skate	-	-	-	-	-	-	-	-	-	-
Blackgill Rockfish	0.073	0.016	0.004	0.876	0.000	0.000	0.000	0.000	0.000	0.031
Blue/Deacon Rockfish	-	-	-	-	-	-	-	-	-	-
Bocaccio Rockfish	0.094	0.000	0.001	0.005	0.001	0.375	0.077	0.445	0.000	0.002
Brown Rockfish	-	-	-	-	-	-	-	-	-	-
Butter Sole	-	-	-	-	-	-	-	-	-	-
Cabezon	-	-	-	-	-	-	-	-	-	-
Calico Rockfish	-	-	-	-	-	-	-	-	-	-
California Scorpionfish	-	-	-	-	-	-	-	-	-	-
California Skate	-	-	-	-	-	-	-	-	-	-
Canary Rockfish	0.011	0.000	0.000	0.004	0.001	0.817	0.013	0.153	0.000	0.001
Chameleon Rockfish	-	-	-	-	-	-	-	-	-	-
Chilipepper Rockfish	0.057	0.000	0.041	0.363	0.000	0.000	0.386	0.131	0.000	0.022
China Rockfish	-	-	-	-	-	-	-	-	-	-
Copper Rockfish	-	-	-	-	-	-	-	-	-	-
Cowcod Rockfish	-	-	-	-	-	-	-	-	-	-
Curlfin Sole	-	-	-	-	-	-	-	-	-	-
Darkblotched Rockfish	0.397	0.000	0.002	0.016	0.000	0.572	0.006	0.003	0.000	0.004
Dover Sole	0.985	0.000	0.000	0.008	0.000	0.000	0.007	0.000	0.000	0.000
English Sole	0.942	0.000	0.000	0.000	0.000	0.002	0.050	0.005	0.000	0.000
Flag Rockfish	-	-	-	-	-	-	-	-	-	-
Flatfish Unid	0.903	0.039	0.000	0.000	0.000	0.019	0.036	0.003	0.000	0.000
Flathead Sole	-	-	-	-	-	-	-	-	-	-
Freckled Rockfish	-	-	-	-	-	-	-	-	-	-
Gopher Rockfish	-	-	-	-	-	-	-	-	-	-
Grass Rockfish	-	-	-	-	-	-	-	-	-	-
Greenblotched Rockfish	-	-	-	-	-	-	-	-	-	-
Greenspotted Rockfish	0.000	0.000	0.000	0.922	0.000	0.000	0.000	0.000	0.000	0.078

