

Appendix B

**Preliminary Draft California Quillback
Rockfish Rebuilding Plan Analysis**

June 2024

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Executive Summary

The California stock of quillback rockfish (*Sebastes maliger*) status was determined as overfished by the Secretary of Commerce in December 2023. In March 2024, the Council adopted the California quillback rockfish rebuilding analysis which specified the following rebuilding parameters: TMIN = 2045, TMAX = 2071, mean generation time of 26 years.

In April 2024, the Council adopted the acceptable biological catch (ABC) Rule rebuilding strategy (i.e., Alternative 2) as their preliminary preferred alternative (PPA). This rebuilding plan analysis examines Alternative 2 in comparison to Alternative 4, or “F = 0”. The ABC rule allows for annual catch limits (ACLs) of 1.3 mt and 1.5 mt for 2025 and 2026, respectively, and increases as the stock rebuilds; whereas, the F = 0 strategy has an ACL of 0 mt until the stock is rebuilt.

Alternative Rebuilding Strategies

The Council is considering two California quillback rockfish rebuilding strategies in this document, Alternative 2 (the ABC Rule) and Alternative 4 (F = 0). Alternative 2 (PPA), the “ABC rule” rebuilding strategy, sets ACL equal to the ABC with management risk tolerance ($P^* = 0.45$) and the scientific uncertainty (time-varying sigma) reduction applied to the overfishing limit (OFL). As shown TABLE ES 1, Alternative 2 rebuilds the stock by 2060 with 73.6 percent probability of rebuilding by 2071, T_{MAX}. (TABLE ES 1).

Alternative 4 (F = 0) represents a harvest strategy that achieves zero fishing mortality. The stock has a median time of rebuilding the stock in the minimum amount of time, i.e., by 2045 with 99.9 percent probability of rebuilding by 2071 (T_{target}) and a 99.9 percent probability of rebuilding by 2071 (T_{MAX}) (TABLE ES 1). The stock is removed from the nearshore rockfish complexes north and south of 40°10' N lat. for purposes of rebuilding

TABLE ES 1. Alternative 2025 and 2026 harvest specifications (mt) and harvest control rules (HCR) for California quillback rockfish.

Alternative	2025			2026			Harvest Control Rule
	OFL (mt)	ABC (mt)	ACL (mt)	OFL (mt)	ABC (mt)	ACL (mt)	
Alternative 2 <i>Preliminary Preferred</i>	1.52	1.30	1.30	1.77	1.49	1.49	ABC ($P^*=0.45$), ACL (ABC rule); Median time to rebuild: T _{TARGET} 2060
Alternative 4	1.52	1.30	0	1.81	1.54	0	ABC (F = 0), ACL (SPR=1); Median time to rebuild: T _{TARGET} 2045

The Council considered but removed Alternative 1 and Alternative 3 from further analysis for use as rebuilding strategies for the California quillback rockfish stock in this rebuilding plan. Alternative 1 uses the quillback rockfish off California default HCR for 2023-24 management cycle of ABC ($P^* = 0.45$), SPR = 0.55. Alternative 1 would rebuild the stock by 2062, with a 69.4

percent probability of rebuilding by 2071 (T_{MAX}). However, the Council rejected Alternative 1 as compared to Alternative 2 because Alternative 1 delays rebuilding by two years and with a lower probability of rebuilding by T_{MAX} . Thus, Alternative 2 allows for slightly better utilization of the resource, while providing a similar timeline and likelihood of achieving the stock's rebuilding goals.

Alternative 3 is where the ABC value is the result of a 2025 OFL of 8.41 with a category 3 buffer using a $P^*=0.40$ to obtain to $ABC = 5.06$ mt (@Agenda Item E.2.a. Supplemental CDFW Report 2, November 2023). The harvest specification values in Alternative 3 are beyond the scope of that found in the 2023 rebuilding analysis, represent harvest levels beyond what would appear biologically reasonable for a rebuilding population, and do not meet the Magnuson-Stevens Fishery Conservation and Management Act (MSA) rebuilding requirements. Thus, Alternative 3 was not selected for further consideration.

Additionally, the No Action alternative, which reflects harvest specifications and management measures that were in place for the 2023-24 biennium, was not adopted. No Action does not reflect the best scientific information available (BSIA) and does not take the stock's status of overfished into account. Thus, this alternative is not consistent with the MSA.

Impacts of the Alternatives on the Stock

The projected rebuilding probabilities under all alternatives are shown above in TABLE ES 1(based on values in Table 3; Langseth, 2023). In brief, Alternative 2 represents a 73.6 percent probability of rebuilding the stock by 2071 and Alternative 4 represents a 99.9 percent probability by 2071. Probabilities represent the proportion of rebuilding analysis simulations that reach the target spawning output by the specified year. Both alternatives rebuild the stock, the primary difference between the two is Alternative 4 rebuilds the stock approximately 15 years faster than Alternative 2.

California quillback rockfish are caught in non-groundfish incidental fisheries that are outside of the Pacific Fishery Management Council's (Council) and the National Marine Fisheries Services' (NMFS) purview. This potentially affects the timeline for rebuilding because the assumption of zero mortality would be violated each year incidental mortality in non-groundfish fisheries occurs.

As a general note, California quillback rockfish inhabit nearshore waters, with the majority of fishing mortality occurring in State waters (0-3 nautical miles from shore). Per 16 U.S.C. 1851(a)(3), the Council and NMFS are required to manage stocks throughout their range. The Council and NMFS only have the authority to implement fishery management regulations in Federal waters, and the State of California has discretion to implement management complementary to Federal action or other management actions in its State waters. Although mortality of quillback rockfish off California in both Federal (3-200 nm) and State waters would be accounted for up to the ACL, this rebuilding plan would be in effect only in the EEZ. Therefore, analysis of the effects of the management measures contained in this rebuilding plan will be limited to the portion of the stock's range found in the EEZ. Whether similar rebuilding measures are enacted in State waters by the State of California is outside the scope of this action. However, because this is a trans-boundary stock, whether or not rebuilding can be achieved in the proposed timeline depends on the State of California implementing management in its waters to complement this Federal action.

Impacts of the Alternatives

Regardless of the rebuilding strategy the Council ultimately adopts for California quillback rockfish, reductions in groundfish fishery opportunities in many California coastal communities will likely ensue in the 2025-2026 biennium and beyond and likely be economically, financially, and socially disruptive with long-lasting impacts (e.g., loss of infrastructure). As noted above, the actual impacts of this rebuilding action are constrained to the portion of fisheries activity that occurs in the EEZ, where quillback rockfish is co-occurring with other target species; which is a small part of this stock's range based on commercial and recreational fishing activity data as proxy. Whether or not the State of California will implement complementary management actions that similarly restrict fishing activity in State waters is unknown and is outside the scope of the impacts considered here. Commercial and recreational fishing activities in California yield well over a billion dollars annually in impacts to communities (NMFS, 2024). Rebuilding measures are likely to compound the impacts already being experienced by these communities and groundfish participants as they have faced recent declines and changes in other fisheries (e.g., Federal disaster declarations for salmon, red sea urchin, Pacific sardine in California, and delayed/shortened Dungeness crab seasons).

In short, the social and economic differences between the two rebuilding alternatives evaluated are hard to quantify because the future impacts are uncertain for three major reasons. First, the response of the stock to rebuilding efforts and the time needed for rebuilding is uncertain. Second, there is uncertainty in this stock's response to management measures and other future changes to the fishery and/or ecosystem. The third major source of uncertainty is fishery participant behavior.

This uncertainty is further complicated by California's diverse coastline and the many ports along the coast with variable infrastructure, ranging from heavily industrialized to small, localized ports. However, a diverse selection of ports along the California coast with both commercial and recreational infrastructure, and that are known to be ports of historical importance to fishing, were analyzed to evaluate rebuilding impacts. California quillback rockfish commercial fishery landings and ex-vessel revenue make up a small portion of each port complex's total revenue generated by rockfish for the entire groundfish management group. Nevertheless, based on the analysis, the Council and NMFS determined that ports would see reduced profits under Alternative 2 or could be required to forgo profits of all groundfish fisheries under Alternative 4, in order to reduce California quillback rockfish mortality to zero.

In the commercial groundfish fishery, California quillback is primarily caught by the Open Access (OA), Limited Entry Fixed Gear (LEFG), and the Nearshore sectors. However, the majority of the nearshore sector activity generally occurs within State waters and is therefore not part of this action. Due to difficulties separating fishing activity in that sector between State and Federal waters, we are unable to differentiate the likely impacts of the rebuilding action in the nearshore fishery. Accordingly, the actual impact of implementing the alternative rebuilding strategies analyzed here could be more than reported, if, for example, California did not adopt complementary management measures. The LEFG, OA, and nearshore recreational fisheries were negatively impacted by Federal and State management measures (trip limits, time/area closures, etc.) put in place in September 2023 to reduce impacts to California quillback rockfish. These measures were continued into 2024 and are expected to have similar impacts, as 2023, to these fisheries. These three non-trawl sectors will continue to be impacted in 2025 and beyond if the

Council adopts Alternative 2, and to a greater extent, if the Council adopts Alternative 4. Alternative 4 would likely result in the prohibition of all groundfish fishing along the California coast, and thus by significantly limiting opportunities in other fisheries, it could require participants to find alternative sources of income. It is uncertain whether participants who leave the fishery would ever re-enter (be it before or after California quillback rockfish is declared rebuilt), especially as the future opportunities in salmon, crab, and other interlinked fisheries remain uncertain. Under Alternative 2, the trawl fishery would likely not be restricted relative to California quillback rockfish, but it would be impacted under Alternative 4. Historically, this fishery has limited catches of California quillback rockfish, with zero catch in many years, but not all. Therefore, in order to achieve the $F = 0$ strategy in Alternative 4, the Council would need to place restrictions on the trawl fishery off of California.

Historically, California quillback rockfish mortality has been higher in the recreational groundfish sector than in the commercial sectors, and for anglers, the groundfish fishery, particularly rockfish, has provided a consistent source for fishing opportunity. The management measures under Alternative 2 are proposed to be the same as in 2024 (see [Agenda Item F.6, Attachment 2, June 2024](#) for detail), which allows for some fishing under strict time/area/depth restrictions. Alternative 4 would result in negative impact to the fishery as it would close all recreational fishing in the EEZ off of California. While Alternative 2 offers restrictions to anglers, it is not as restrictive as Alternative 4.

Short Term Community Impacts (2025-26 Biennium)

Alternative 2 maintains some groundfish opportunity for the 2025-26 biennium under restrictions implemented in 2023 and continued for 2024. These restrictions have already reduced commercial landings and ex-vessel revenue, and similar impacts could be anticipated in the next biennium. In contrast, Alternative 4 would likely require full groundfish fishery closures in Federal waters off California, and thus would result in disastrous short-term economic impacts to impacted fishing communities. It is important to note that the likelihood of short-term economic and social impacts to local fishing communities is also dependent on the State's decision to implement complementary management measures.

Alternative 2

Under Alternative 2, management measures for California quillback rockfish would be focused on the commercial non-trawl and recreational fisheries, as these fisheries generate the vast majority of impacts to this stock. Management measures implemented under Alternative 2 would resemble measures that were implemented in 2023 and 2024 to minimize California quillback rockfish encounters, which are described in more detail below. Additional inseason action may also be needed if catch limits are exceeded or projected to be exceeded. Impacts would predominantly affect Federal fixed gear vessels between 42° N. lat. and 37° 07' N. lat. and would not impact trawl vessels. Fixed gear vessels operating in the Individual Fishing Quota (IFQ) fishery (i.e., "gear switchers") would be impacted by the area-based restrictions under Alternative 2, because they are subject to the non-trawl Rockfish Conservation Area (RCA). Non-trawl commercial fisheries south of 37° 07' N. lat. would be prohibited from retaining California quillback rockfish, but area-based trip limits and depth restrictions are not expected to be imposed.

The 2024 commercial management measures to minimize California quillback rockfish impacts imposed gear type requirements¹ for non-trawl vessels targeting groundfish, when fishing shoreward of 75 fathoms north of 37° 07' N. lat., thereby concentrating non-trawl commercial effort onto the continental shelf. Continuation of this change in gear type means that, in many cases, in order to continue fishing in Federal waters shoreward of 75 fathoms, fishery participants would have to deploy a new gear type. It is reasonable to assume that there would be a learning curve that might negatively impact profits within this fishery until participants learn the gear. In addition, commercial vessels fishing outside of State waters must have a vessel monitoring system (VMS), which could represent a new cost for vessels that only previously fished in State waters. For those vessels that were historically fishing shoreward of 75 fathoms, and who are unable to adopt the new gear requirement, fuel costs and encounters with inclement weather would likely increase as those vessels are forced to fish farther offshore. While OA vessels have generally fished shallower than LEFG vessels in the past, these measures may concentrate LEFG and OA vessels into the same area. These impacts would be expected to continue into 2025 and beyond under the Alternative 2 ABC rule rebuilding strategy.

Compared to Alternative 4, however, Alternative 2 allows commercial vessels to continue fishing and maintains some level of co-occurring target stock utilization as California quillback rockfish rebuilds. Fishery participants would not lose all sources of groundfish revenue, and thus there is the potential for shoreside infrastructure to remain intact and stable, which would better ensure that there would be buyers and processors ready to receive the benefits of a rebuilt stock by the end of the rebuilding period.

The economics of recreational fishing impacts from the alternative California quillback rockfish rebuilding strategies are difficult to estimate. However, in the most general sense a reduction in overall fishing effort is likely to result in negative economic impacts to revenue in local communities, through reductions in goods and services provided to recreational anglers (e.g., launch fees, fuel, lodging, etc.). For recreational fisheries, Alternative 2 would maintain the depth restrictions and a zero (0) California quillback rockfish sub-bag limit adopted for 2024. The California recreational fishery would have no access to nearshore areas in the EEZ for 2025-26, and would only have short periods allowed in the offshore-only fishery. Similar to the commercial fishery, while Alternative 2 imposes some restrictions to minimize California quillback rockfish mortality, it also allows anglers to continue fishing for other target species and thus does not entirely eliminate all opportunity. Alternative 2 therefore provides economic benefits to ports and their communities by providing nearshore opportunities in lieu of a full fishery closure in the EEZ.

Alternative 4

Under Alternative 4, all directed groundfish fishing sectors in California would be impacted to accomplish the California quillback rockfish rebuilding strategy. Alternative 4 would likely prohibit all commercial groundfish fishing in Federal waters off California at all depths. Likewise, this alternative would fully close recreational groundfish fishing in all marine areas at all depths in Federal waters off the State. The economic impact to communities due to a recreational groundfish closure is difficult to estimate; however, based on Fisheries Economics of the United States, 2022 (NMFS 2023) it is reasonable to assume the impacts would be substantial Statewide.

¹ Legal non-bottom contact hook-and-line gear are allowed in the non-trawl RCA ([50 CFR 660.330\(b\)\(3\)](#)).

Some communities may be more or less impacted than others. But, these complete and/or near-complete closures of Federal groundfish fisheries would have devastating impacts to fishery participants and coastal communities in California. For example, a complete closure of the commercial groundfish fishery off California under Alternative 4 could result in a potential yearly loss to California port communities of almost \$18 million dollars in ex-vessel revenue when compared to average landings from 2023-24 (TABLE ES 2). However, because much of this fishery is in State waters, the actual impact of the Federal action would only be a portion of that. Moreover, the management measures used to reduce the 10-year California quillback rockfish average yearly mortality in this area, which is currently 2 mt, to zero (0), would come at the potential loss of the catch of 1,841 mt of all other rockfish, or 6,314 mt of all other groundfish, per year (TABLE ES 2). Due to data difficulties (i.e., the data does not easily discern between State and Federal waters activity), these summaries include both State and Federal waters fishery activity, and therefore overestimate the likely impacts of this Federal action alternative. The likely long-term impacts of the alternatives, including infrastructure loss, are discussed in the following section

TABLE ES 2. Average yearly landings and ex-vessel revenue of California quillback rockfish compared to all rockfish landings (including cabezon, greenling, California scorpionfish, and lingcod) and all groundfish landings for 2014-23. Source PacFIN 4/24/24

	Quillback Rockfish (mt)	Rockfish (mt)	Groundfish (mt)	Groundfish Ex-Vessel Revenue (USD)
42° to 40° 10' N. lat.	1.33	620	2,921	\$4,851,445
40° 10' to 37° 07' N. lat	0.92	793	2,162	\$5,124,627
37° 07' N. lat. to the US Mexico Border	<0.01	427	1,230	\$7,777,678
Total	2.25	1,841	6,314	\$17,753,750

< [value] indicates a confidential value due to data limitations.

Long Term Community Impacts

California has many ports with variable infrastructure, ranging from heavily industrialized (e.g., Los Angeles harbor) to small, localized ports (e.g., Shelter Cove). For a variety of California ports, engagement and reliance scores are given for both commercial and recreational fisheries using United States Census Bureau data. For many ports off of California, fishery engagement is medium to high, while fishery reliance is low (both commercial and recreational). This is most likely driven by the high population density within those areas and the existence of a variety of industries in those ports (i.e., low reliance); meanwhile, the total number of fishing vessels and number of landings into those ports are generally high (i.e., high engagement) compared to ports off of Oregon and Washington, where a small number of large-volume landings are more common. This means that, while the economies in some California communities may be able to adapt to the long-term potential loss of commercial fishing engagement, a large number of participants and buyers in the fishery could be severely impacted long-term by fishing restrictions under the alternatives in this rebuilding plan, particularly under Alternative 4. Additionally, with the long-term potential loss of recreational engagement under the alternatives, a large number of businesses, patrons, and private anglers could be impacted long-term. It is important to note, however, that the likelihood of long-term economic and social impacts to California fishing communities is also dependent on

the State's decision to implement management measures complementary to Federal rebuilding strategies.

Alternative 2 would maintain some groundfish opportunity but at the cost of more time under the rebuilding restrictions, recognizing that given the small stock size and recent mortality trends of California quillback rockfish, it is not likely that all restrictions would be removed when the stock is rebuilt. Alternative 4 rebuilds California quillback rockfish faster than the Alternative 2 timeline. However, it is likely that more participants might be required to leave the fisheries, and more shoreside infrastructure may be lost under Alternative 4 than under Alternative 2, due to the large scale of the resulting closures in space and target species. Based on ad hoc conversations with commercial fishing industry members, it is unlikely that fishery participants who have taken a hiatus from fishing would re-enter the fishery once California quillback rockfish is rebuilt. Depending on the port community, when fishery participants leave, there is also a likelihood that infrastructure (e.g., ice houses, processors) would permanently leave these communities. Moreover, under either course of action (Alternative 2 or Alternative 4), once the California quillback rockfish stock is rebuilt, regulatory restrictions for California quillback rockfish would likely continue, as the predicted rebuilt stock B_{MSY} is expected to be lower than past California quillback rockfish mortality allocations prior to 2023. Based on this information, even when rebuilt, some groundfish fisheries are unlikely to be restored to levels typical of the years before the California quillback rockfish stock was declared overfished.

Below, long-term impacts to commercial port complexes and recreational management areas (MAs) under each of the two HCR alternatives (Alternative 2 and Alternative 4) are described in more detail.

Alternative 2

Commercial Port Complexes

Alternative 2 management measures are likely to mirror those implemented for 2024, which have already inflicted adverse economic impacts to California fishery participants and port economies. Those impacts are likely to continue into the future beyond the 2025-26 biennium, but it is difficult to predict long-term management measures throughout the entire rebuilding period as the ACL slowly increases. Alternative 2 would predominantly impact Federal fixed gear vessels in the long-term, as the vast majority of commercial mortality of California quillback rockfish comes from those fisheries. Alternative 2 better meets the needs of fishing communities in the short term by providing some fishing opportunities now, with a gradual increase in fishing opportunity throughout the rebuilding time frame (which is projected to be approximately 15 years longer than that of Alternative 4). This short-term benefit would come at the cost of access to co-occurring stocks in Federal waters in the 2045-2060 time frame, however, compared to Alternative 4. In other words, Federal fishery participants restricted by Alternative 2 management measures would not likely realize the benefits of a rebuilt stock until much later under Alternative 2, compared to Alternative 4.

Additionally, under Alternative 2, the long-term Federal nearshore restrictions could force some fixed gear vessels out of the groundfish fishery entirely, if those vessels are unable to learn and utilize a new gear type, or if the costs of fuel and the risk of inclement weather serve as barriers to a spatial effort shift toward offshore areas. Alternative 2 management measures could also shift

effort from northern areas subject to California quillback rockfish restrictions into Federal waters off the Central and Southern California coast. This effort shift, in conjunction with the opening of the Cowcod Conservation Areas through Amendment 32 to the Pacific Coast Groundfish Fishery Management Plan (Groundfish FMP), and the opening of the Non-Trawl RCA seaward of 75 fathoms, could concentrate effort south of 37° 07' N. lat., which may create unintended impacts that may need to be addressed using existing inseason management measures to control effort (e.g., trip limits, area closures, etc.).

Recreational Management Areas

Opportunity in nearshore waters close to coastal reefs is the primary driver of recreational groundfish effort and the social and economic benefits of recreational groundfish fishing in California. From 2013-2024, just over 71 percent of bottomfish trips took place within 3 miles of the coast. Therefore, the impact of this rebuilding plan on California recreational fisheries is limited to approximately 29 percent of the overall effort. Statewide, recreational fishery engagement and reliance vary. Overall, reliance on recreational fishing is low for most ports in California, whereas, engagement leans towards medium to medium high. Under the Alternative 2 some of the smaller communities (e.g., Crescent City, Fort Bragg, Bodega Bay, etc.) may be impacted by the proposed recreational season structure more so than other areas.

Under Alternative 2, each recreational fishery MA has a different season and depth structure, reflecting historical California quillback rockfish catch and angler effort for bottomfish. Management measures to achieve Alternative 2 include an “offshore only” season, which would require anglers to fish seaward of the 50 fathom RCA line. “Offshore-only” depth restrictions are effective at reducing recreational mortality of California quillback rockfish. However, because of localized variations in bathymetry, the presence or absence of rocky reefs outside of 50 fathoms, and the proximity of the 50-fathom line to shore, a season structure which restricts anglers to fishing grounds seaward of 50 fathoms would likely reduce effort as many private recreational vessels cannot access or fish the grounds beyond 50 fathoms safely. The majority of MAs contain a number of smaller launch sites where kayaks and other smaller vessels are the most effective means to access local reefs. In all MAs, the offshore-only fishery would likely eliminate effort by kayak fishing, which has increased significantly over the last 20 years, as kayaks are not often able to safely travel long distances from shore. Overall, decreases in fishing effort would have a negative economic impact to revenue in local communities, through reductions in goods and services provided to recreational anglers (e.g., launch fees, fuel, lodging, etc.). However, alternative fishing target opportunities (e.g., salmon, Pacific halibut) could offset some of these negative impacts due to groundfish effort reductions, at times when those fisheries are not restricted as well.

Alternative 4

Commercial Port Complexes

Under Alternative 4, it is likely all directed commercial groundfish fishing in the EEZ off of California would be prohibited. Due to the uncertainty around the true range of the California quillback rockfish stock, with references saying that the geographic range extends southward in California to Anacapa Island (34° N. lat.) and that California quillback rockfish can be found deeper than 75 fathoms (Love et al., 2002), extending the area and/or depth closures for the stock beyond the current 2024 restrictions would need to be considered by the Council to achieve $F = 0$.

Management measures for the entire Federal groundfish fishery would also need to be enacted to reduce mortality of California quillback rockfish to zero. As a result, Alternative 4 would have substantial adverse economic impacts to all commercial and recreational groundfish sectors in California. Further, it is unlikely that an $F = 0$ scenario would be reached even with Alternative 4 in this rebuilding plan, given the historical mortality of California quillback rockfish in other non-groundfish fisheries outside the jurisdiction of the Council and NMFS.

Loss of the Federal groundfish fishery in California would likely reduce, and potentially eliminate, infrastructure (e.g., processors, port services, etc.) linked to groundfish. Given the timeline to rebuild this stock, it is foreseeable that other community interests would likely integrate into the port areas (i.e., industry replacement). Densely populated ports with high property value such as San Francisco would see the loss of fishing infrastructure at a faster rate than less populated areas, and be less likely to return to fishing infrastructure if ports were to become restaurants and apartment buildings. Following rebuilding, port communities could select for a known economic return rather than re-establish an unknown economy from fisheries, which would result in the loss of historic fishing communities to development.

Fishing engagement and dependence, along with social vulnerability, can be an indicator of long-term community impacts from a complete loss of fishing in a port. The two port complexes in northern California, Crescent City and Eureka, have a medium and low dependency on the commercial fishing industry, respectively, and rate moderate to high on the social vulnerability scale. The three more northerly port complexes in Central California (area between $40^{\circ} 10'$ and $37^{\circ} 07'$ N. lat.), Fort Bragg, Bodega Bay, and San Francisco, have a medium and low dependency on the commercial fishing industry, respectively, and have high to low social vulnerability as latitude decreases (Table 9). These port complexes rely heavily on Dungeness crab, and to a lesser extent salmon and groundfish, with the exception of Fort Bragg, which is unique as it derives more proportional ex-vessel revenue from groundfish than any other port besides Eureka. The five port complexes in the area between $37^{\circ} 07'$ N. lat. and the U.S./Mexico Border, Monterey Bay, Morro Bay, Santa Barbara, Los Angeles, and San Diego, have a high to low dependency on the commercial fishing industry. They rate moderate to low on the social vulnerability scale, with the exception of Moss Landing and Los Angeles, which rate high to medium high. Due to rare encounters with quillback rockfish south of Point Conception, it is unclear whether impacts from a rebuilding plan will be experienced in all port complexes. However, to achieve $F = 0$, Federal recreational groundfish fisheries in Monterey Bay, Morro Bay, Santa Barbara, Los Angeles, and San Diego would likely be closed as well. Commercial quillback rockfish encounters are extremely rare south of Point Conception, but not zero, therefore these ports may also need to be closed to commercial groundfish fishing along with more centrally located ports.

Recreational Management Area

Under Alternative 4, all Federal marine areas would be closed to recreational groundfish fishing, with social and economic impacts commensurate with community dependence. For areas more reliant on bottomfish trip types, the impact could be greater compared to ports with more diverse targets. Businesses that are centered on marine recreational groundfish fisheries (e.g., tackle shops, charter boats, etc.) would likely see adverse economic impacts, and businesses (e.g., hotels, restaurants, etc.) that are linked to marine recreational groundfish fisheries could be negatively

impacted, as well. In the long term, as the stock recovers, it is uncertain what fisheries, areas, etc., could reopen.

As noted above, fishing engagement and dependence, along with social vulnerability, can be an indicator of long-term community impacts from a complete loss of groundfish fishing. A low reliance rating suggests significant social and economic impacts to these communities may not result from regulatory changes. These management/port areas may be more diversified, in terms of other industries available to residents, and thus could potentially withstand impacts from recreational fishery regulatory changes (including closures). In northern California, the ports of Crescent City and Eureka were identified as having high and medium high social vulnerability, respectively. Both exhibit medium recreational engagement; whereas, Crescent City displays medium reliance on recreational fisheries and Eureka has low reliance. The Mendocino MA encompasses the major ports of Shelter Cove and Fort Bragg, with several rural ports (e.g., Albion). Shelter Cove and Fort Bragg were identified as having medium social vulnerability and medium reliance on groundfish in the recreational fisheries. Within the San Francisco MA, the major ports of Bodega Bay and San Francisco are both identified as having low social vulnerability, while they diverge relative to recreational engagement and reliance. Bodega Bay scores low and medium high, respectively, with San Francisco scoring the opposite. This area is unique in that San Francisco Bay offers additional fishing alternatives, when other fisheries are closed or when weather is inclement. The Central MA encompasses a number of major recreational ports, including Santa Cruz, Monterey, Avila Beach, and Morro Bay, plus rural landings. Except for Moss Landing, these ports have low social vulnerability and low reliance on recreational fishing. The community reliance on recreational fishing in the Southern MA is generally low. However, Oxnard and Los Angeles, have medium high vulnerability. This MA also represents the largest population center in California and a far greater amount of boat-based effort is exerted in this MA, than in MAs north of Point Conception.

1. Introduction

This document constitutes the analysis in support of the rebuilding plan for the California stock of quillback rockfish. The status of the California stock of quillback rockfish (*Sebastes maliger*) was determined as overfished by the Secretary of Commerce ([Agenda Item F.2, Attachment 2, March 2024](#)) according to the “applicable minimum stock size threshold” (MSST) as described in Section 4.5 of the Pacific Coast Groundfish Fishery Management Plan (hereinafter FMP). In brief, that section describes that the term “overfished” is where a stock’s abundance is below its overfished threshold, or MSST. The default value of this threshold is 25 percent of the estimated unfished spawning output level for non-flatfish stocks or 50 percent of the level that would produce maximum sustainable yield (B_{MSY}), if known. The FMP defines a proxy value for B_{MSY} of 40 percent of unfished spawning output for non-flatfish stocks. The 2021 assessment ([Langseth et al., 2021](#)) estimated the California stock of quillback rockfish (hereafter “California quillback rockfish”) population to be at 14 percent of the unexploited equilibrium spawning output at the start of 2021 ([Langseth et al., 2021](#)) estimated the California stock of quillback rockfish (hereafter “California quillback rockfish”) population to be at 14 percent of the unexploited equilibrium spawning output at the start of 2021 (Figure 1). Per the Magnuson-Stevens Fishery Conservation and Management Act (MSA) Section 304(e)(3), the Council is required to prepare and implement a FMP Amendment specifying the rebuilding plan for the California stock of quillback rockfish.

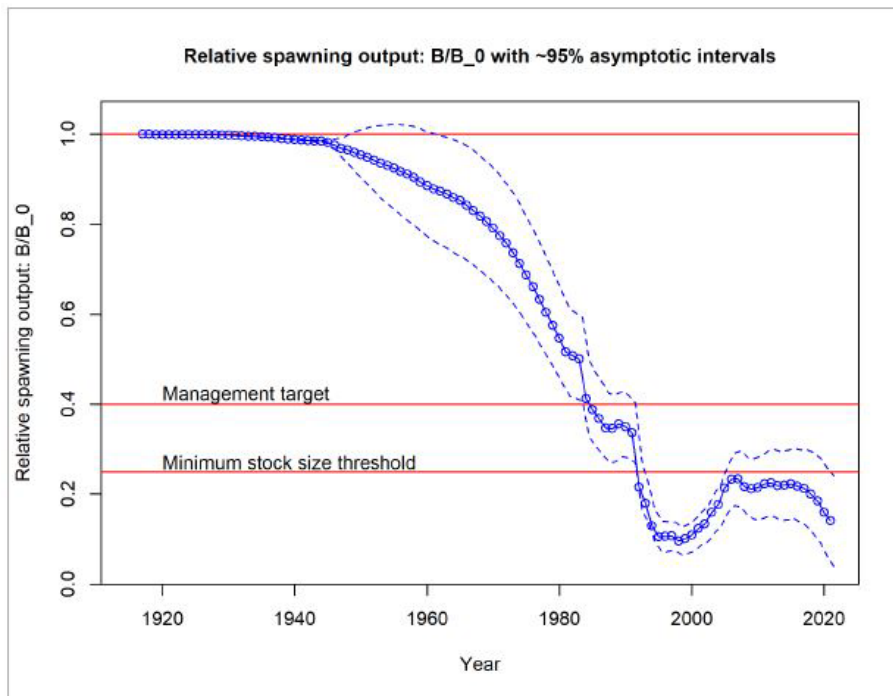


Figure 1. Estimated time series of relative spawning output from Langseth et al., 2021, Figure 24.

1.1 Action Area

The proposed action area is the Exclusive Economic Zone (EEZ) off of the State of California.



Figure 2. Action area for the California stock of quillback rockfish rebuilding plan, the entire EEZ , i.e., 3 to 200 nm, seaward of California State territorial waters.

1.2 Purpose and Need of the Proposed Action

The purpose of this action is to rebuild the California stock of quillback rockfish, which was declared as overfished by the Secretary of Commerce, to sustainable levels in as short a time as possible. See 16 U.S.C. § 1854(e)(4)(i). The proposed action is needed because MSA § 304(e)(3) requires Regional Fishery Management Councils to “prepare a fishery management plan, plan amendment, or proposed regulations” in order to prevent overfishing and to implement a plan to rebuild the overfished stocks. [MSA § 304\(e\)\(3\)](#) requires the Council to prepare and implement a plan amendment or proposed regulations within two years of notification that a stock is overfished.

Rebuilding plans are mandated when the size of a stock or stock complex falls below a level described in the FMP as the MSST. Regardless of the cause of the decline, fishing mortality needs to be controlled to prevent further deterioration in the condition of the stock, and if the stock has been overfished, to allow it to rebuild. Rebuilding plans specify a time period for rebuilding and the management actions being taken to rebuild an overfished stock. Both the procedural provisions and the standards established for rebuilding plans must meet the requirements of the MSA, in particular, National Standard 1 and § 304(e). Rebuilding plans must also be consistent with the relevant FMP goals and objectives.

Preventing overfishing also means returning stocks to a size capable of achieving maximum sustainable yield (MSY). Finally, Council actions should be submitted to National Marine Fisheries Service (NMFS) within 15 months of the overfished notification to ensure sufficient time for the Secretary to implement the rebuilding measures, if approved ([50 CFR 600.310\(j\)\(2\)\(ii\)](#)).

1.3 Stock Rebuilding Plans

The FMP discusses stock rebuilding plans at [§4.6.3](#), which is incorporated by reference. Briefly, for a stock that is overfished, the rebuilding plan will specify a time period for ending the overfished condition and rebuilding the stock. Overfishing restrictions and recovery benefits should be fairly and equitably allocated among sectors of the fishery.

1.4 Requirements for Rebuilding Plans

National Standard Guidelines specify how rebuilding should occur and, in particular, establish constraints on Council action (50 CFR §660.310(e)). Rebuilding should bring stocks back to a population size that can support MSY (B_{MSY}). A rebuilding plan must specify a target year (T_{TARGET}) for rebuilding based on the time required for the stock to reach B_{MSY} . This target is bounded by a lower limit (T_{MIN}) defined as the time needed for rebuilding in the absence of fishing (i.e., $F = 0$). Rebuilding plans for stocks with a T_{MIN} less than ten years must have a target rebuilding time of less than or equal to ten years. If, as is the case with most of the groundfish stocks considered in this amendment to the FMP, the biology of a particular species dictates a T_{MIN} of ten years or greater, then the maximum allowable rebuilding time, T_{MAX} , is the rebuilding time in the absence of fishing (T_{MIN}) plus “one mean generation time.” Mean generation time is a measure of the time required for a female to produce a reproductively-active female offspring (Pielou, 1977; and especially Restrepo et al., 1998), calculated as the mean age of the net maternity function (product of survivorship and fecundity at age). The MSA states that a stock’s rebuilding time should be as short as possible, taking into account the status and biology of the overfished stock and the needs of fishing communities (See §304(e)(A)(i)). In most cases, because of the biology of the stocks and the needs of fishing communities, the rebuilding time, or the target year, will be greater than the minimum rebuilding time

1.5 Contents of Rebuilding Plans

This document follows the detailed contents of a rebuilding plan, as described in §4.6.3.2 in the FMP, which is incorporated by reference.

1.6 History of Action

Quillback rockfish was assessed in 2021 using a length-based data-moderate method, which is included by reference (Langseth et al., 2021). The Scientific and Statistical Committee (SSC) reviewed the assessment in June 2021 and endorsed it as the best scientific information available (BSIA) and suitable to inform management ([Agenda Item G.5.a, Supplemental SSC Report 1, June 2021](#)). The SSC noted the estimated stock size of California quillback rockfish to be below the MSST ([Agenda Item G.5.a Supplemental SSC Report 1, June 2021](#)), indicating it is overfished. A rebuilding analysis was conducted and submitted to the Council at the September 2021 meeting under [Agenda Item G.5, Attachment 10, June 2021](#) and recommended by the SSC ([Agenda Item C.6.a Supplemental SSC Report 1, September 2021](#)). The Council referred the assessment to the Groundfish Subcommittee (GFSC) of the SSC for further review in September 2021. The SSC

determined the results of the rebuilding analysis, per the recommendations of the GFSC, to be technically correct ([Agenda Item E.2.a. Supplemental SSC Report 1, November 2021](#)). The Council then adopted the stock assessment and the rebuilding analysis at their November 2021 meeting.

The next step was for NMFS to determine the status of quillback rockfish based on the stock assessment results. In March 2021, the Council was informed by NMFS that it needed to correct the FMP to define stocks of managed groundfish species ([Agenda Item E.3.a, NMFS Report 1, March 2022](#)). Briefly, the FMP at that time did not define stocks of managed species. Therefore, the status of California quillback rockfish could not be determined until the stock was defined in the FMP, which [Amendment 31](#) accomplished.

Despite not being declared overfished, the Council took precautionary measures to reduce impacts on California quillback rockfish for the 2023-24 biennium. The Council adopted Alternative 1, HCR is $ACL < ABC$ ($P^* = 0.45$), $SPR = 0.55$, for the California quillback rockfish harvest specifications at their June 2022 meeting, under Agenda Item F.6., as their final preferred alternative (FPA) (refer to [Informational Report 2, September 2022](#)). As quillback rockfish was not yet deemed State-specific stocks (see Amendment 31), it remained in the nearshore rockfish complexes north and south of $40^{\circ} 10' N$. lat. The California assessment was used to develop harvest specifications for the species contribution to the stock complexes using the aforementioned HCR. However, to specify the California contribution to the complexes, the harvest specification, 49.6 percent of the OFL from the assessment was apportioned from 42° to $40^{\circ} 10' N$ lat. and 50.4 percent of the OFL from the assessment was apportion south of $40^{\circ} 10' N$ lat. These apportionment ratios were based on the estimated average 2002-2020 total catch by area. Additionally, for waters off of California, the Council implemented an annual catch target (ACT) set equal to the combined Statewide ACL contributions to the nearshore rockfish complexes (Table 1). The Council also adopted a 75 lbs. bimonthly trip limit for the fixed gear commercial fishery and a 1 fish bag limit for the recreational fishery. These harvest specifications and management measures are detailed in [Informational Report 2, September 2022](#).

Table 1. The 2023-24 estimated and summed California quillback rockfish contributions (ACL contribution $SPR 0.55 < ABC$ $P^* = 0.45$) and ACTs (ACT = ACL contribution) to the nearshore rockfish complexes north and south of $40^{\circ} 10' N$. lat.