Species / Sector (Washington)	Catch Shares	Catch Shares EM	LE Fixed Gear DTL	LE Sablefish	Midwater Hake	Midwater Hake EM	Midwater Rockfish	Midwater Rockfish EM	Nearshore	OA Fixed Gear
Greenstriped Rockfish	0.365	0.000	0.005	0.529	0.000	0.000	0.000	0.087	0.000	0.015
Grenadier Unid	-	-	-	-	-	-	-	-	-	-
Groundfish Unid	-	-	-	-	-	-	-	-	-	-
Harlequin Rockfish	0.000	0.000	0.000	0.000	0.002	0.997	0.000	0.001	0.000	0.000
Honeycomb Rockfish	-	-	-	-	-	-	-	-	-	-
Kelp Greenling	-	-	-	-	-	-	-	-	-	-
Kelp Rockfish	-	-	-	-	-	-	-	-	-	-
Leopard Shark	-	-	-	-	-	-	-	-	-	-
Lingcod	0.838	0.002	0.003	0.074	0.000	0.069	0.003	0.006	0.000	0.006
Longnose Skate	0.468	0.000	0.025	0.476	0.000	0.002	0.004	0.000	0.000	0.023
Longspine Thornyhead	0.691	0.001	0.000	0.006	0.000	0.000	0.302	0.000	0.000	0.000
Mexican Rockfish	-	-	-	-	-	-	-	-	-	-
Nearshore Rockfish Unid	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Olive Rockfish	-	-	-	-	-	-	-	-	-	-
Pacific Cod	0.059	0.000	0.000	0.815	0.010	0.106	0.000	0.000	0.000	0.011
Pacific Grenadier	-	-	-	-	-	-	-	-	-	-
Pacific Hake	0.000	0.000	0.000	0.000	0.008	0.991	0.000	0.001	0.000	0.000
Pacific Ocean Perch	0.531	0.000	0.000	0.001	0.002	0.454	0.006	0.005	0.000	0.000
Pacific Sanddab	-	-	-	-	-	-	-	-	-	-
Petrale Sole	0.984	0.001	0.001	0.007	0.000	0.000	0.005	0.000	0.000	0.003
Pink Rockfish	-	-	-	-	-	-	-	-	-	-
Pinkrose Rockfish	-	-	-	-	-	-	-	-	-	-
Pygmy Rockfish	-	-	-	-	-	-	-	-	-	-
Quillback Rockfish	-	-	-	-	-	-	-	-	-	-
Redbanded Rockfish	0.209	0.001	0.013	0.720	0.000	0.000	0.000	0.001	0.000	0.056
Redstripe Rockfish	0.162	0.000	0.000	0.002	0.001	0.582	0.026	0.227	0.000	0.000
Rex Sole	0.990	0.000	0.000	0.000	0.000	0.001	0.009	0.000	0.000	0.000
Rock Sole	0.807	0.000	0.000	0.000	0.000	0.000	0.000	0.193	0.000	0.000
Rockfish Unid	-	-	-	-	-	-	-	-	-	-
Rosethorn Rockfish	0.944	0.000	0.001	0.040	0.000	0.000	0.005	0.008	0.000	0.002
Rosy Rockfish	-	-	-	-	-	-	-	-	-	-
Rougheye/Blackspotted Rockfish	0.133	0.000	0.036	0.693	0.000	0.048	0.001	0.002	0.000	0.086
Sablefish	0.162	0.066	0.019	0.649	0.001	0.057	0.002	0.000	0.000	0.045
Sand Sole	0.796	0.000	0.000	0.000	0.000	0.000	0.000	0.204	0.000	0.000

Species / Sector (Washington)	Catch Shares	Catch Shares EM	LE Fixed Gear DTL	LE Sablefish	Midwater Hake	Midwater Hake EM	Midwater Rockfish	Midwater Rockfish EM	Nearshore	OA Fixed Gear
Sanddab Unid	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sharpchin Rockfish	0.958	0.000	0.000	0.004	0.000	0.000	0.025	0.014	0.000	0.000
Shelf Rockfish Unid	0.000	0.000	0.000	0.670	0.000	0.171	0.000	0.007	0.000	0.153
Shortbelly Rockfish	0.000	0.000	0.000	0.000	0.000	0.961	0.005	0.034	0.000	0.000
Shortraker Rockfish	0.203	0.000	0.014	0.659	0.000	0.012	0.068	0.000	0.000	0.044
Shortspine Thornyhead	0.506	0.003	0.016	0.430	0.000	0.000	0.031	0.000	0.000	0.013
Shortspine/Longspine Thornyhead	-	-	-	-	-	-	-	-	-	-
Silvergray Rockfish	0.921	0.000	0.000	0.015	0.000	0.056	0.006	0.002	0.000	0.000
Slope Rockfish Unid	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
Soupfin Shark	0.000	0.000	0.000	0.000	0.164	0.816	0.000	0.020	0.000	0.000
Speckled Rockfish	-	-	-	-	-	-	-	-	-	-
Spiny Dogfish Shark	0.140	0.000	0.000	0.000	0.000	0.803	0.000	0.037	0.000	0.019
Splitnose Rockfish	0.968	0.000	0.000	0.001	0.000	0.024	0.000	0.006	0.000	0.000
Spotted Ratfish	0.914	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.086
Squarespot Rockfish	-	-	-	-	-	-	-	-	-	-
Starry Flounder	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Starry Rockfish	-	-	-	-	-	-	-	-	-	-
Stripetail Rockfish	-	-	-	-	-	-	-	-	-	-
Tiger Rockfish	0.000	0.000	0.000	0.909	0.000	0.000	0.000	0.000	0.000	0.091
Treefish Rockfish	-	-	-	-	-	-	-	-	-	-
Vermilion Rockfish	-	-	-	-	-	-	-	-	-	-
Widow Rockfish	0.000	0.000	0.000	0.000	0.001	0.117	0.135	0.746	0.000	0.000
Yelloweye Rockfish	0.009	0.000	0.000	0.930	0.000	0.000	0.000	0.003	0.000	0.058
Yellowmouth Rockfish	0.001	0.000	0.000	0.005	0.000	0.065	0.000	0.929	0.000	0.000
Yellowtail Rockfish	0.008	0.000	0.000	0.001	0.007	0.676	0.038	0.270	0.000	0.000