Specification	2023 (mt)	2024 (mt)
OFL	2.11	2.32
ABC	1.85	2.01
ACL Contribution	1.76	1.93
ACT	1.76	1.93

Amendment 31 defined quillback rockfish as State-specific stocks off of Washington, Oregon, and California, which allowed NMFS to determine the status of these stock units. In December 2023, the status of California quillback rockfish was determined to be overfished ([Agenda Item F.2, Attachment 2, March 2024](#)).

At the September 2023 meeting, the Council was informed by the California Department of Fish and Wildlife (CDFW) that the 2023 California quillback rockfish ACT was exceeded ([Agenda](#)

[Item G.8.a, CDFW Report 1, September 2023](#)) and that California had implemented actions to reduce impacts to the stock ([Agenda Item G.8.a, Supplemental CDFW Report 2, September 2023](#)). Following analysis by the Groundfish Management Team (GMT; [Agenda Item G.8.a, Supplemental Report 5, September 2023](#)), the Council adopted inseason actions for Federal waters off of California that were consistent to CDFW actions ([Agenda Item G.8.a, Supplemental Report 5, September 2023](#)). In brief, these actions reduced the commercial trip limit and recreational bag limit to zero. Further, recreational groundfish fishing shoreward of the 50 fathom non-trawl rockfish conservation area (RCA) was prohibited and area-based gear-specific trip limit restrictions were placed on the fixed gear commercial fishery.

In September 2023, under Agenda Item G.6 Initial Harvest Specifications and Management Measures Actions for 2025-26, the Council expressed concerns regarding the assumed removals for 2023 and 2024 applied in the updated rebuilding analysis. The GMT's recommended removal assumption for 2024 in the rebuilding analysis was 10.62 mt, which was based on the 2023 Groundfish Multiyear Report (GEMM, [Agenda Item G.1.b, NWFSC Report 1, September 2023](#); [Agenda Item E.2.a, Supplemental GMT Report 2, November 2023](#)). The methodology used to develop this value is described in [Agenda Item E.2, Supplemental GMT Report 1, November 2023](#). At that time, additional inseason actions were being considered in response to the ACT being exceeded for California quillback rockfish – actions that were expected to reduce mortality for the remainder of 2023 and for 2024. Given these concerns, CDFW recommended a removal assumption of 6.32 mt in 2024 ([Agenda Item G.6, Supplemental CDFW Report 1, September 2023](#)). In response, the Council recommended the Northwest Fishery Science Center (NWFSC) complete an alternate run of the rebuilding analysis using an alternate quillback rockfish removal assumption based on expected inseason actions, i.e., the CDFW removal assumption.

In November 2023, the Council reviewed the draft 2023 California quillback rockfish rebuilding analysis, with the alternate rebuilding removal assumption (i.e., the CDFW removal assumptions) included as a separate appendix ([Agenda Item E.2, Attachment 1, November 2023](#)). The SSC endorsed the rebuilding analysis as BSIA and concurred with the GFSC that the analysis was conducted in accordance with the [Terms of Reference \(TOR\)](#) for Groundfish Rebuilding Analysis ([Agenda Item E.2.a, Supplemental SSC Report 1, November 2023](#)). However, the SSC did not make recommendations on the removal assumptions. The Council postponed adoption of the 2023 rebuilding analysis (based on the 2021 assessment) and requested an additional SSC review of the public comments submitted by Dr. Ray Hilborn and Dr. Mark Maunder [via a [letter submitted by J.T. Hobbs](#)] regarding the 2021 stock assessment.

Also in November 2023, as part of developing the range of 2025-26 harvest specifications and management measures, CDFW recommended the Council consider managing California quillback rockfish contributions to the nearshore rockfish complexes north and south of 40° 10' N. lat. with a 2025 OFL specification of 8.41 mt and a category 3 buffer using a $P^*=0.40$ to obtain an ABC of 5.06 mt [$ABC = 8.41 * 0.602 = 5.06$] ([Agenda Item E.2, Supplemental CDFW Report 2, November 2023](#)). CDFW recommended this be added to the range of HCRs) considered for the 2025-26

biennium. Thus, a range of four action alternatives² for the 2025-26 California quillback rockfish OFL, ABC, and ACL values were adopted for overwinter analysis:

- Alternative 1 - ACL SPR = 0.55 < ABC P* 0.45,
- Alternative 2 - the ABC rule, P* 0.45,
- Alternative 3 - CDFW alternative, and
- Alternative 4 - F = 0.

In November 2023, the Council adopted inseason adjustments by extending the duration of several measures implemented through the September 2023 ([G.8.a. Supplemental GMT Report 2, September 2023](#)) inseason action, with the goal of minimizing the mortality of California quillback rockfish (detailed in [E.9.a. Supplemental GMT Report 1, November 2023](#)) in limited entry (LE) and open access (OA) groundfish fisheries in 2024. The majority of the management measures implemented through the 2023 inseason actions are for the area between 42° N. latitude and 36° N. latitude, between the depths of 30 and 50 fathoms, where California quillback rockfish are most abundant. In November 2023, the inseason action expanded the RCA to include all Federal waters shoreward of 75 fathoms. Based on analysis conducted by the GMT at the November 2023 meeting ([E.9.a. Supplemental GMT Report 1, November 2023](#)), the Council recommended revising some of the measures implemented through the September 2023 inseason action to reduce discard mortality of California quillback rockfish, while further narrowing the scope of restrictions and minimizing the economic impact to fishing communities to the extent possible ([88 FR 90127, January 1, 2024](#)). Additionally, on November 8, 2023, NMFS approved Amendment 31 to the PCGFMP, which defined California quillback rockfish as a stock in need of conservation and management (November 16, 2024; [88 FR 78677](#)).

In December 2023, NMFS determined that the 2021 California quillback rockfish stock assessment and the 2023 rebuilding analysis are BSIA. Also in December 2023, NMFS determined that California quillback rockfish is overfished and notified the Council via letter of the necessity to develop a rebuilding plan ([Agenda Item F.2, Attachment 2, March 2024](#)).

In January 2024, the SSC GFSC conducted a review of the public comments submitted by Dr. Ray Hilborn and Dr. Mark Maunder, as requested by the Council in November. A Terms of Reference (TOR) was specifically developed for this review meeting to provide the Council with further guidance on using the existing 2021 assessment of California quillback rockfish and corresponding 2023 rebuilding analysis for decision-making. This additional GFSC review of public comment did not raise new information that either had not been considered by the GFSC and SSC during its past reviews, or which suggested that the approach taken by the stock assessment team did not follow the TOR and accepted practices guidelines, or which indicated that there were data that could have been included in the assessment at the time it was conducted that were not considered ([SSC GFSC report, March 2024](#)).

At the March 2024 Council meeting, the GFSC and the SSC again recommended use of the 2021 stock assessment and adoption of the 2023 rebuilding analysis for California quillback rockfish as BSIA ([Agenda Item F.7.a, Supplemental SSC Report 1, March 2024](#)). The Council adopted the

² [Table 5 and 4, Agenda Item E.2, Attachment 1, November 2023](#) and [Agenda Item E.2.a, Supplemental CDFW Report 2, November 2023](#)

2023 rebuilding analysis for California quillback rockfish, as described in [Agenda Item F.2, Attachment 1, March 2024](#), with the original GMT removal assumptions. The Council also affirmed the range of 2025-26 harvest specifications to be included in the rebuilding analysis, based on the range developed in November (see Table 1 in [Agenda Item E.7.a, Supplemental GMT Report 1 November 2023](#)).

In April 2024, the Council adopted the ABC rule (Alternative 2) as PPA for the California quillback rockfish rebuilding strategy and removed the default HCR (Alternative 1) and the California Department of Fish and Wildlife (CDFW) proposal (Alternative 3) from further analysis. Final action on California quillback rockfish harvest specifications for 2025-26 and the associated rebuilding plan is scheduled for June 2024.

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2. Alternatives

2.1 *Rebuilding Analysis*

A draft California quillback rockfish rebuilding analysis was prepared in 2023 ([Langseth, 2023](#)) to examine a range of alternative rebuilding strategies and inform harvest specification decision-making, which is incorporated by reference. Based on the rebuilding analysis, California quillback rockfish are unable to rebuild within 10 years. T_{MAX} is the maximum time allowed for rebuilding, and is calculated as the T_{MIN} plus the mean generation time for stocks that require more than 10 years to rebuild. Mean generation time is the estimated time it takes a spawning female to be replaced by a spawning female in the next generation. For long-lived rockfish, the mean generation time plus T_{MIN} can provide an extended period to achieve rebuilding. The adopted California quillback rockfish rebuilding analysis specified resulting rebuilding parameters ($T_{MIN} = 2045$, $T_{MAX} = 2071$, mean generation time of 26 years). In the rebuilding analysis, a $P^* = 0.45$ was used to generate harvest specifications. The use of this P^* was the default for quillback rockfish, as specified [2015 “Harvest Specifications and Management Measures for 2015-2016 and Biennial Periods Thereafter Environmental Impact Statement](#) (hereinafter “2015 EIS”, PMFC 2015) That document noted that ACLs for most species are determined based on the ACLs being set equal to the ABCs with a P^* value of 0.45. The Council for both the 2023-24 and the 2025-26 biennia did not request analyses of different P^* values for this stock. As such, the P^* remained as the default 0.45.

2.2 *Rebuilding Options*

At the April 2024 meeting, the Council adopted the following rebuilding plan harvest specifications for analysis, as described in [Agenda Item F.2, Supplemental Revised Attachment 1, April 2024](#). The analyses for these alternatives are detailed above in [Agenda Item F.6, Attachment 2, June 2024](#) which is incorporated by reference, though summarized here.

- **Alternative 2:** the “ABC rule” rebuilding strategy, in which the ACL is set equal to the ABC given a selected management risk tolerance ($P^* = 0.45$) and time-varying scientific uncertainty ($\sigma = 1.0$) reduction applied to the OFL
- **Alternative 4:** $F = 0$, i.e., no fishing mortality

The rebuilding analysis assumes these HCRs persist through the course of rebuilding the California quillback rockfish population. However, long-term management strategies for California quillback rockfish may be revisited during each biennial management cycle undertaken by the Council. The T_{TARGET} indicates the rebuilding target year in which the stock would be rebuilt and is associated with each potential rebuilding strategy for consideration by the Council. The target year for rebuilding (T_{TARGET}) must fall between T_{MIN} and T_{MAX} .

As a general note, Quillback rockfish inhabit nearshore waters, with the majority of fishing mortality occurring in State waters (0-3 nautical miles from shore). Per 16 U.S.C. 1851(a)(3), the Council and NMFS are required to manage stocks throughout their range. The Council and NMFS only have the authority to implement fishery management regulations in Federal waters, and the State of California has discretion to implement management complementary to Federal action or

other management actions in its State waters. Thus, this rebuilding plan would be in effect only in the EEZ, even though mortality of quillback rockfish off California in both Federal (3-200 nm) and State waters would be counted towards the ACL. Whether similar rebuilding measures are enacted in State waters by the State of California is outside the scope of this action. However, because this is a trans-boundary stock, whether or not rebuilding can be achieved in the proposed timeline depends on the State of California implementing management in its waters to complement this Federal action.

2.3 Alternatives Considered But Not Analyzed Further.

The Council requested analysis of a range of rebuilding strategies for policy consideration as part of the 2025-26 groundfish harvest specifications and management measure process ([Agenda Item F.6, Attachment 2, June 2024](#)). The requested rebuilding strategies were Alternatives 1 through 4, with Alternative 1 as the default HCR and Alternatives 2 and 4 as the Alternatives described above (i.e., ABC rule and $F = 0$). Alternative 3 included harvest specifications that were proposed by CDFW ([Agenda Item E.2.a, Supplemental CDFW Report 2 Nov 2023](#)).

Alternative 1 for California quillback rockfish represents the default HCR when taking into account BSIA and the status of the stock. Alternative 1 is projected to rebuild the stock with a 50 percent probability by 2062, within the statutory maximum time to rebuild of 2071 (T_{MAX}) and represents a 69.4 percent probability of rebuilding by 2071 (T_{MAX}). Alternative 1 under default HCR would have a slightly lower probability of rebuilding (69.4 percent) within the required timeline, compared to Alternative 2 (73.6 percent) with the ABC rule. Alternative 1 would also take two years longer (2062) for the stock to reach the target rebuilding level, compared to Alternative 2 (2060). Thus, in April 2024, the Council did not select Alternative 1 for further consideration. Additionally, the Council noted that overall trends represented by Alternative 1 (default) and Alternative 2 (ABC rule) harvest control rules were functionally identical, in that they did not deviate until well into the rebuilding period.

Alternative 3 harvest specifications for California quillback rockfish were proposed by CDFW during the November 2023 Council meeting. The Alternative 3 ABC value was the result of a 2025 OFL of 8.41 mt with a category 3 $\sigma=2.0$ and a $P^*=0.40$ applied to obtain an $ABC = 5.06$ mt [$ABC = 8.41 * 0.602 = 5.06$]. The harvest specification values in Alternative 3 were greater than those estimated in the adopted 2023 rebuilding analysis and represented harvest levels beyond what would appear biologically reasonable for a rebuilding population, and as such did not meet the MSA rebuilding requirements. Lastly, Alternative 3 was proposed for analysis prior to the Council officially adopting the 2023 rebuilding analysis. Thus, in April 2024, the Council did not select Alternative 3 for further consideration.

Additionally, No Action for the purposes of this rebuilding plan is the 2023-24 harvest specifications and management measures. No Action does not represent BSIA. Under No Action, the most recent scientific information has not been applied to the HCR per Amendment 24 to the FMP. Therefore, No Action is untenable for adoption. Further, No Action is not a rebuilding strategy, does not take the stock's status of overfished into account, and would not remove California quillback rockfish from the complex. Accordingly, this alternative is not consistent with the MSA and was not adopted for further analysis by the Council

2.4 Comparison of Rebuilding Strategies

The California quillback rockfish rebuilding analysis ([Langseth, 2023](#)) compares rebuilding strategies in Table 2 of that document. The Council considered a No Action and four harvest specification alternatives for California quillback rockfish. The Council, as discussed below, adopted Alternative 2 as their PPA and removed Alternative 1 and Alternative 3 from consideration as a final rebuilding strategy. This rebuilding plan analysis therefore examines Alternative 2 (PPA) and Alternative 4 in detail, while providing some information on the Council's prior comparison of Alternatives 1, 2 and 4 in Table 2 below.

No Action is not a tenable option, as it does not represent BSIA or take into account the stock's status. Alternative 1 represents the default HCR and uses the rebuilding strategy of $SPR = 0.55$, $ACL < ABC$, $P^* = 0.45$. Alternative 1 comports to the $SPR = 0.55$ rebuilding strategy, represents the stock as defined, and represents a management strategy for California quillback rockfish as a single stock. Therefore, for purposes of this rebuilding analysis Alternative 1 was considered the most comparable to Alternative 2 and Alternative 4.

Table 2. Harvest specifications for OFL and ACL resulting from rebuilding strategies based on Langseth (2023) given the assumed removals for 2021-2024.

Quillback Rockfish in CA	Harvest Control Rule a/		
	Alternative 1	Alternative 2	Alternative 4
	SPR 0.55	ABC Rule ($P^*=0.45$)	$F = 0$ (i.e., no fishing mortality)
2021 assumed removals (mt)	15.58	15.58	15.58
2022 assumed removals (mt)	18.11	18.11	18.11
2023 assumed removals (mt)	11.12	11.12	11.12
2024 assumed removals (mt)	10.62	10.62	10.62
2025 OFL/ACL (mt)	1.52/1.26	1.52/1.30	1.52/0
2026 OFL/ACL (mt)	1.77/1.47	1.77/1.50	1.81/0
SPR	0.55	-	1.0
T_{TARGET}	2062	2060	2045
T_{MAX}	2071	2071	2071
Probability of recovery by T_{MAX}	0.694	0.736	0.999

a/ Alternative 3 is not included in this table because it was not part of the range included in the rebuilding analysis.

Under an Alternative 1 strategy, California quillback is predicted to rebuild the stock by 2062 with an expected 69.4 percent probability of rebuilding by 2071 (T_{MAX}). The ACLs in 2025-26 under Alternative 1 are marginally less than those under Alternative 2 only differing in the hundred decimal position (e.g., 2025 Alt. 1 ACL = 1.26 mt versus Alt. 2 ACL = 1.30 mt). Across the rebuilding period, Alternative 1 is projected to rebuild the stock two years before Alternative 2. However, the probability that Alternative 1 rebuilds by T_{MAX} is 69.4 percent, slightly lower than the projected probability associated with Alternative 2 of 73.6 percent. Overall, there is no

substantive difference between these two Alternatives in terms of management and harvest specifications and a meaningful comparison between these two alternatives is limited because of their similarities. For example, the resulting difference in impacts to communities, both short and long term, between Alternatives 1 and 2 are negligible. Alternative 2 was selected by the Council as PPA in April 2024 because it provides slightly more fishing opportunity, and thus reduces impacts on fishing communities (even if minimally), without negatively impacting the Council's or the MSA's rebuilding goals. Therefore, this rebuilding plan analysis compares only Alternative 2 and Alternative 4 in detail.

Alternative 2 is described as the “ABC rule” rebuilding strategy, which is where the ACL is set equal to the ABC based on a pre-specified management risk tolerance (P^*) and the scientific uncertainty (σ) reducing the ABC from the overfishing limit (OFL). This calculation applies the ABC harvest rate with category 2 time-varying $\sigma = 1.0$ and a $P^* = 0.45$. The ABC rule has a 50 percent probability of rebuilding the stock by 2060 (Figure 3), within the statutory maximum time to rebuild of 2071 (T_{MAX}). The ABC rule rebuilding strategy allows for minimal harvest during rebuilding (Figure 4) and represents the strategy that is closest to the maximum time to rebuild. The Alternative 2 ABC rule has an expected 73.6 percent probability of rebuilding by 2071 (T_{MAX}) (Figure 5).

Alternative 4 is set at $F = 0$, which assumes no fishing mortality, has a 50 percent probability of rebuilding the stock by 2045 and a 99.9 percent probability of rebuilding by 2071 (T_{MAX} , Figure 6). This Alternative rebuilds the stock on the fastest schedule; however, it assumes that there would be no mortality in any fishery, groundfish or otherwise.

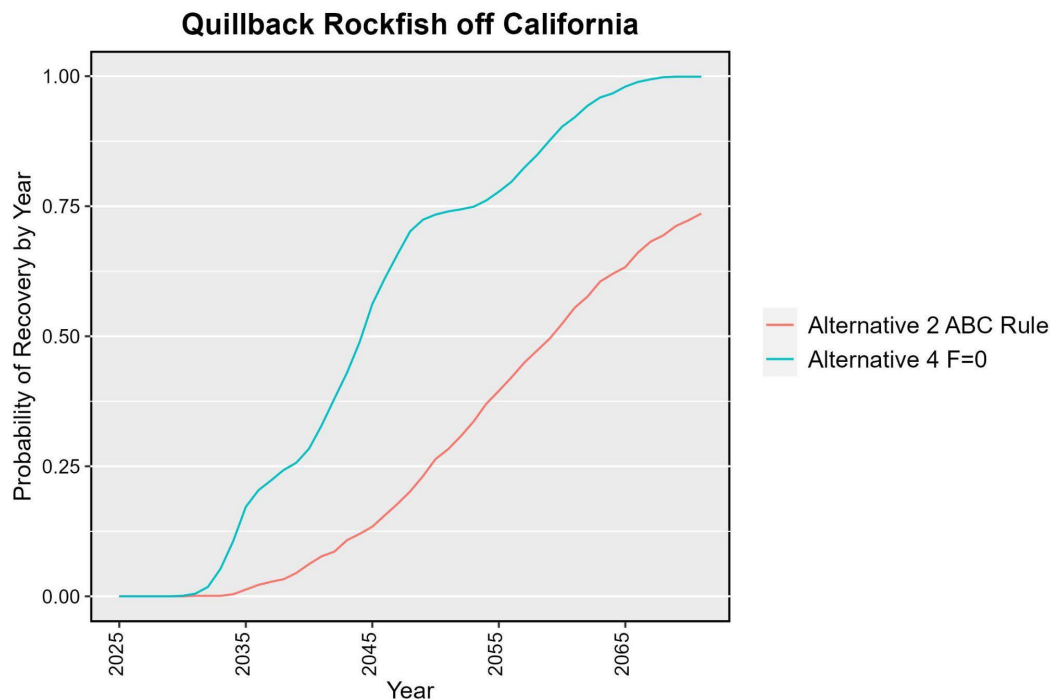


Figure 3. Projected probability of recovery by year of California quillback rockfish under each rebuilding strategy; Alternative 2 ABC rule and Alternative 4 with no fishing mortality ($F = 0$). Probabilities represent the proportion of simulations that reach the target spawning output (i.e., recovery) by the specified year.

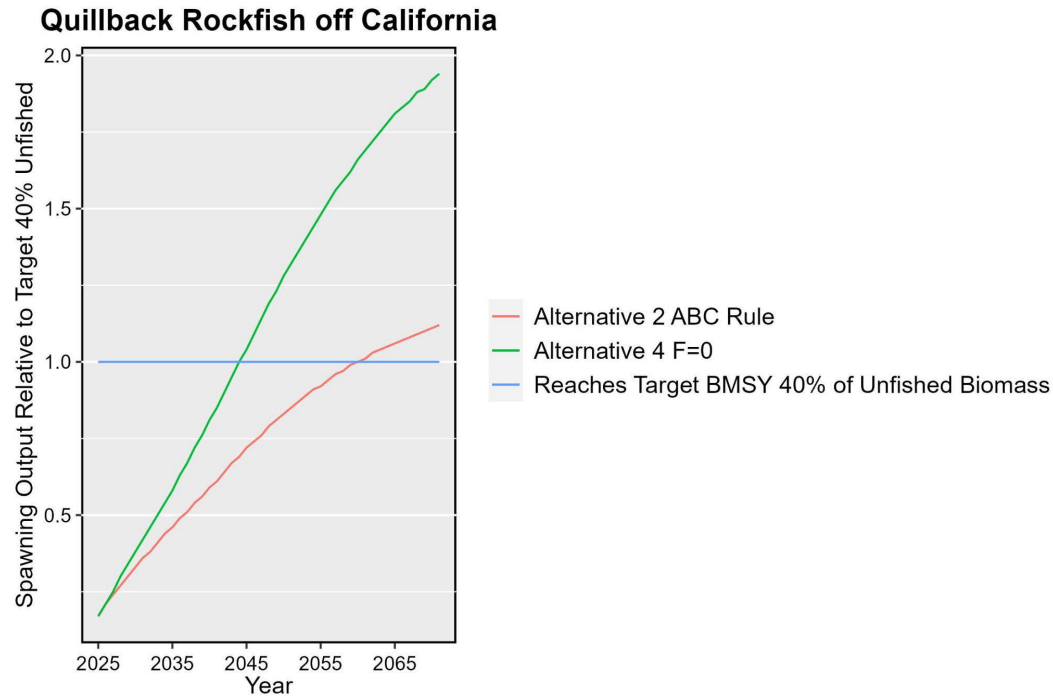


Figure 4. Projected spawning output relative to the target 40 percent unfished spawning output (i.e., value 1 = reached target), of California quillback rockfish under each rebuilding strategy; Alternative 2 ABC rule and Alternative 4 with no fishing mortality ($F = 0$).

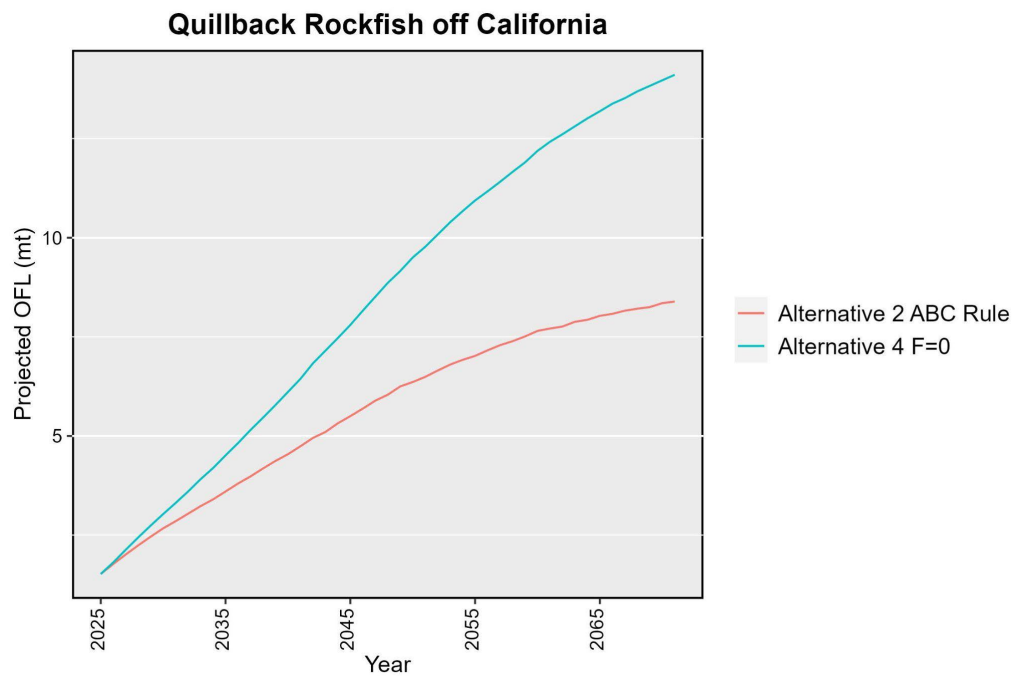


Figure 5. Projected overfishing limit (OFL; mt) of California quillback rockfish under each rebuilding strategy; Alternative 2 ABC rule and Alternative 4 with no fishing mortality ($F = 0$).

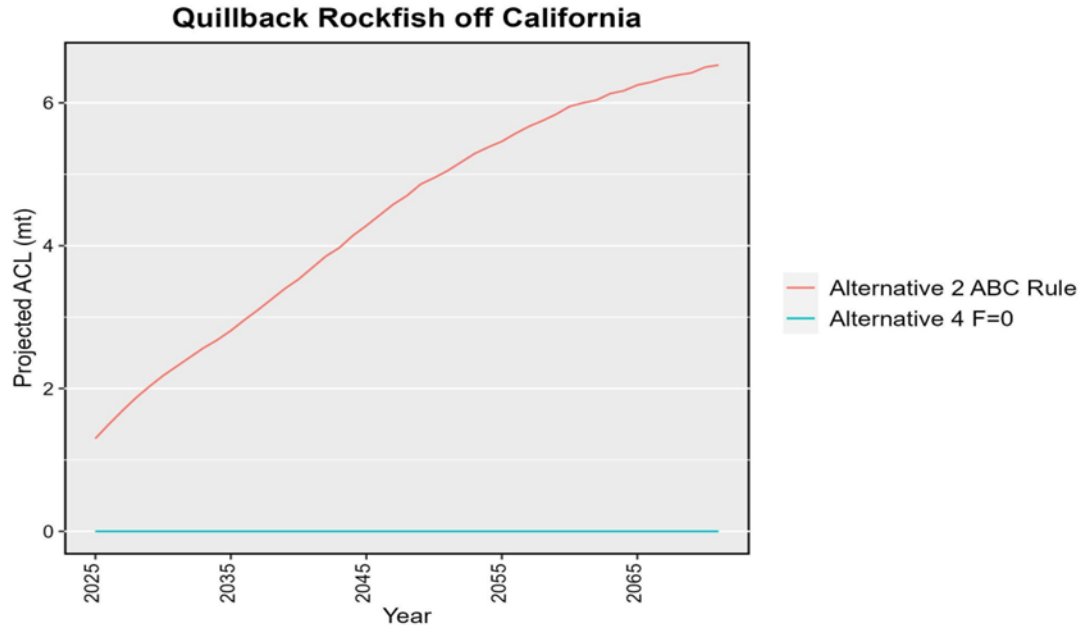


Figure 6 Projected annual catch limit (ACL; mt) of California quillback rockfish under each rebuilding strategy; Alternative 2 ABC rule and Alternative 4 with no fishing mortality ($F = 0$).

2.5 Alternatives Considered but Rejected

The biology and population dynamics of quillback rockfish are described in several documents, including the Groundfish Stock Assessment and Fishery Evaluation (SAFE) report (PFMC, 2022), the 2021 assessment (Langseth et al., 2021), and Amendment 31 (PFMC, 2023). These reports are incorporated by reference.

Quillback rockfish is a long-lived nearshore rockfish, which can live up to 95 years and is late to mature (Yamanako and Lacko, 2001; Love et al., 2002). The range of this species is from Kodiak Island, Alaska to Anacapa Island, California, though it is most common from southeast Alaska to central California (Love et al., 2002). Off of California, adult quillback rockfish are generally found in waters between 20-50 fathoms in nearshore kelp forests and rocky habitat (Love et al., 2002; Love, 2011).

In 2010, a productivity and susceptibility analysis conducted at a coastwide scale estimated quillback rockfish to have a vulnerability of major concern ($V = 2.22$, Cope et al., 2011). This analysis calculated species-specific vulnerability scores based on two dimensions: productivity characterized by life history and susceptibility characterized by how the stock is likely affected by fisheries.

3. Stock Status and Biology

3.1 Biology

The biology and population dynamics of quillback rockfish are described in several documents, including the Groundfish Stock Assessment and Fishery Evaluation (SAFE) report (PFMC, 2022), the 2021 assessment (Langseth et al., 2021), and Amendment 31 (PFMC, 2023). These reports are incorporated by reference.

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3.2 Assessment

Quillback rockfish was first assessed in 2010 using Depletion-Based Stock Reduction Analysis (DB-SRA) to provide estimates of coastwide OFLs (Dick and MacCall, 2010). The coastwide OFL was then apportioned to each management area based on the proportion of historical catches north and south of 40° 10' N. lat. It is important to note, the application of DB-SRA did not estimate a stock status, but rather assumed that depletion at that time was distributed around the management target (i.e., 40 percent of unfished spawning output). The 2010 assessment found there was a 52 percent probability that quillback rockfish was experiencing overfishing, as recent coastwide catches were greater than the estimated median coastwide OFL estimate from that analysis (Dick and MacCall, 2010).

The 2021 assessment of California quillback rockfish used a length-based data-moderate methodology (Langseth et al., 2021). This assessment was a single-sex model that included two fishing fleets (a recreational fleet and a commercial fleet), externally estimated biological relationships (length-weight, length-at-age, natural mortality, fecundity, and maturity), estimated asymptotic selectivity for each fishing fleet, assumed a Beverton-Holt stock recruitment relationship with fixed productivity (i.e., steepness of 0.72), and estimated annual recruitment deviations ([Agenda Item G.5.a, Supplemental SSC Report 1, June 2021](#)). Assumed biological parameters are provided below in Table 3. There was substantial uncertainty in the California model given sensitivity to assumed mortality parameters and the limited data in California. The assessment was assigned a category 2 designation (i.e., $\sigma = 1.0$). The assessment of California quillback rockfish estimated 2021 depletion (i.e., fraction of unfished spawning output) of 14 percent, below the MSST for rockfish (25 percent).

The SSC reviewed the 2021 assessment and endorsed it as BSIA for use in management and the Council adopted the assessment after considering several discussions presented in SSC statements and GFSC reports that are reflected in the record for Council meetings in June 2021 ([Agenda Item G.5.a Supplemental SSC Report 1](#)), September 2021 ([Agenda Item C.6.a Supplemental SSC Report 1](#)), and November 2021 ([Agenda Item E.2.a Supplemental SSC Report 1](#)). Those reports characterize the SSC’s conclusions about the assumptions, strengths, and limitations of the 2021 assessment. An additional review meeting conducted in January 2024 also clarifies SSC conclusions ([SSC GFSC report, March 2024](#)).

Table 3. Summary of key parameters in the 2021 assessment for California quillback rockfish.

Parameter	Value	Estimated or Fixed
Natural mortality yr ⁻¹	0.057	Fixed
Length at age (cm)		
von Bertalanffy k yr ⁻¹	0.199	Fixed
Asymptotic length (cm)	43.04	Fixed
Weight at length (kg)		
Coefficient	1.963 e-05	Fixed
Exponent	3.016	Fixed
Maturity at length (cm)		
Inflection (cm)	29.23	Fixed
Slope	-0.80	Fixed
Fecundity at length (cm)		
Inflection	3.93e-07	Fixed
Slope	3.702	Fixed
Stock-recruitment		
Ln(R ₀)	3.17	Estimated
Steepness (h)	0.72	Fixed
Variation in Recruitment (σ _R)	0.60	Fixed
Recruitment deviations	Annual deviations from the stock-recruitment curve	Estimated
Start Year for Early Deviations	1940	Fixed
Start Year for Main Deviations	1978	Fixed
End year for Deviations	2017	Fixed
Maximum Bias Adjustment	0.35	Fixed

3.3 Model sensitivity to stock-recruit steepness

The steepness of the stock-recruitment relationship, which determines the productivity of a fish population, is one of the key parameters for understanding the dynamics of the stock and determining projected rebuilding. The stock-recruit steepness represents the proportion of average unfished recruitment achieved at 20 percent of unfished spawning output and ranges from 0.2 to 1.0 (the higher value indicates the higher productivity of the stock). Reliable estimation of this parameter is dependent on long, contrasting time-series of stock-recruit data that are often not available (Hilborn and Walters, 1992; Conn et al., 2010). To date, the majority of groundfish assessments lack sufficient data to estimate steepness reliably, resulting in the parameter being fixed at an assumed value. Similar to other groundfish assessments, the assessment of California quillback rockfish was unable to reliably estimate this parameter due to the short time-series of data, which are primarily available after the estimated large declines in spawning output, and due to the continuous downward trajectory of the stock abundance. Therefore, steepness in the assessment model was fixed at the value of 0.72, which is the mean of the rockfish prior defined in the groundfish stock assessment TOR ([applicable version to 2021 assessment; December 2020](#)).

The impact to the assumed value of steepness was explored in the 2021 assessment through analysis of model sensitivity to alternative values, and through likelihood profile analyses. The likelihood profile for steepness from the 2021 assessment for California quillback rockfish is shown in Figure 7. The estimated negative log-likelihood declines indicate improved fits to the data with increasing values of steepness with the best fit to the data found with a value of 1.0, which is considered to be implausible for a slow-growing rockfish, implying that this parameter is unable to be estimated given the available data. The change in the estimated fraction of unfished spawning output across a range of steepness values is shown in Figure 7.

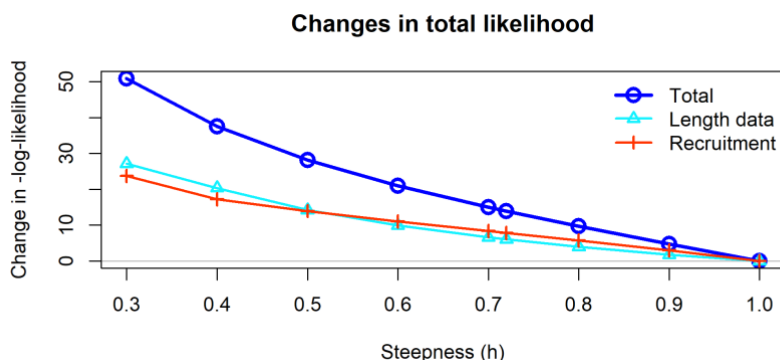


Figure 7. Negative log-likelihood profile in total and for each data type over the range of steepness from 0.3 to 1.0 by increments of 0.1 (from Langseth et al., 2021).

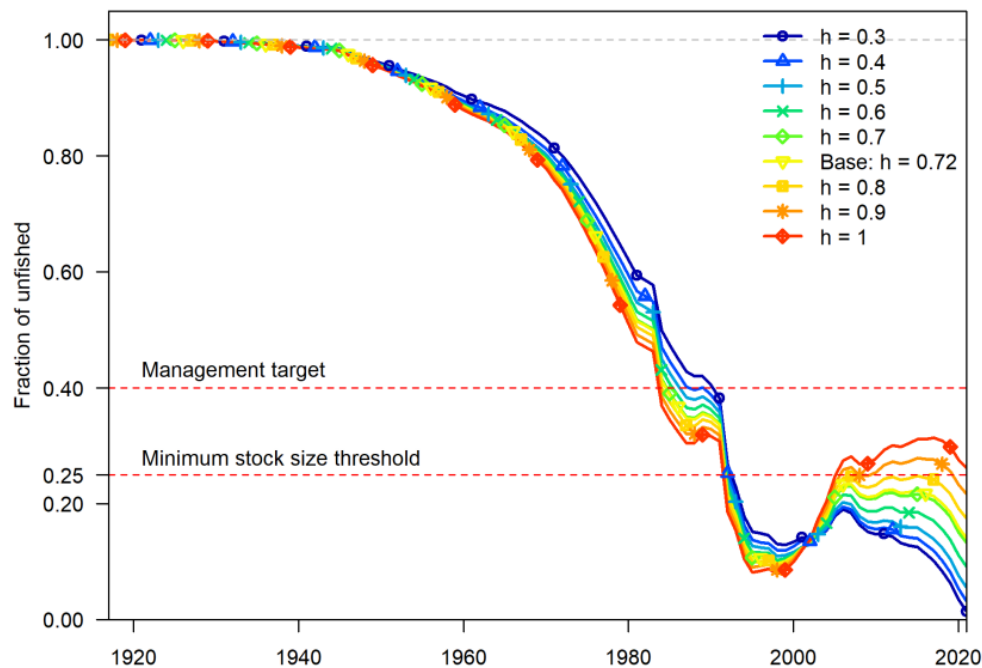


Figure 8. Time series of the estimated fraction of unfished spawning output associated with values of steepness ranging from 0.3 to 1.0 by increments of 0.1 (from Langseth et al., 2021).

Similar to steepness, natural mortality is often difficult to estimate based on available data and is often fixed within groundfish assessments. Quillback rockfish are a long-lived rockfish that are thought to live up to 95 years of age (Yamanako and Lacko, 2001; Love et al., 2002). Across the U.S. West Coast there are limited age data for quillback rockfish with the majority of these samples being collected in recent years, well after the peaks of high historical catches. Natural mortality was fixed in the model based on literature values of a maximum age of 95, resulting in an assumed natural mortality of 0.057 yr^{-1} . A likelihood profile and model sensitivities over natural mortality values were conducted in the 2021 assessment (Langseth et al., 2021). The likelihood profile over natural mortality supported higher values (i.e., a lower maximum age, Figure 9). This information is being informed primarily by the length data and the estimates of annual recruitments, which would be expected to contain limited data on natural mortality, particularly compared to age data which were not included in the base model. The estimated fraction unfished was also highly sensitive to assumptions about natural mortality (Figure 10).