Table 4. Annually summarized boundaries (fm) for the non-trawl Rockfish Conservation Area (RCA) off the West Coast of the United States, over the past ten years, 2017 through June of 2024 (bold font indicates data years used in the present analysis). The structure of the RCA was quite constant over the years included in the analysis, but has changed somewhat in 2024 north of 34°27' N lat., to decrease fishing in much of the southern nearshore, while at the same time opening more of the central shelf (seaward side of RCA) to fishing. Adapted from Jessi Doerpinghaus' historical RCA summary tables.

	2024	2023	2022	**2021**	**2020**	**2019**	**2018**	**2017**
North of 46°16' N. lat. (WA/OR border)	Shoreward EEZ-100	shore - 100	shore - 100	shore - 100	shore - 100	shore - 100	shore - 100	shore - 100
42° - 46°16' N. lat. (WA/OR to OR/CA border)	30-75	30-100	30 - 100*	30 - 100*	30 - 100	30 - 100	30 - 100	30 - 100
40°10' - 42° N. lat. (N/S Management line - OR/CA border)	Shoreward EEZ-75							
38°57' - 40°10' N. lat. (Pt. Arena, CA - N/S Management line)	Shoreward EEZ-75	40 - 125	40 - 125	40 - 125	40 - 125	40 - 125	40 - 125	30 -125; 40 - 125
37°07' N. lat. - 38°57' N. lat. (Pt. Arena, CA)	Shoreward EEZ-75	50 - 125	50 - 125	50 - 125	40 - 125	40 - 125	40 - 125	30 -125; 40 - 125
34°27' N. lat. (Point Conception, CA) - 37°07' N. lat.	50-75							
South 34°27' N. lat. (+ islands; S. of Pt. Conception, CA)	100-150	100-150	100-150	100-150	75 - 150	75 - 150	75 - 150	75 - 150

*except between 30-40 fm, certain gear types allowed.

Appendix A. SQL script used to query PacFIN landings.

```
SELECT T.AGENCY_CODE AS "AGENCY_CODE",
      ROUND(SUM(T.ROUND_WEIGHT_MTONS),4) AS "ROUND_WEIGHT_MTONS",
      T.NOMINAL_TO_ACTUAL_PACFIN_SPECIES_NAME AS "NOMINAL_TO_ACTUAL_PACFIN_SPECIES_NAME",
      T.MANAGEMENT_GROUP_CODE AS "MANAGEMENT_GROUP_CODE",
      T.COUNCIL_CODE AS "COUNCIL_CODE",
      T.DAHL_GROUNDFISH_CODE AS "DAHL_GROUNDFISH_CODE",
T.FOS_GROUNDFISHSECTOR_CODE,
      T.PACFIN_YEAR AS "PACFIN_YEAR",
      T.PACFIN_GROUP_GEAR_CODE AS "PACFIN_GROUP_GEAR_CODE"
  FROM NWFSC.COMPREHENSIVE_FT_WITH_FOS_CODES T
 WHERE T.PACFIN_YEAR BETWEEN 2015 AND 2021
   AND T.COUNCIL_CODE = 'P'
   AND T.MANAGEMENT_GROUP_CODE = 'GRND'
 GROUP BY T.AGENCY_CODE,
         T.NOMINAL_TO_ACTUAL_PACFIN_SPECIES_NAME,
         T.MANAGEMENT_GROUP_CODE,
         T.COUNCIL_CODE,
         T.DAHL_GROUNDFISH_CODE,
       T.FOS_GROUNDFISHSECTOR_CODE,
         T.PACFIN_YEAR,
         T.PACFIN_GROUP_GEAR_CODE
```

Appendix B. Mean annual total catch (mt) and coefficient of variance (CV), including estimated discard mortality (GEMM) by species, apportioned by state according to landings distributions (PacFIN). Estimates include only the specific, major shorebased commercial groundfish sectors listed in the Methods section.