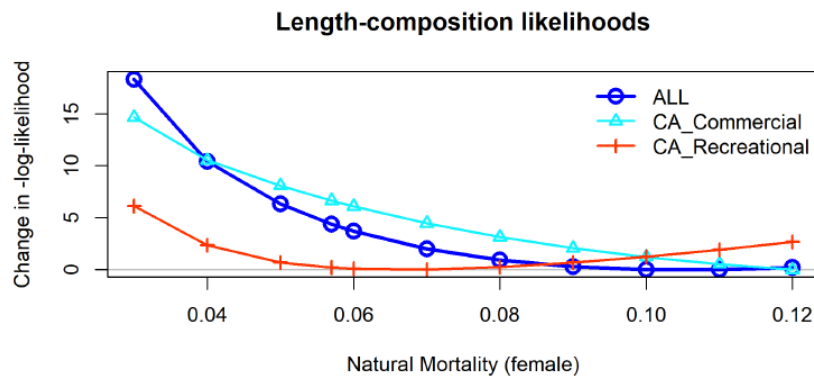
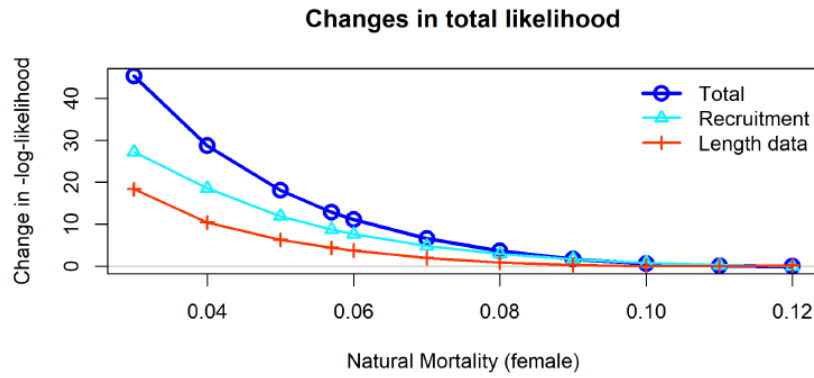


Figure 9. Negative log-likelihood profile in total and for each data type over a range of natural mortality values (from Langseth et al., 2021).

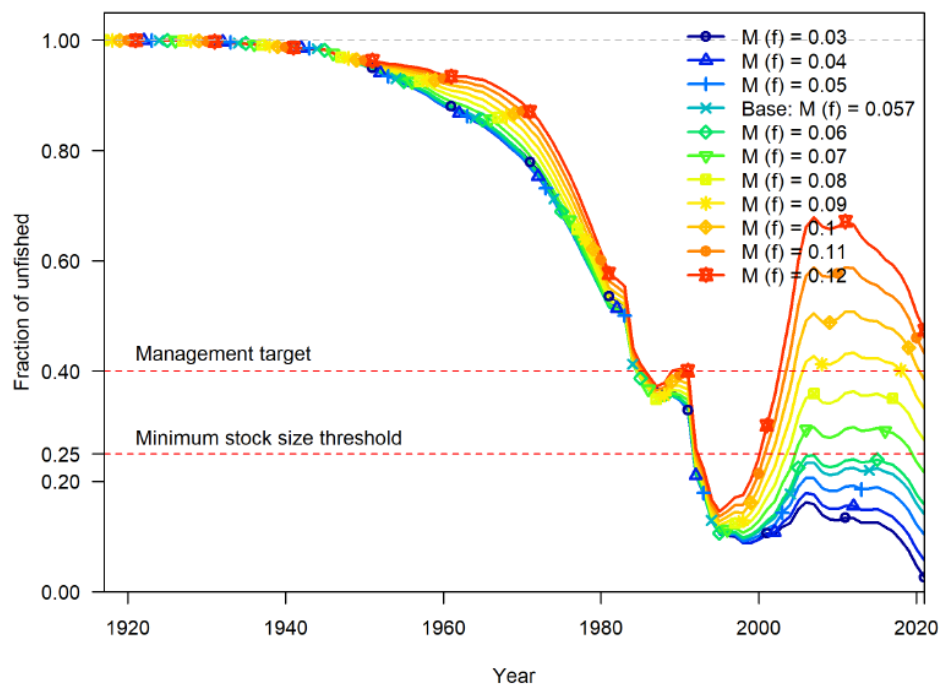


Figure 10. Time series of the estimated fraction of unfished spawning output associated with a range of natural mortality values (from Langseth et al., 2021).

3.4 Projected rebuilding probabilities

The projected rebuilding probabilities under all alternatives are shown below in Table 4 (based on values in Table 3; Langseth, 2023). In brief, Alternative 2 represents a 73.6 percent probability of rebuilding the stock by 2071 ($T_{\max}$) and Alternative 4 represents a 99.9 percent probability by $T_{\max}$. Probabilities represent the proportion of rebuilding analysis simulations that reach the target spawning output by the specified year. Both alternatives rebuild the stock, but Alternative 4 rebuilds the stock approximately 15 years faster than Alternative 22.

Table 4. Rebuilding strategies for Alternative 2 and Alternative 4 showing T_{target} , $T_{\max}$, rebuilding probability by $T_{\max}$

	Alternative 2	Alternative 4
Rebuilding Strategy	ABC Rule	F = 0
T_{target}	2060	2045
$T_{\max}$	2071	2071
Rebuilding probability	73.6%	99.9%

3.5 Aging error

The 2021 assessment of California quillback rockfish did not include ages in the model; hence, aging error was not defined within the assessment.

3.6 Research

The stock assessment for California quillback rockfish (Langseth et al., 2021) provided the following research recommendations:

- At the time of the assessment due to issues in California data in Pacific Fisheries Information Network (PacFIN) (i.e., condition code) length samples landed live vs. dead from the commercial fleet were unable to be identified. The ability to examine sample sizes and lengths from each type of landings would allow for future assessments to account for a greater range of commercial fishing behavior.
- Improved understanding of where recreational fishing is commonly occurring (areas and depths) and the range of sizes available by depth would better inform the selectivity form.
- Age data were predominantly from Oregon and Washington waters. Collecting length and otolith samples from recreational and commercial catches in California would result in samples from the entire U.S. West Coast informing growth. Otoliths from the West Coast Groundfish Bottom Trawl survey would also help inform growth; however, the survey has limited observations of quillback rockfish in California since they are commonly found at or around untrawlable habitat (e.g., rocky reefs). Otoliths collected in California that were identified and aged during model reviews were insufficient to robustly estimate a separate California specific length-age relationship given the limited sample size of young quillback

rockfish. More data, particularly of young and old fish, are needed to be able to robustly estimate a California-specific growth curve and confirm whether growth of quillback rockfish differs between California and Washington and Oregon.

- Recruitment patterns showed lower than average recruitment in the 2000s. Additional data to support such patterns in recruitment would provide additional support for model estimates. Catches of quillback rockfish were particularly high in a few years for both the recreational and commercial fleet. Better understanding the factors contributing to these high catches as well as potential resolutions, should they be needed, would aid in ensuring catch time series are accurate.
- The SSC Groundfish Subcommittee also identified the following future work topics based on the additional Council requested [January 2024 review meeting](#), as presented to the Council under the SSC items for the March 2024 Council meeting:
 - The prior for h (i.e., steepness) should be revisited given the results of recent assessments and recent advancements in methods for constructing h priors, such as the approach developed by Marc Mangel (e.g., Mangel et al., 2010).
 - The next assessment of quillback rockfish in California should explore the development of a recreational and/or California Collaborative Fisheries Research Program survey-based index of abundance, comparable to those developed in recent assessments for vermilion rockfish, copper rockfish, and other nearshore rockfish species.
 - Research should be conducted to assess what constitutes “too uncertain” given the default of returning to the last assessment, especially in the context of assessments for which there are no previous full or data-moderate assessments.
 - It was noted that turning off the sum-to-zero constraint on penalty in Stock Synthesis increases the value of terminal year depletion within the assessment for California quillback rockfish. The SSC should consider this matter when revising the groundfish stock assessment review Terms of Reference and Accepted Practices Guidelines documents.
 - It was noted that the estimated variances for some recruitment deviations exceeded the value of σ_{MAR} , which is unusual (though has occasionally been seen in other assessments) and unexpected, and may indicate model misspecification. This issue was recommended for further exploration and could be a diagnostic for future data-moderate assessments.

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4. Management of Quillback Rockfish

4.1 *Harvest Specifications*

4.1.1 Management Background

Quillback rockfish is currently managed under the Nearshore Rockfish Complexes north and south of 40° 10' N. lat. Off of California, the northern component was from 42° N. lat. to 40° 10' N. lat. and the southern component was from 40° 10' N. lat. to the U.S./Mexico border. Stock complexes have multiple stocks that contribute their harvest specifications to calculate a single OFL/ACL for the complex. These complexes are managed to the complex harvest specification and, in general, not to individual component stock specifications. For 2025 and beyond, the Council recommended removing the California quillback rockfish stock from the nearshore rockfish complexes and managing it to the stock-specific OFL/ABC/ACL to facilitate precision in management and tracking of mortality, which will assist in sustainable management under rebuilding

4.1.2 Considerations related to the Council's selected P^* value

P^* is shorthand for probability of overfishing. As applied in the context of evaluating and setting catch limits, P^* is an expression of management risk, which is applied to the sigma to generate the ABC, and is a Council overfishing risk tolerance policy decision. This policy decision, with respect to the P^* , is well described in the SAFE (2024) see Section 2.8.2.1 and the FMP (Chapter 4), which are incorporated by reference. In brief, in cases where scientific uncertainty exists associated with estimating an OFL, sigma (σ) is quantified by the SSC, the percentage reduction that defines the scientific uncertainty buffer and the ABC is then determined by translating the estimated σ to a range of probability of overfishing (P^*) values. Each P^* value is then mapped to its corresponding buffer fraction. The Council then determines the preferred level of risk aversion by selecting an appropriate P^* value, accordingly. In cases where the P^* approach is used, the upper limit of P^* values considered will be 0.45, as estimated OFLs are median estimates. There is a 50% probability that the OFL is overestimated; therefore, a $P^* = 0.5$ equates to no scientific uncertainty or, in other words, the ABC is set equal to the OFL.

Quillback rockfish has been managed with a $P^* = 0.45$ since the 2015-16 biennium; noting that prior to this biennium (2025-26) California quillback rockfish was not defined as State-specific stock, but rather considered a de facto coastwide stock with a single OFL/ABC contribution to the complexes. For the 2023-24 biennium, the Council recognized that the 2021 California quillback rockfish assessment (Langset et al, 2021) estimated that California quillback rockfish were depleted below the minimum stock size threshold (MSST), and thus would potentially require population rebuilding if/when a California-specific stock was adopted by the Council. In lieu of putting a stock definition in place for the 2023-24 biennium, the Council opted to proactively apply a lower spawning potential rate (SPR) when developing quillback rockfish HCRs, than the default specified for rockfish species within the FMP. This was aimed at balancing the needs of the fishing community and the potential future need for a formal rebuilding plan once quillback rockfish was defined as a stock(s). The California portion of quillback rockfish therefore remained in the Nearshore Rockfish Complexes for the 2023-24 biennium.

In balancing competing needs, the Council considered three alternatives to set ACLs for quillback rockfish off of California for the 2023-24 biennium. Under all alternatives, the Council only considered a $P^* = 0.45$. The $P^* = 0.45$ was applied to the sigma of 1.0 to generate the ABC for the California quillback rockfish component. This P^* was the default for quillback rockfish as specified under [Amendment 24 to the groundfish FMP](#), which is the upper limit for P^* for any groundfish by the FMP. The Council adopted Alternative 1 as FPA for the 2023-24 biennium, which reflects a SPR of 0.55; a 2023 ACL contribution = 1.76 mt and a 2024 ACL contribution = 1.93 mt; and $P^* = 0.45$. A $P^* = .45$ was also used as default for this biennium (2025-26) per Amendment 24.

At the June 2023 meeting, the Council adopted State-specific stock definitions for quillback rockfish as specified under Amendment 31 to the FMP. The status of the California stock was subsequently declared overfished in December 2023, as described elsewhere in this document. As discussed above, the Council considered No Action and four action alternatives as rebuilding strategies for California quillback rockfish. The Council considered $P^* = 0.45$ for Alternatives 1, 2, and 4, consistent with the identification of a $P^* = 0.45$ as both the default for rockfish in the FMP pursuant to Amendment 24 and the highest P^* utilized to set catch limits for groundfish since the 2015-16 biennium. Alternative 3 specified a $P^* = 0.40$.

In discussion in November 2023, the Council noted that the use of $P^* = 0.40$ rather than $P^* 0.45$ reflects a measure of reduction from the OFL to account for perceived risk presented by the uncertainty associated with issues that have been identified with the California quillback rockfish assessment in the associated model parameters. However, as noted above, Alternative 3 was rejected by the Council from further consideration at their April 2024 meeting based on its non-alignment to the MSA and National Standards.

The key facet to the Council decision to move forward with a $P^*0.45$ is the most flexible when coupled with the rebuilding strategies to reduce impacts to California quillback overall and also take into account needs of fishing communities. This biennium, the Council was focused on rebuilding strategies in concert with contemplating their risk tolerance of overfishing while acknowledging the need to reduce impacts, to the extent practicable, of communities. A lower P^* would further reduce the available harvestable amount and could increase negative impacts on communities.

Table 5 shows the estimated harvest specifications under Alternative 2 and Alternative 4 until 2034.

Table 5. Predicted OFL, ABC, and ACL values under Alternative 4 ($F = 0$) and Alternative 2 (ABC Rule) rebuilding strategies through 2025-34 for California quillback rockfish

Year	Time-Varying Sigma Buffer ¹	Alternative 4, $F = 0$			Alternative 2, The ABC Rule		
		OFL (mt)	ABC (mt)	ACL (mt)	OFL (mt)	ABC (mt)	ACL (mt)
2025	0.857	1.52	1.30	0	1.52	1.30	1.30
2026	0.849	1.81	1.54	0	1.77	1.49	1.49
2027	0.841	2.13	1.79	0	2.01	1.69	1.69

Year	Time-Varying Sigma Buffer ¹	Alternative 4, F = 0			Alternative 2, The ABC Rule		
		OFL (mt)	ABC (mt)	ACL (mt)	OFL (mt)	ABC (mt)	ACL (mt)
2028	0.833	2.44	2.03	0	2.24	1.87	1.87
2029	0.826	2.74	2.26	0	2.46	2.03	2.03
2030	0.818	3.03	2.48	0	2.67	2.18	2.18
2031	0.810	3.31	2.68	0	2.85	2.31	2.31
2032	0.803	3.6	2.89	0	3.04	2.44	2.44
2033	0.795	3.91	3.11	0	3.23	2.57	2.57
2034	0.788	4.19	3.30	0	3.4	2.68	2.68

4.2 Fishery Mortality

Quillback rockfish inhabits nearshore waters, with the majority of fishing mortality taken in State waters. Historically, California quillback rockfish mortality has been higher in the recreational sector than in the commercial sectors (Table 6, Figure 11). Prior to the overfished declaration, California quillback rockfish were targeted and retained by a small group of commercial limited entry State issued deeper nearshore permittees. Commercial open access and limited entry participants without a deeper nearshore permit also incidentally encounter quillback rockfish while targeting other species and must discard that catch at sea ([Agenda Item G.8.a, Supplemental GMT Report 2, September 2023](#), [Agenda Item G.8.a, Supplemental GMT Report 5, September 2023](#), [Agenda Item E.9.a, Supplemental GMT Report 1, November 2023](#)).

This rebuilding plan is specific to the groundfish FMP and can only restrict targeted groundfish fisheries in the EEZ (Table 6)³. Based on fishery dependent observations records (commercial and recreational), the majority of California quillback rockfish mortality occurs in State waters and is not under the jurisdiction of the FMP, the Council, or NMFS. Additionally, historically there have been some small incidental catch from fisheries in the EEZ not managed under the FMP. These fisheries are not subject to the California quillback rockfish rebuilding plan. However, all California quillback rockfish mortality counts against the ACL. Meaning, mortality from non-groundfish fisheries would likely result in failure of the Alternative 4 F = 0 rebuilding strategy. These non-groundfish fisheries include, but are not limited to, State waters groundfish fisheries, directed Pacific halibut, open access California halibut, and pink shrimp trawl. Additionally, mortality from research is estimated. Figure 11 displays the same information as Table 6, but as a

³ These values were provided by the Fisheries Observation Program and were produced using the methods outlined in [Somers et al. 2022b](#). These estimates are in a pre-review, pre-decisional state and should not be formally cited. They are to be considered provisional and do not represent any final determination or policy of NOAA or the Department of Commerce. Incidental open access (IOA) includes directed Pacific halibut, open access California halibut, pink shrimp trawl, and incidental mortality. Limited entry (LE) fixed gear hook and line includes both sablefish-endorsed and non-sablefish-endorsed sectors. Research mortality was not estimated by state, and coastwide values are shown here for reference.

visual representation.⁴ Figure 12 shows the California quillback rockfish mortality by management area used to manage the nearshore rockfish complex.⁵

Table 6. Preliminary estimates of quillback rockfish mortality (mt) off California by sector, 2013-2022. Incidental open access (IOA) includes directed Pacific halibut, open access California halibut, pink shrimp trawl, and research. Note that research values represent coastwide estimates, and are not specific to California.

YEAR	Directed Groundfish Fisheries					Other		Total (mt)
	California Recreational (mt)	Shoreside Trawl (mt)	LEFG Hook & Line (mt)	Nearshore (mt)	OA Hook & Line (mt)	Coastwide Research (mt)	IOA (mt)	
2013	2.9	0	0	0.67	0	0.01	0	3.58
2014	2.53	0	0	0.45	0	0.03	0	3.01
2015	7.43	0	0	1.09	0.01	0.08	0	8.61
2016	8.48	0	0.03	0.96	0.02	0.17	0	9.66
2017	9.76	0	0.77	1.74	0.01	0.09	0.03	12.4
2018	10.11	0	0	2.62	0.01	0.04	0	12.78
2019	11.46	0	0	3.89	0	0.03	0.8	16.18
2020	7.8	0	0	4.1	0.12	0	0	12.02
2021	10.55	0	0	4.76	0	0.02	0.01	15.34
2022	9.23	0.01	0	1.86	6.75	0.06	0.01	17.92

⁴ *Id.*

⁵ *Id.*

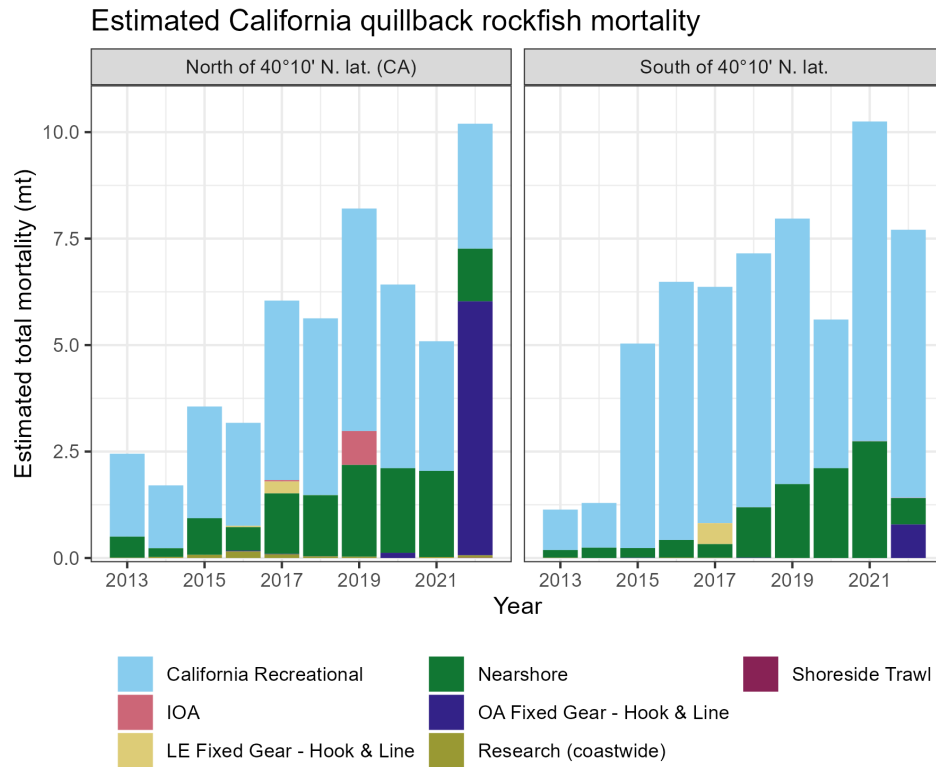


Figure 11. Preliminary estimates of California quillback rockfish mortality by sector from 2013-2022. Incidental open access (IOA) includes directed Pacific halibut, open access California halibut, pink shrimp trawl, and incidental mortality. Note that research values represent coastwide estimates, and are not specific to California.

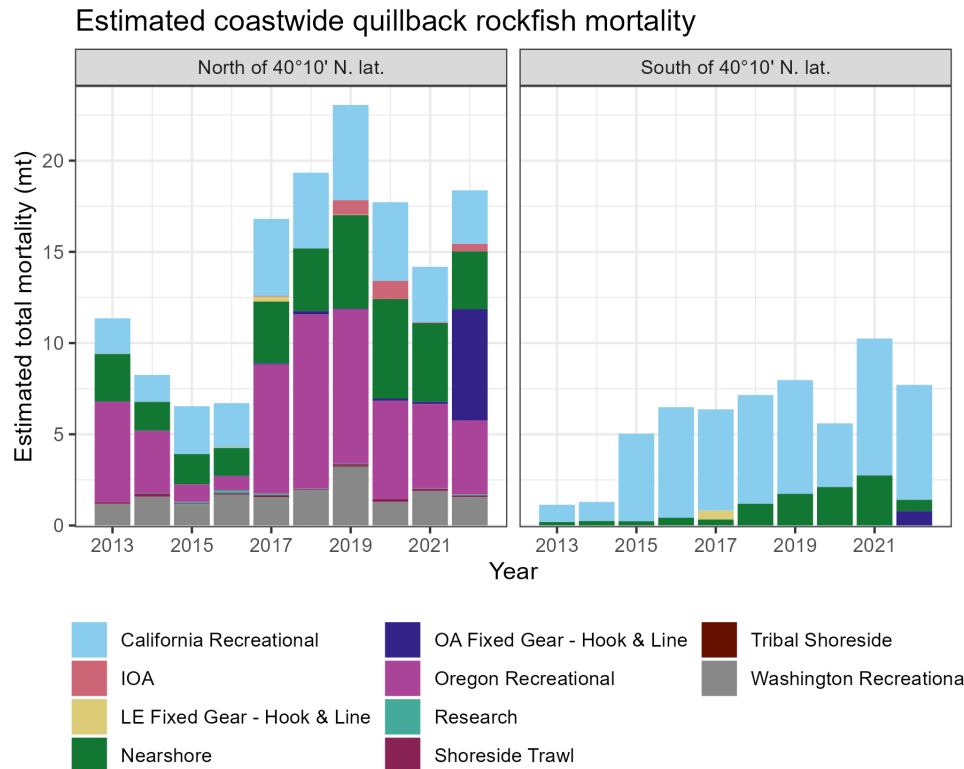


Figure 12. Estimated coastwide quillback rockfish fishing mortality north and south of 40° 10' N. lat by sector from 2013-2022. Incidental open access (IOA) includes directed Pacific halibut, open access California halibut, pink shrimp trawl, and incidental mortality. Data from [Somers et al. 2022b](#).

4.3 Management of California Quillback Rockfish

Quillback rockfish is caught in both the commercial and recreational fisheries off of California. This rebuilding plan and the management measures proposed to achieve its goals are applicable to Federal waters only. While this stock is caught in both Federal and State waters, the proportion of catch/mortality by each area is unclear. However, based on known fishery dependent and independent information of California quillback rockfish, the majority of the stock's depth range is assumed to be in State waters (the majority of the fishing mortality of quillback rockfish occurs in State waters). As will be discussed below, waters less than 20 fathoms are predominantly in California's State waters and, therefore, under State control in terms of management measures. However, it is important to state upfront that all quillback rockfish mortality off of California, regardless of area, will count towards the ACL adopted by the Council under this rebuilding plan. Additionally, the likelihood of the impacts from rebuilding described here is dependent on the State's decision to implement complementary management or not.

4.4 Commercial Fisheries

4.4.1 History of California Quillback Rockfish Management in the Non-trawl Commercial Fishery

California quillback rockfish is predominantly caught in the commercial fixed gear groundfish fishery relative to all other commercial sectors. Routine management measures available to the Council to achieve management objectives for this fishery include trip limits, gear types, and the

non-trawl RCA. Routine measures can be modified, as appropriate, within the season under the routine groundfish inseason management measure agenda item. Emergency action is also an option, but criteria at MSA section [305\(c\)](#) must be met in order for the Council to consider this option.

Prior to the 2023-24 biennium, species specific management measures were not employed by the Council for this stock. At the beginning of the 2023-24 biennium, a quillback rockfish trip limit of 75 lbs. per two months, within the 2,000 lbs. per two months minor nearshore rockfish trip limit for the area between 42° - 40° 10' N. lat. and south of 40° 10' N. lat., was adopted by the Council ([Informational Report 2, September 2022](#)). The ACT for this stock was exceeded in the summer of 2023. As a result, CDFW took action to close areas in California State waters, and the Council took action to reduce all impacts on this stock in Federal waters at the September 2023 meeting. The Council adopted a suite of management depth/area based trip limit measures, which included reducing the trip limit for this stock to 0 lbs. per two months and established a commercial Non-Trawl RCA boundary for additional trip limits at 36° N. lat. . ([Agenda Item G.8.a, Supplemental GMT Report 2, September 2023](#) and [Agenda Item G.8.a, Supplemental GMT Report 5, September 2023](#)).

At the November 2023 meeting, the Council recommended similar commercial fishery management measures be implemented for 2024 ([Agenda Item E.9.a, Supplemental GMT Report 1, November 2023](#)). In March 2024, the Council adjusted the shoreward boundary of the Non-Trawl RCA, between 36° N. lat. and 37° 07' N. lat., from the 3 nautical mile (nm) line to 50 fathoms (fm). This modification was due to findings, as noted in [F.8.a, Supplemental GMT Report 1 March 2024](#), that California quillback rockfish encounters between 36° N. lat. and 37° 07' N. lat. were rare throughout the analyzed time series. This finding suggested restoration of the fishery to this area was feasible and should have limited impacts on the stock.

4.4.2 Comparison of Proposed 2025-26 Commercial Management Measures

Detailed analysis and comparison of the proposed 2025-26 biennial management measures under all alternatives for the non-trawl fishery are in Chapter 5 in the [Agenda Item F.6, Attachment 2, June 2024](#) and are incorporated by reference. The measures to achieve but not exceed ACLs generated via the rebuilding parameters for Alternative 2 (PPA) and Alternative 4 are summarized and compared below. Alternative 2, while less restrictive than Alternative 4, results in management measures which are very similar to those implemented in the latter half of 2023 and all of 2024. These measures are expected to keep mortality of California quillback rockfish within Alternative 2 harvest specifications.

Under Alternative 2, area-based depth restrictions coupled with specific trip limits and specific non-trawl gear types were adopted as PPA (see Chapter 5, [Section 2.1.3](#)). These measures are similar to those adopted by the Council in November 2023 ([Agenda Item E.9.a, Supplemental GMT Report 1, November 2023](#)). The objective of these measures is to reduce mortality in the non-trawl commercial fishery to ensure that the 2025 and 2026 Alternative 2 ACLs of 1.30 mt and 1.50 mt, respectively, are not exceeded. Alternative 2 management measures to reduce impacts on California quillback rockfish predominantly impact commercial Federal fixed gear vessels between 42° N. lat. and 37° 07' N. lat. Non-trawl commercial fisheries south of 37° 07' N. lat. must abide by a 0 lbs. trip limit for California quillback rockfish, but area based trip limits and depth restrictions are not as restrictive as north of this latitude. Under Alternative 2, management

measures for California quillback rockfish would be limited to the commercial non-trawl and recreational fisheries, as these fisheries generate the vast majority of impacts to this stock. The management measures adopted as PPA would not restrict the trawl fishery in regard to California quillback rockfish, but gear switchers in the IFQ fishery would continue to be subject to non-trawl RCA restrictions.

The objective of Alternative 4 (Chapter 5, of [Agenda Item F.6, Attachment 2, June 2024](#)) would be to reduce mortality of California quillback rockfish to zero in all Federal groundfish fisheries. Due to the uncertainty around the true range of this stock, with references saying the California quillback rockfish geographic range extends southward in California to Anacapa Island (34° N. lat.) and can be found deeper than 75 fathom (Love et al., 2002), extending the area or depth closure beyond the current 2024 restrictions would need to be considered by the Council to achieve $F = 0$. Management measures for the entire groundfish fishery would also need to be enacted to reduce mortality of California quillback rockfish to zero. Unlike Alternative 2, the trawl fishery, including the at-sea whiting sector, would also be impacted under Alternative 4. This fishery has limited catches of California quillback rockfish with zero catch in many years, but not all (e.g., there are historical records prior to 2014, Somers et al., 2023). Therefore, in order to achieve an $F = 0$ strategy, the Council would likely need to place restrictions on all Federal groundfish fisheries, including the trawl fishery. The extent of depth and gear restrictions off of California necessary to achieve zero mortality of quillback rockfish are unknown at this time, noting that some vessels generally operate much deeper than areas considered “nearshore” where quillback rockfish reside. However, the Council may wish to conservatively close all directed groundfish fishing in the EEZ off of California under Alternative 4. An important point to reiterate about Alternative 4 is California quillback rockfish mortality could occur in other non-groundfish fisheries (e.g., salmon, coastal pelagic, etc.) that are not covered under this rebuilding plan.

The non-trawl fishery in California has been subject to a suite of management measures that took place in September 2023 ([Agenda Item G.8.a, Supplemental GMT Report 2, September 2023](#)) for the remainder of 2023 ([Agenda Item G.8.a, Supplemental GMT Report 5, September 2023](#)) and in November 2023 ([Agenda Item E.9.a, Supplemental GMT Report 1, November 2023](#)) for 2024. In brief, these measures concentrate non-trawl commercial fishery effort north of 37° 07' N. lat onto the continental shelf with specific gear type requirements (i.e., legal non-bottom contact hook-and-line gear are allowed in the non-trawl RCA ([50 CFR 660.330\(b\)\(3\)](#))) when targeting groundfish. This change in gear type means that in many cases, in order to continue fishing in Federal waters shoreward of 75 fathoms, fishery participants will have to learn a new gear type. It is reasonable to assume that there will be a learning curve that might inhibit profits within this fishery until participants learn the gear and find new fishing areas.

These changes in management between 42° and 36° N. lat. (until March 2024 when the line was amended to 37° 07' N. lat. for commercial sectors) directly impact nearshore fishermen that fish in the EEZ, Open Access fishermen that target groundfish shoreward of the Non-trawl RCA in the EEZ, and any limited entry fishermen operating shoreward of the Non-trawl RCA in the EEZ. Currently under Federal management measures, the nearshore fishery will be impacted more than other fisheries. However, this action is only applicable to the EEZ, where only a small portion of nearshore fisheries occur. There is uncertainty around what management measures the State of California will take to manage the fisheries within State waters (including the nearshore fishery). The restrictions put into place in 2023 (No Action) and put forth for consideration under

Alternative 2 have already severely impacted fishers on the water, as seen by a reduction of ex-vessel revenue and landings. Regulatory restrictions for California quillback rockfish may continue after the stock is rebuilt, as the predicted rebuilt stock B_{MSY} is expected to be lower than recent California quillback rockfish mortality. Based on this information, even when rebuilt, groundfish fisheries are unlikely to be restored to levels seen before the stock was declared overfished.

Alternative 4 closures would be more widespread than Alternative 2, and therefore would have fewer options to continue fishing, with no groundfish fishing likely taking place in order to achieve $F = 0$. Non-groundfish opportunities, such as Chinook/coho salmon and Dungeness crab, are already constrained and are unlikely to accommodate expansion resulting from lost groundfish opportunities, and they may not provide enough stable income to keep participants fishing. Therefore, under Alternative 4, although it would rebuild California quillback rockfish on a quicker timeline, it is likely that more participants might choose to leave fisheries (Option 2 described in Fuller et al., 2017) than under Alternative 2 because of the large spatial scale of closures. Alternative 2 does maintain some groundfish opportunity but at the cost of more time under restrictions. It also allows for more regulatory flexibility and adaptation as new information is found. Under both alternatives, once the California quillback rockfish stock is rebuilt, it is likely that there will continue to be restrictions to fishing operations, as the small, estimated stock size and consequently low expected ACLs (ACLs much lower than past California quillback rockfish mortality) even after the stock is rebuilt are unlikely to accommodate a full removal of restrictions. It is unlikely that fishery participants who have taken a hiatus from fishing would re-enter the fishery once California quillback rockfish is rebuilt. Depending on the port communities and when fishery participants leave, there is also a likelihood that infrastructure (e.g., ice houses, processors) will permanently leave these communities.

4.4.3 Commercial Monitoring

PacFIN Fish Ticket Data

The majority of California quillback rockfish mortality from commercial fisheries is discarded at-sea, which means that fish ticket data on shoreside landings is not informative for tracking most mortality across all commercial sectors throughout the season.

West Coast Groundfish Observer Program

The West Coast Groundfish Observer Program (WCGOP) is the main source of information on at-sea discards in shore-based groundfish fisheries. From 2018 to 2022, coastwide WCGOP observer coverage has averaged about 39 percent in the limited entry fixed gear sablefish endorsed fishery, 3 percent in the limited entry fixed gear non-sablefish fishery, 5 percent in the non-nearshore open access fixed gear fishery, and 7 percent in the nearshore fixed gear fishery ([Somers et al., 2023a](#)). Fleet-wide discards are estimated annually using a ratio estimator for sectors without full observer/electronic monitoring coverage ([Somers et al., 2023b](#)). WCGOP data indicated that the OA fixed gear sector encountered and discarded California quillback rockfish at a higher rate in 2022 than in previous years, potentially driven by an increase in pole effort. In 2022, estimated OA fixed gear discards of California quillback rockfish increased from a previous three year average of 0.1 mt to 6.9 mt coastwide ([Somers et al. 2023b](#)).

Dockside sampling

The California Cooperative Groundfish Survey (CCGS) is a commercial market sampling program implemented in 1978. This program is designed primarily to collect species composition data for rockfish and secondarily to collect biological information such as length, sex, maturity, and age data to help manage the fishery. Over time this program grew to include other groups of groundfish including flatfish, roundfish, and non-groundfish such as California sheephead. The CCGS is conducted jointly by the Pacific States Marine Fisheries Commission (PSMFC), CDFW, and NMFS. Using the sampling scheme designed by Sen (1984), port samplers collect data from the landings at each of the seven defined port complexes. The data are entered into the CCGS catch database, termed CALCOM, managed by PSMFC. At the end of the year, port sampling data are applied to landing receipts to obtain the final estimates of species-specific landings for the State. In addition, the landing estimates are applied to the age and length data from the port samples to estimate age and length compositions of the commercial landings. For estimation purposes, port sampling is stratified by year, market category, port complex, gear group, quarter (1-4), and condition (live or dead). The annual landing estimates are then provided to PacFIN for inclusion in their system.

4.5 Recreational Fisheries

4.5.1 Historical Management of California Quillback Rockfish in the California Recreational Fishery

California quillback rockfish mortality is predominantly driven by the California recreational groundfish fishery, primarily with hook and line gear. In the recreational fishery, this stock is caught in conjunction with other groundfish, particularly nearshore rockfish. The prevalence of this stock decreases from north to south; however, California quillback rockfish have been reported in recreational catch as far south as the Southern management area (Figure 13). The Council uses routine measures to mitigate catch of this stock, e.g., seasons, depth/area closures, and bag limits. Prior to 2022 there was no California quillback rockfish sub bag limit and anglers could take up to 10 quillback rockfish, ([Agenda Item E.7.a Supplemental CDFW Report 2 November 2021](#)). California manages recreational fisheries within five districts (Figure 13) bounded north and south by lines of latitude. Each district can have specific management measures, which may differ across districts (e.g., season length, sub-bag limits, etc.). The season structures and corresponding recreational catch estimates for quillback rockfish for 2012-2021 can be found in [Agenda Item F.4.a Supplemental CDFW Report 3 April 2022](#). In 2022 a one (1) fish quillback rockfish sub-bag limit was instated following the results of the 2021 quillback rockfish data moderate stock assessment. Additionally, “all depth” fishing opportunities were allowed in 2023 with the hopes that anglers would spread out, and choose to fish in areas where quillback rockfish were not prevalent. However, this did not occur and anglers primarily targeted nearshore waters resulting in exceedance of the quillback rockfish OFL and inseason closures in 2023 ([Agenda Item G.8.a Supplemental CDFW Report 2 September 2023](#)). As part of the 2023-24 biennial groundfish management measures, the quillback rockfish sub-bag limit in California remained at one (1) fish; however, at the September 2023 Council meeting, the Council reduced the limit to a zero (0) quillback rockfish sub-bag limit for the remainder of 2023 as the ACT was exceeded. In March 2024, the Council adopted similar management measures for the remainder of 2024 (see [Agenda](#)

[Item F.8.a, Supplemental GMT Report 1, March 2024](#) and [Agenda Item F.8.a, Supplemental CDFW Report 2, March 2024](#) (Table 7).



Figure 13. Map of California showing the five groundfish management areas, noting Central is one management area, though divided by management measures at 36° N. lat. Source: CDFW.

Table 7. Summary of 2024 California recreational groundfish season structure after inseason by month, area, and depth according to March 2024 Council recommendations. Open in depths greater or less than 50 fm shown as “>50fm” or “<50fm”, respectively.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern		Closed		>50 fm	May 1 – Sep 30 < 20 fm					>50 fm	<20 fm	>50 fm
Mendocino		Closed		>50 fm	May 1 – Sep 30 < 20 fm					>50 fm	<20 fm	>50 fm
San Francisco		Closed		>50 fm	May 1 – Sep 30 < 20 fm					>50 fm	<20 fm	>50 fm
Central – N °36		Closed		>50 fm	May 1 – Sep 30 < 20 fm					>50 fm	<20 fm	>50 fm
Central – S °36		Closed		All Depth			Jul 1 - Sep 30 < 50 fm			Oct 1 - Dec 31 > 50 fm		
Southern		Closed		All Depth			Jul 1 - Sep 30 < 50 fm			Oct 1 - Dec 31 > 50 fm		

4.5.2 Proposed 2025-26 Recreational Management Measures for California Quillback Rockfish

Detailed analysis and comparison analysis of the proposed 2025-26 biennial management measures for the recreational fishery under all alternatives are found in Chapter 8 in [Agenda Item F.6, Attachment 2, June 2024](#) and are incorporated by reference. Alternative 2 (PPA) and Alternative 4 are compared below. In brief, comparatively, both Alternatives would allow for fishing, though with depth-based area restrictions. Alternative 2 management measures, while less restrictive than Alternative 4, are very similar to those implemented in the latter half of 2023 and all of 2024. The difference in management complexity between 2024 management measures and Alternative 2 is negligible. Alternative 2 is less likely to cause increased social and economic impacts on port communities relative to 2024 than Alternative 4.