Species	California		Oregon		Washington	
	Mean	CV	Mean	CV	Mean	CV
Arrowtooth Flounder	48.676	43.1%	877.382	32.0%	31.345	104.6%
Aurora Rockfish	10.209	57.9%	22.960	52.2%	3.348	123.7%
Bank Rockfish	33.375	17.6%	1.932	26.4%	0.049	146.6%
Big Skate	26.347	16.9%	133.654	34.1%	8.603	183.3%
Black and Yellow Rockfish	16.140	14.4%	0.014	132.9%	0.000	-
Black Rockfish	42.293	15.9%	116.265	13.2%	0.002	173.3%
Black Skate	2.853	146.5%	0.000	-	0.000	-
Blackgill Rockfish	42.810	35.6%	4.315	81.8%	0.076	175.8%
Blue/Deacon Rockfish	17.771	9.1%	7.152	20.5%	0.000	-
Bocaccio Rockfish	299.736	32.4%	24.240	68.7%	5.536	72.0%
Brown Rockfish	19.818	5.7%	0.050	98.6%	0.000	-
Butter Sole	0.000	-	0.007	189.9%	0.000	-
Cabezon	23.087	9.3%	27.248	14.5%	0.000	-
Calico Rockfish	0.018	181.8%	0.000	-	0.000	-
California Scorpionfish	0.764	86.2%	0.000	-	0.000	-
California Skate	1.176	69.9%	0.000	-	0.000	-
Canary Rockfish	120.894	36.3%	216.597	25.4%	43.783	119.5%
Chameleon Rockfish	0.008	223.6%	0.000	-	0.000	-
Chilipepper Rockfish	526.522	50.9%	40.877	38.6%	0.005	137.1%
China Rockfish	1.991	56.8%	6.512	19.3%	0.000	-
Copper Rockfish	14.217	21.1%	2.055	13.3%	0.000	-
Cowcod Rockfish	0.940	74.5%	0.024	75.4%	0.000	-
Curlfin Sole	0.470	93.9%	0.091	108.1%	0.000	-
Darkblotched Rockfish	23.604	40.9%	234.001	18.5%	12.706	74.1%
Dover Sole	1,587.077	16.4%	3,917.582	28.6%	250.345	58.2%
English Sole	98.184	48.4%	121.292	24.5%	2.447	80.8%
Flag Rockfish	0.206	45.1%	0.000	-	0.000	-
Flatfish Unid	0.547	84.5%	4.072	55.4%	0.215	107.1%
Flathead Sole	0.001	223.6%	23.172	52.7%	0.000	-
Freckled Rockfish	0.003	223.6%	0.000	-	0.000	-
Gopher Rockfish	27.984	8.6%	0.051	42.0%	0.000	-
Grass Rockfish	9.643	10.4%	0.093	65.6%	0.000	-