The Council considered four recreational season structures proposed by CDFW, as shown in the Chapter 8 in [Agenda Item F.6, Attachment 2, June 2024](#). They adopted Alternative 2, Option 4 (Table 7) as PPA, which is identical to 2024 inseason changes ([Agenda Item F.8.a CDFW Supplemental Report 2, March 2024](#)). This alternative would allow the recreational fishery to target groundfish, but under management measures that are designed to reduce impact to levels that would not exceed the ACL. Given the similarity of Alternative 2, Option 4 to the 2024 season structure, it could be expected that similar economic returns may occur.

Under Alternative 4, the objective is for no fishery related mortality ($F = 0$) for California quillback rockfish. In order to achieve no fishing mortality to California quillback rockfish, groundfish season structures would require a full-closure of the EEZ within all five Groundfish MAs (Table 8). [Agenda Item F.8.a Supplemental GMT Report 1 March 2024](#) presented recreational quillback rockfish mortality for California between 2005-23. Even with the closure of the boat-based groundfish fishery, bycatch of California quillback rockfish is expected in non-groundfish fisheries (e.g., salmon, coastal pelagic, etc.), which are not covered under this rebuilding plan. Additionally, mortality in the State waters recreational groundfish fishery is not covered under this rebuilding plan.

Table 8. Potential California recreational fishery season structure by Groundfish Management Areas in the Exclusive Economic Zone (EEZ) under the Alternative 4 rebuilding strategy.

Management Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern	Jan 1 – Dec 31; Closed all depths in the EEZ											
Mendocino	Jan 1 – Dec 31; Closed all depths in the EEZ											
San Francisco	Jan 1 – Dec 31; Closed all depths in the EEZ											
Central	Jan 1 – Dec 31; Closed all depths in the EEZ											
Southern	Jan 1 – Dec 31; Closed all depths in the EEZ											

Recreational Monitoring

The California Recreational Fisheries Survey (CRFS) is a multi-part survey implemented in 2004. The [CRFS Sampler Manual](#) provides an explanation of the principles and goal of CRFS, detailed

instructions regarding sampling procedures and protocols, and the proper coding of all forms. The manual describes the history of the survey, general information, methods, the roles and responsibilities of supervisors, leads, and samplers, and much more.

The goal of CRFS is to produce, in a timely manner, marine recreational fishery data needed for sustainable management of California's marine resources. The fishery data produced are catch and effort estimates for marine recreational finfish fisheries. CRFS field sampling is conducted at over 500 publicly-accessible sites during daylight hours to gather catch and effort data. CRFS samplers intercept recreational anglers at the completion of their fishing trips to collect on-site data by conducting the survey. The Angler License Directory Telephone Survey (ALDTS) operates on a monthly basis. The data collected are used to estimate the total number of marine recreational fishing trips taken by license holders when field observations of effort are not feasible, such as night-time fishing and private-access sites

CRFS conducts four major angler surveys based on fishing mode, and each survey is different. A fishing mode is defined as the method of access to fisheries. The modes in CRFS are:

- MM – Man-made structure fishing
- BB – Beach and bank fishing
- PC – Party and charter boat fishing
- PR – Private and rental boat fishing

CDFW Groundfish Project tracks recreational groundfish mortality on a weekly and/or monthly basis to ensure that mortality remains within allowable limits. Several rockfish species of concern are tracked on a weekly basis using preliminary CRFS field reports. In 2024, the species tracked weekly included black rockfish, California quillback rockfish, copper rockfish, and yelloweye rockfish. Additional information can be found under California Recreational Fishery, No Action, Inseason Management Response in the Revised Draft 2025-26 Management Measure Analytical Document ([Agenda Item F.6, Attachment 2, June 2024](#)).

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5. Community Dependence

Alternatives 2 and 4 are both likely to have pronounced impacts on groundfish fishing communities⁶ in California. It is important to note, however, that the actual impacts from restrictions in the EEZ for quillback rebuilding are a small portion of the overall effects documented because the majority of fishing mortality for quillback rockfish occurs in State waters. And, due to the current monitoring and reporting structure that does not readily differentiate between catch in Federal waters versus State waters, we are unable to estimate impacts with precision in this regard.

In terms of differentiating between Alternatives 2 and 4, the alternatives differ mainly in how the impacts on groundfish fishing would be distributed among current and future fishing communities. Relative to Alternative 4, expected benefits of Alternative 2 accrue to current California fishing communities in the form of increased groundfish fishing opportunities in the period from the present to 2045⁷. During this period, groundfish harvesting opportunities in California under Alternative 2, while unknown, are expected to be higher than under Alternative 4. The expected costs of Alternative 2, relative to Alternative 4, come in the form of fewer groundfish fishing opportunities in the period 2045 - 2060. These costs are paid by future fishermen and fishing communities. During this period, the stock is projected to reach B_{MSY} under Alternative 4 and to be in rebuilding under Alternative 2. Therefore, it is assumed that harvesting opportunities in this period are higher under Alternative 4. These expectations are subject to a number of important uncertainties as articulated in Section 3.3.2 (biologic uncertainty regarding the realized speed of rebuilding and managerial uncertainty regarding specific future management actions). The key uncertainty affecting an economic comparison of the alternatives addressed in this section is the extent to which expected future benefits under Alternative 4 can be realized. This uncertainty is heavily influenced by the ability of California groundfish fishing communities to adapt to a 20 year moratorium on groundfish fishing and persist into the future. The community dependence section is an attempt to articulate the specific issues that influence how communities might adapt to loss of groundfish revenues, which heavily impacts the extent to which future benefits of rebuilding can be realized.

5.1 California Communities

California comprises 1,100 miles of diverse coastline. Marine fisheries in this State are diverse due to the differences of coastal geography, bathymetry, and variance in impact of the California current along the State. Commercial fisheries are spread along the coast and many fishermen have a diverse portfolio of fishery participation, e.g., crab, groundfish, etc. Anecdotal evidence suggests

⁶ Although “fishing community” has often been defined in place-based terms under MSA National Standard 8 (see Clay and Olson, 2008), there is emerging recognition that “fishing community” encompasses communities of practice as well as communities of place. This section considers both fishing communities of place (geographically defined California communities where fishing occurs) and communities of practice (aggregations of fishery participants such as commercial and recreational fishermen as well as participants in the different sectors of the groundfish fishery).

⁷ These expectations are discussed in Section 2 and 3. Section 2 establishes the expectation of rebuilding the stock by 2045 under Alternative 4 and by 2060 under Alternative 2. Section 3 establishes the expectation that Alternative 4 imposes a moratorium on groundfish fishing in California, while Alternative 2 allows for some groundfish fishing in the majority of groundfish sectors under some limited conditions.

that groundfish is considered the base fishery for many participants, as the resource is consistently available throughout the year, whereas salmon or crab are seasonal fisheries subject to wide fluctuations in numbers and regulatory controls. Recreational fishing is equally diverse. These anglers target groundfish, particularly rockfish, as this fishery has in the past provided a consistent source for fishing opportunity. Recreational Fisheries Information Network (RecFIN), the database for West Coast recreational data, estimates that well over a million recreational angler trips per year are taken from California ports. Commercial and recreational fishing activities yield well over a billion dollars annually in impacts to California communities (NMFS, 2024). The following sections examine community vulnerability and dependence on commercial and recreational fishing

5.2 Summarized Vulnerability and Dependence of Select California Port Communities

California has many ports with variable infrastructure, ranging from heavily industrialized (e.g., Los Angeles harbor) to small, localized ports (e.g., Shelter Cove). This analysis examines a selection of ports along the California coast with both commercial and recreational infrastructure that are also known to be ports of historical importance to fishing. These port areas are analyzed using the Community Social Vulnerability Index (CSVI), which is a measure of generalized social and economic vulnerability at the community scale. CSVI is derived from U.S. Census Bureau data (demographics, personal disruption, poverty, housing characteristics, housing disruption, labor force structure, etc.; see Jepson and Colburn, 2013) in communities that depend on commercial fishing (page 33, [Agenda Item H.1.a CCIEA Team Report 1, March 2024](#)). Recreational and Commercial Fishing Reliance measures a community's dependence on commercial and recreational fishing. These index values are constructed using similar methods as those used to construct the CSVI. Construction of these index values is discussed in [Breslow et al. \(2014\)](#), [The 2023-2024 California Current Ecosystem Status Report](#), and [Jepson and Colburn \(2013\)](#). Commercial fishing engagement is calculated using counts of permits, number of fish dealers, and volume of fish landed commercially in each community. Like the CSVI, this index is calculated at the geographic level of Census Designated Place (CDP), which means there are several hundred West Coast communities for which this index value is calculated. The index value is generally higher in CDPs that overlap with a commercial fishing port (such as Crescent City, Eureka, or Santa Barbara, CA) and are generally lower in CDPs which are proximate to, but not co-located with, a major fishing port (such as Scotts Valley, Moss Beach, or San Rafael, CA). Commercial fishing reliance is a population weighted measure of dependence that scales the commercial fishing engagement index by population. Recreational fishing engagement and reliance is calculated similar to commercial engagement/reliance using counts of charter licenses and permits.

Table 9 shows the CSVI, recreational and commercial fishing reliance, and recreational and commercial fishing engagement for the ports selected for this analysis. The meanings of these values will be expanded in sections below. For many ports off California, fishery engagement is medium to high while fishery reliance is low (both commercial and recreational). This is most likely driven by the high population density and existence of a variety of industries in those ports (i.e., low reliance), while the total number of vessels and number of landings into those ports are generally high (i.e., high engagement) compared to ports off of Oregon and Washington where a small number of large-volume landings are more common. This means that, while the economies in those communities may be able to adapt to the loss of commercial fishing engagement, a large

number of participants and buyers in the fishery will be impacted by fishing restrictions under this rebuilding plan. With the loss of recreational engagement, a large number of businesses, patrons, and private anglers will be impacted.

Table 9. Vulnerability and dependence in California fishing communities for 2021.

Name	CSVI	Commercial Engagement	Commercial Reliance	Recreational Engagement	Recreational Reliance	Recreational District
Crescent City	High	High	Medium	Medium	Medium	Northern
Eureka	Medium High	High	Low	Medium	Low	Northern
Shelter Cove	Medium High	Medium	Medium	Low	Low	Northern
Fort Bragg	High	High	Medium	Medium	Medium	Mendocino
Bodega Bay	Low	High	Medium	Low	Medium High	Mendocino
San Francisco	Low	High	Low	High	Low	San Francisco
Half Moon Bay	Low	High	Medium	Low	Low	San Francisco
Santa Cruz	Low	High	Low	Medium	Low	Central N. 36
Moss Landing	High	High	High	Medium	Low	Central N. 36
Monterey	Low	High	Low	Medium High	Low	Central N. 36
Avila Beach	Low	Medium	Medium	Low	Medium High	Central S. 36
Morro Bay	Low	High	Medium	Medium	Low	Central S. 36
Santa Barbara	Low	High	Low	High	Low	Southern
Oxnard	Medium High	High	Low	High	Low	Southern
Los Angeles	Medium High	High	Low	High	Low	Southern
Newport Beach	Low	Medium	Low	High	Low	Southern
San Diego	Low	High	Low	High	Low	Southern

(Source: Karma Norman/NWFSC Human Dimensions Program, see discussion of indicators above).

5.3 Commercial Communities

Reductions in groundfish fishery opportunities in many California coastal communities will likely be financially detrimental, socially disruptive and may have long-lasting impacts (e.g. loss of infrastructure). This is likely to compound the impacts already being experienced by these communities as they have faced recent declines and changes in other fisheries. For example, in the past five years, there have been multiple Federal fisheries disaster declarations for salmon fisheries, red sea urchin, and Pacific sardine in the State of California (Table 10)

Table 10. Federal disaster declarations for marine fisheries off of California in the last ten years. (Source: [NOAA Fishery Disaster Declaration](#))

Fishery	Declaration Year(s)
California Sacramento River Fall Chinook and Klamath River Chinook Salmon Fisheries	2024 a/
California Sacramento River Fall Chinook, Klamath River Fall Chinook Ocean and Inland Salmon Fisheries, 2023	2023
Resighini Rancheria Tribe Klamath River & Ocean Salmon, 2023	2023 a/
Oregon and California Klamath River Fall Chinook Salmon Fishery, 2016 and 2017	2016/2017
California Red Sea Urchin Fishery	2016, 2017, 2018, & 2019
California Pacific Sardine Fishery	2015, 2016, 2017, 2018, & 2019
California Dungeness Crab and Rock Crab	2015 & 2016

a/pending

In addition, recent Dungeness crab seasons have been delayed and shortened, potentially decreasing opportunities for groundfish participants affected by existing California quillback rockfish related management measures to rely on this already-volatile fishery. Based on the figures Figure 14 and Figure 15 (R3 and R4, respectively, from [Agenda Item I.1.a, IEA Team Report 2, March 2021](#)), the groundfish fishery contributes to the network of fishing participation in Crescent City, Eureka, Fort Bragg, Monterey, Morro Bay and Los Angeles to varying degrees. Groundfish has been called the “glue,” income stabilizer, or bridge fishery that keeps communities together because of the potential year-round stability it provides participants when salmon or crab seasons are closed or shortened. It remains uncertain the degree to which the 2023 and 2024 closure of salmon fishing in California will shift participants into the groundfish fishery, even if this fishery is reduced by management restrictions in association with California quillback rockfish. Alternative 4 would suspend all groundfish fishing between 42° N. lat. and 34° N. lat., and with limited opportunities in other fisheries, it might force more participants to find alternative sources of income and not rely on their network of fishing participation. Additionally, these existing participation networks might not be indicative of fishing communities future flexibility, because Alternatives 2 and 4 might lead to consolidation of fisheries. It is also uncertain whether participants who leave the fishery will ever re-enter (be it before or after California quillback rockfish is declared rebuilt). In addition, the future opportunities in salmon, crab, and other interlinked fisheries remain uncertain.

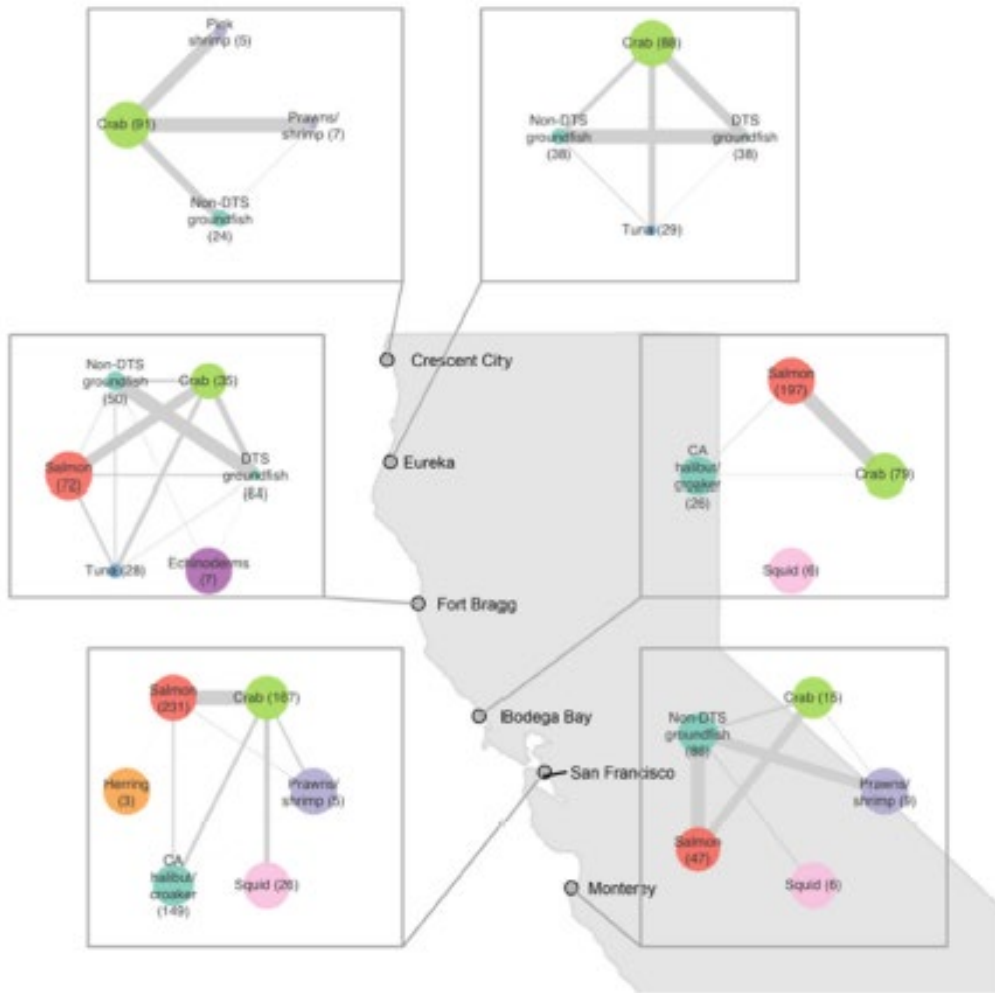


Figure 14. Figure R.3 from [Agenda Item I.1.a, IEA Team Report 2, March 2021](#). Fisheries participation networks for IO-PAC port groups in Northern and Central California based on November 2019-September 2020 landings receipts. Node size is proportional to revenue from a given fishery; numbers in parentheses are number of vessels participating in a node. The thickness of lines (“edges”) is proportional to the number of vessels participating in the pair of fisheries connected by the edges.

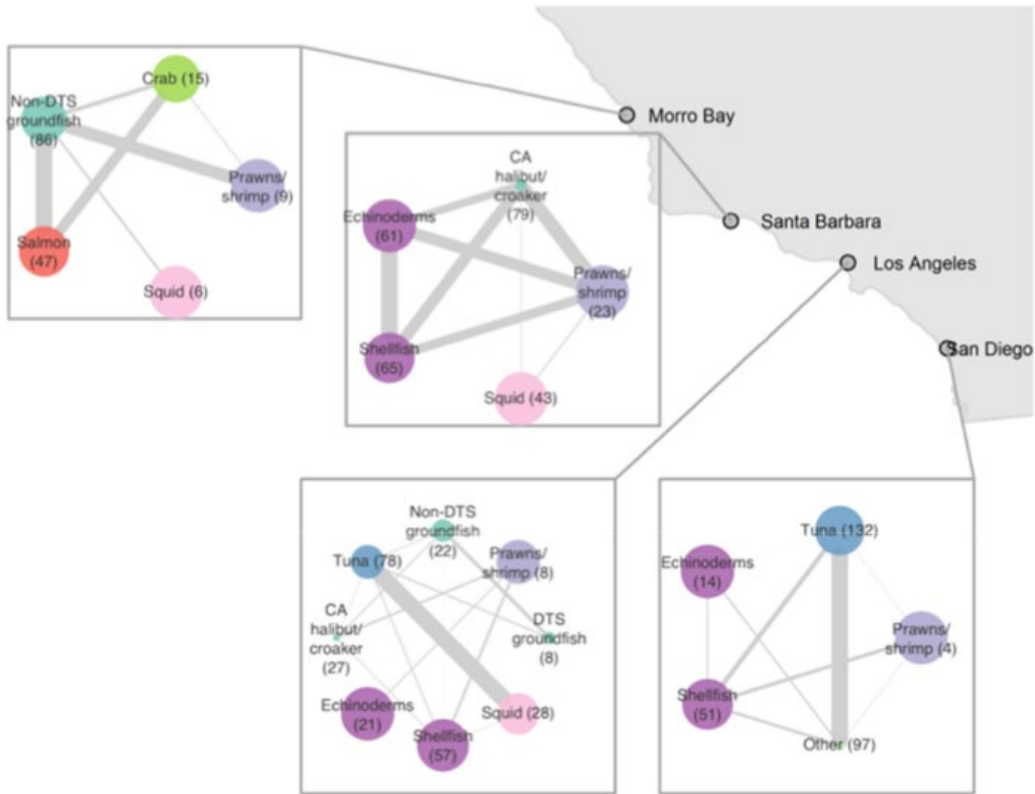


Figure 15. Figure R.4 from [Agenda Item I.1.a, IEA Team Report 2, March 2021](#). Fisheries participation networks for IO-PAC port groups in Southern California based on November 2019- September 2020 landings receipts. Node size is proportional to revenue from a given fishery; numbers in parentheses are number of vessels participating in a node. The thickness of lines (“edges”) is proportional to the number of vessels participating in the pair of fisheries connected by the edges.