Species	California		Oregon		Washington	
	Mean	CV	Mean	CV	Mean	CV
Greenblotched Rockfish	0.741	147.9%	0.000	-	0.000	-
Greenspotted Rockfish	4.591	90.0%	0.316	174.1%	0.001	148.2%
Greenstriped Rockfish	6.588	58.9%	37.152	30.1%	1.340	126.7%
Grenadier Unid	14.401	33.8%	2.843	193.6%	0.000	-
Groundfish Unid	0.000	-	0.356	93.7%	0.000	-
Harlequin Rockfish	0.000	-	0.009	146.1%	0.013	223.6%
Honeycomb Rockfish	0.026	101.7%	0.000	-	0.000	-
Kelp Greenling	2.282	28.0%	9.788	30.4%	0.000	-
Kelp Rockfish	0.979	19.7%	0.000	-	0.000	-
Leopard Shark	0.607	136.1%	0.000	-	0.000	-
Lingcod	234.098	17.5%	353.333	18.7%	61.513	110.3%
Longnose Skate	137.704	16.4%	490.144	15.7%	67.428	58.2%
Longspine Thornyhead	220.605	98.1%	182.523	121.4%	3.707	73.3%
Mexican Rockfish	0.528	176.6%	0.000	-	0.000	-
Nearshore Rockfish Unid	0.551	170.8%	0.000	-	0.000	223.6%
Olive Rockfish	1.951	75.9%	0.014	109.4%	0.000	-
Pacific Cod	0.000	223.6%	11.812	147.5%	1.113	62.8%
Pacific Grenadier	8.349	140.8%	0.000	-	0.000	-
Pacific Hake	85.057	51.3%	117,441.156	23.1%	19,818.742	137.4%
Pacific Ocean Perch	0.362	78.2%	280.303	77.6%	44.465	109.7%
Pacific Sanddab	53.198	51.6%	42.313	47.5%	0.000	-
Petrale Sole	635.290	16.4%	1,794.288	11.5%	151.697	39.4%
Pink Rockfish	0.007	192.2%	0.000	-	0.000	-
Pinkrose Rockfish	0.004	223.6%	0.000	-	0.000	-
Pygmy Rockfish	0.000	-	0.000	223.6%	0.000	-
Quillback Rockfish	3.645	34.5%	2.513	22.2%	0.000	-
Redbanded Rockfish	10.147	18.1%	17.205	17.5%	11.579	45.3%
Redstripe Rockfish	0.000	-	35.408	30.1%	3.169	93.4%
Rex Sole	81.501	22.2%	338.714	24.4%	7.262	57.3%
Rock Sole	0.324	65.2%	0.756	58.5%	0.004	211.1%
Rockfish Unid	0.017	202.0%	0.000	-	0.000	-
Rosethorn Rockfish	0.220	45.3%	6.624	46.5%	7.096	174.4%
Rosy Rockfish	0.547	41.2%	0.001	138.0%	0.000	-
Rougheye/Blackspotted Rockfish	1.001	63.0%	44.621	26.2%	24.741	60.8%
Sablefish	1,446.463	15.7%	2,504.868	10.0%	641.668	18.9%
Sand Sole	0.180	151.0%	1.197	193.0%	0.002	210.2%
Sanddab Unid	0.487	128.2%	0.000	-	1.205	223.6%

Species	California		Oregon		Washington	
	Mean	CV	Mean	CV	Mean	CV
Sharpchin Rockfish	0.028	141.7%	32.460	100.6%	1.320	195.3%
Shelf Rockfish Unid	7.095	91.5%	16.377	82.1%	0.006	150.3%
Shortbelly Rockfish	2.584	78.9%	281.613	56.8%	6.027	124.4%
Shortraker Rockfish	0.082	49.9%	5.398	27.9%	3.921	73.9%
Shortspine Thornyhead	246.492	42.2%	415.086	40.7%	26.261	47.7%
Shortspine/Longspine Thornyhead	1.314	136.8%	0.000	-	0.000	-
Silvergray Rockfish	0.382	210.8%	37.299	122.9%	16.687	173.7%
Slope Rockfish Unid	4.723	84.9%	5.768	45.4%	0.003	223.6%
Soupfin Shark	5.177	64.6%	0.221	104.2%	0.115	134.3%
Speckled Rockfish	0.640	84.7%	0.000	-	0.000	-
Spiny Dogfish Shark	122.576	84.5%	337.749	70.6%	89.888	99.9%
Splitnose Rockfish	15.388	90.9%	79.939	19.4%	8.571	163.7%
Spotted Ratfish	31.307	87.5%	49.038	69.1%	6.769	76.5%
Squarespot Rockfish	0.075	60.0%	0.000	-	0.000	-
Starry Flounder	0.640	181.2%	1.692	174.4%	0.013	223.6%
Starry Rockfish	1.484	58.0%	0.000	-	0.000	-
Stripetail Rockfish	18.793	73.7%	33.909	76.5%	0.000	-
Tiger Rockfish	0.058	131.8%	0.299	22.2%	0.000	199.2%
Treefish Rockfish	2.533	15.2%	0.000	-	0.000	-
Vermilion Rockfish	55.170	24.3%	3.238	12.2%	0.000	-
Widow Rockfish	147.026	51.0%	7,465.646	17.9%	1,316.418	47.8%
Yelloweye Rockfish	1.448	131.9%	1.420	110.5%	0.267	192.8%
Yellowmouth Rockfish	0.154	223.1%	17.945	85.7%	4.704	222.8%
Yellowtail Rockfish	18.902	61.8%	2,470.217	19.7%	489.680	53.9%