Although California quillback rockfish are a contributing economic component to individuals participating in the nearshore fishery, and to a greater extent the nearshore live fish fishery, the total California quillback rockfish landings and ex-vessel revenue make up a small portion of each port complex’s total revenue generated by rockfish (including cabezon, greenling, California scorpionfish, and lingcod) or the entire groundfish management group (Table 11 and Table 12). Although California quillback rockfish landings are a small portion of each port’s portfolio, under Alternative 4 each port would be required to forgo the profits of all groundfish to reduce California quillback rockfish mortality to zero, because there is a possibility that any directed groundfish sector may encounter California quillback rockfish incidentally. For example, each year Eureka could forgo approximately \$4 million to prevent the mortality of 0.4 mt of quillback rockfish. The extent to which quillback rockfish contribute to each port’s overall landings and ex-vessel revenue of groundfish varies and will be analyzed in each respective section below.

Table 11. Average landings of California quillback rockfish compared to all rockfish landings (including cabezon, greenling, California scorpionfish, and lingcod) and all groundfish landings for 2014-2023. Source PacFIN 4/24/24

Port Group	Quillback Rockfish (mt) a/	All Rockfish (mt)	All Groundfish (mt)
Crescent City	0.95	70.73	190.57
Eureka	0.38	549.57	2730.86
Fort Bragg	0.90	625.74	1662.39
Bodega Bay	<0.01	19.19	62.65
San Francisco	0.02	148.30	436.99
Monterey	0.00	121.64	417.68
Morro Bay	<0.01	138.73	374.22
Santa Barbara	--	116.38	291.77
Los Angeles	--	25.11	66.95
San Diego	--	25.47	79.68

a/ 0.00" indicate a non-zero rounding sum, "--" indicate no data.

< [value] indicates a confidential value due to data limitations.

Table 12. Average ex-vessel revenue from California quillback rockfish compared to revenue from all rockfish landings (including cabezon, greenling, California scorpionfish and lingcod) and all groundfish landings for 2014-2023. Source PacFIN 4/24/24

Port Group	Quillback Rockfish USD (\$) a/	All Rockfish USD (\$)	All Groundfish USD (\$)
Crescent City	8,862	337,382	650,918
Eureka	2,796	747,816	4,200,527
Fort Bragg	11,779	1,097,311	3,483,528
Bodega Bay	<40	109,547	424,802
San Francisco	283	364,305	1,216,297
Monterey	36	639,014	1,588,203
Morro Bay	<10	1,485,596	2,574,326
Santa Barbara	—	1,494,419	2,558,643
Los Angeles	—	221,619	478,430
San Diego	—	245,876	578,077

a/ 0.00" indicate a non-zero rounding sum, "--" indicate no data.

< [value] indicates a confidential value due to data limitations.

The commercial non-trawl sectors were most negatively impacted by the management measures put in place in 2023 to prevent commercial California quillback rockfish mortality from exceeding

the harvest limits. ([Agenda Item G.8.a, Supplemental GMT Report 2, September 2023](#), [Agenda Item G.8.a, Supplemental GMT Report 5, September 2023](#), and [Agenda Item E.9.a, Supplemental GMT Report 1, November 2023](#) hereinafter links are referred to as No Action). Those management measures have already greatly limited access in the commercial groundfish fishery. These sectors will continue to be impacted if the Council adopts Alternative 2, and to a greater extent, if the Council adopts Alternative 4, because the majority of commercial impact to protect California quillback rockfish is concentrated on these sectors. Within the LEFG (excluding sablefish endorsed landings), OA, and Nearshore sectors Figure 16, Figure 17, and Figure 18 displays each port complex's total commercial groundfish landings, number of vessels that made landings, and ex-vessel revenue from groundfish landings by year from 2014 to 2023. These figures highlight the relative scale of landings, participation, and revenue across port complexes, with the largest concentration of groundfish landings and revenue generally occurring in the port complexes of Monterey, Morro Bay, and Santa Barbara. In some years, landings and revenue in the Fort Bragg port complex was comparable or greater than those of the three previously mentioned ports, and prior to 2020, participation was also comparable. In 2020, there was a reduction across most port complexes (likely due to COVID-19) and each port complex has begun to rebound since then. The landings, number of participants, and ex-vessel revenue across port complexes are variable and will be addressed in the following sections.



Figure 16. Groundfish landings (mt; all species) in the Limited Entry Fixed Gear (excluding sablefish endorsed), Open Access, and Nearshore sectors by California IOPAC port group, 2014-2023.

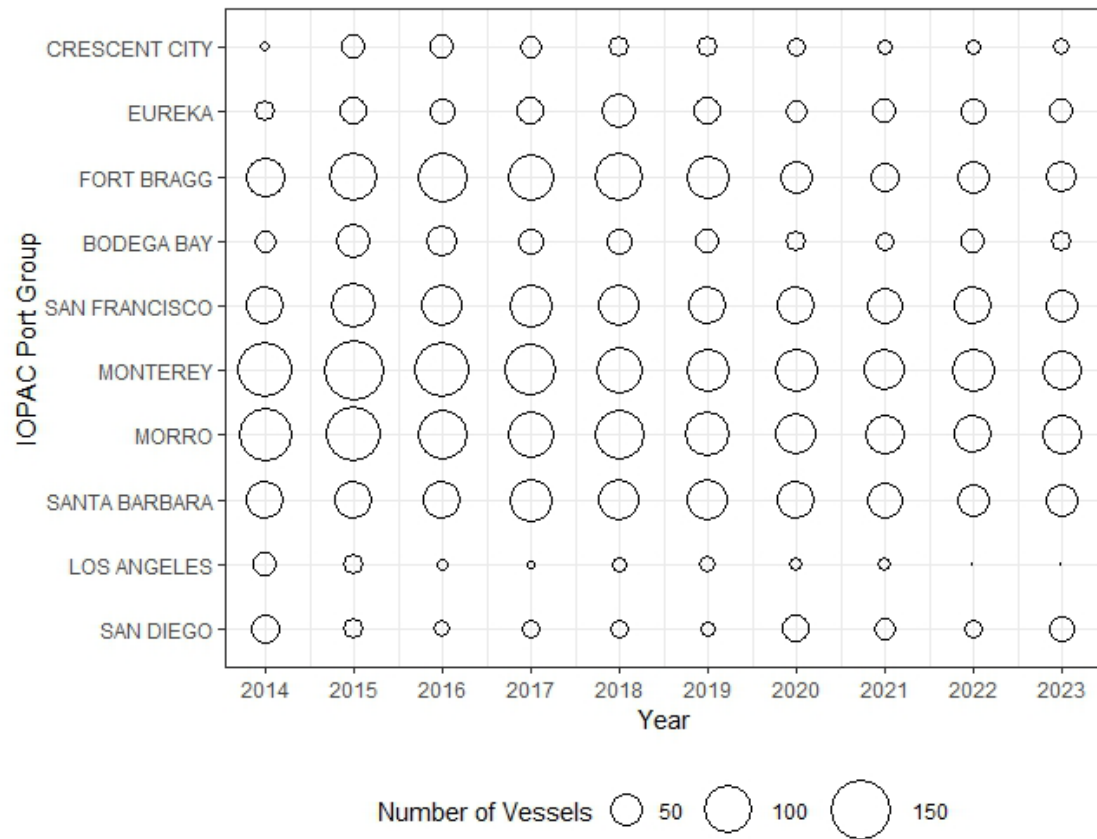


Figure 17. Number of vessels that made groundfish landings (all species) in the Limited Entry Fixed Gear (excluding sablefish endorsed), Open Access, and Nearshore sectors by California IOPAC port group, 2014-2023.



Figure 18. Inflation-adjusted ex-vessel revenue from groundfish landings (all species) in the Limited Entry Fixed Gear (excluding sablefish endorsed), Open Access, and Nearshore sectors by California IOPAC port group, 2014-2023.

5.3.1 Area Between 42° and 40° 10' North latitude

The two port complexes in northern California, Crescent City and Eureka, have a medium and low dependency on the commercial fishing industry, respectively, and rate moderate to high on the social vulnerability scale (Table 9). Both Crescent City and Eureka rely heavily on Dungeness crab (Figure 19). However, Eureka fisherman also rely on groundfish as a major contributor to the port complex portfolio. Although groundfish may not supply the ports with the most ex-vessel revenue, groundfish are the fishery sectors that have been the most stable in light of canceled salmon closures or shortened invertebrate seasons (e.g., Dungeness crab, red sea urchin, etc.). In years where salmon and crab are open, groundfish provides fishermen the opportunity to generate an income in between these seasons, as crab is typically prosecuted in the winter and salmon in the late spring.

Groundfish landings and ex-vessel revenue in northern California are similar across both port complexes when comparing limited entry fixed gear, open access, and nearshore sectors since 2014, noting that there are more vessels participating out of Eureka (Figure 16, Figure 17, and Figure 18). This indicates each port complex in the north will be equally impacted by the fixed gear management measures outlined in Alternative 2 similar to the management measures put in place in 2023 and 2024 to prevent commercial California quillback rockfish mortality from exceeding the harvest limits. These management measures, which include vast area closures, gear restrictions, and prohibiting the entire nearshore complex in Federal waters, will have substantial

impacts to these fishing communities. These ports generate a large portion of their fixed gear income from lingcod and nearshore and demersal shelf stocks, which can no longer be accessed inside of 75 fm (where the majority of the rocky reefs exist). Additionally, the diversity of the Northern California bathymetry, with many canyons and shelf sections that extend the 75 fm depth contour far past the safe range for some of the smaller operations, could prevent vessels from replacing lost opportunity shoreward of the Non-Trawl RCA.

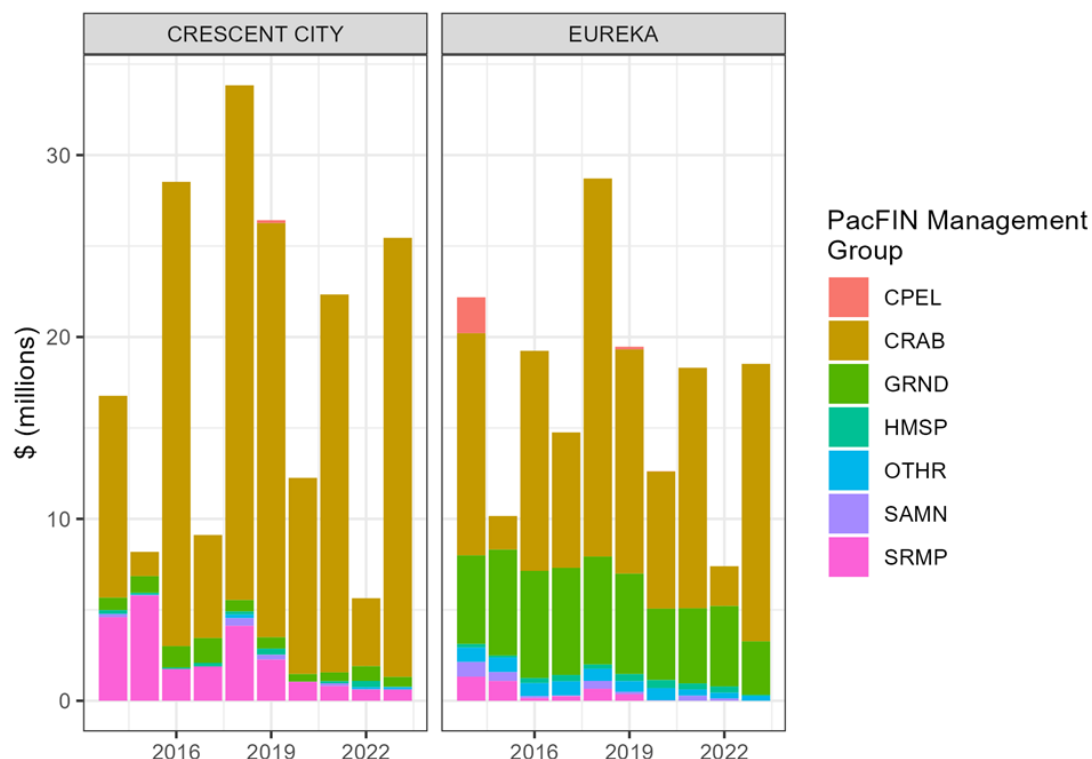


Figure 19. Commercial fish revenues by PacFIN Management Group for California IOPAC Port Areas between 42° - 40'10" 2014 - 2023. Shellfish revenues are excluded. PacFIN Management Group acronyms are as follows: coastal pelagic (CPEL), crab, groundfish (GRND), highly migratory species (HMSP), other (OTHR), salmon (SAMN), and shrimp (SRMP). CODE010 - PacFIN Species Code List

The proposed management measures under Alternative 4 would likely close groundfish fisheries in the EEZ off of Northern California. Eureka is unique as it derives more of their proportional ex-vessel revenue from groundfish than any other port; however, most of the port complex's ex-vessel revenue is from bottom and midwater trawl landings (Figure 20). Given the different fishing strategies and target stocks of the trawl fishery compared to the non-trawl fishery, Alternative 2 may have less impact on the overall commercial value but Alternative 4 would have substantial impacts on the port. If the Council were to adopt the Alternative 4 ($F = 0$) rebuilding strategy, in the near term all directed groundfish sectors would need to be completely closed between 42° and 40° 10' N. lat. in the EEZ. In the long term, as the stock recovers, it is uncertain what fisheries, areas, etc. could reopen, as there is a non-zero chance that the trawl and fixed gear sector may interact with at least a single California quillback rockfish. A complete closure of the groundfish fishery between 42° and 40° 10' N. lat. may result in a potential yearly loss to the area of up to \$5 million dollars based on a ten year ex-vessel revenue average (Table 12). However, the actual

impact would likely be less if State waters activity was excluded. Moreover, the management measures used to reduce the 10-year California quillback rockfish average mortality in this area, which is currently 1 mt, would come at the potential loss of 620 mt of all other rockfish or 2,921 mt of all other groundfish per year (Table 11). Alternative 4 would have substantial adverse economic impacts to the groundfish sectors in this area. Further, it is unlikely an $F = 0$ scenario could be achieved, given the historical mortality of California quillback rockfish in other non-groundfish fisheries like Pacific halibut in this area of the State.

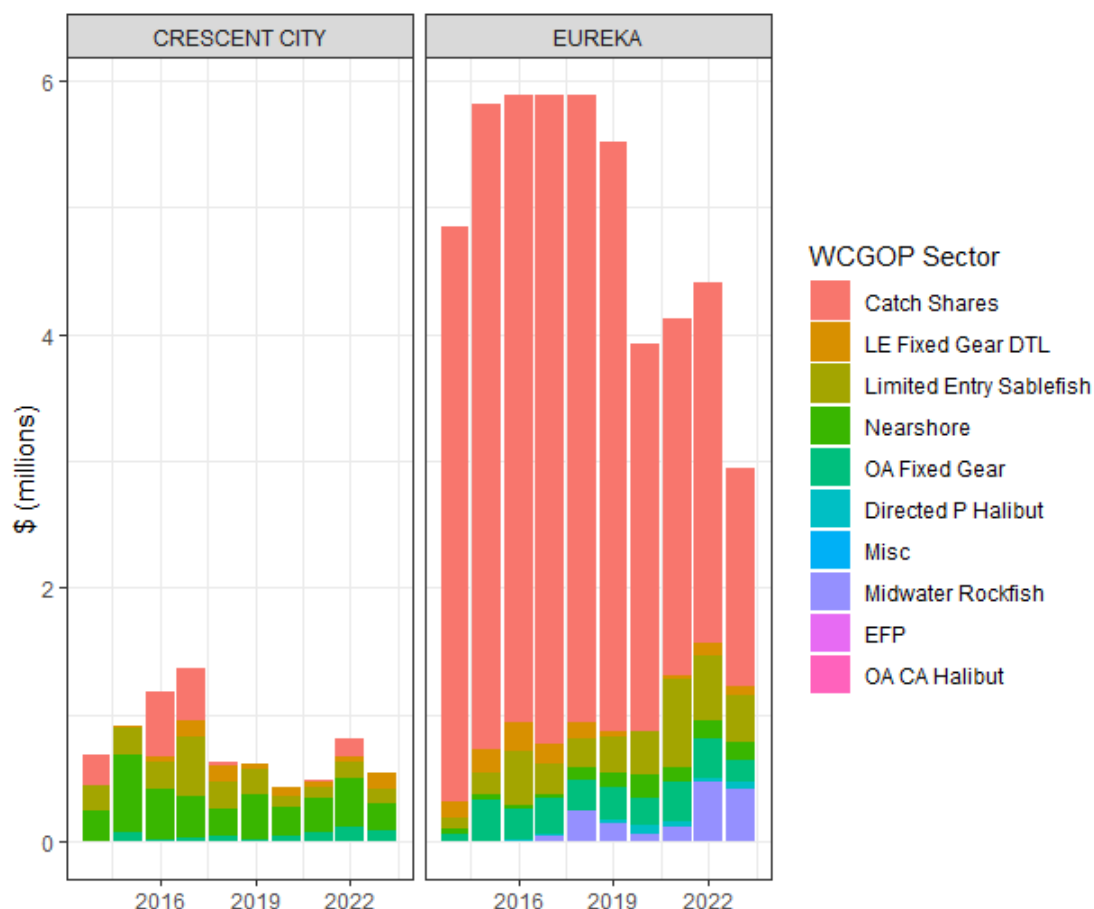


Figure 20. Groundfish revenue by West Coast Groundfish Observer Program sector code for IOPAC port areas between 42° - 40° 10' N. lat. The following modifications to original WCGOP codes have been made here for ease of presentation: “Catch Shares” and “Catch Shares EM” have been combined; “Midwater Rockfish” and “Midwater Rockfish EM” have been combined; “Pink Shrimp,” “Ridgeback Prawn,” “Sea Cucumber,” and “Research” have been combined into a “Misc” sector. There were no shoreside whiting landings into California ports, though note that the shoreside whiting fishery may possibly operate in California waters and land elsewhere.

5.3.2 Area Between 40° 10' and 37° 07' North latitude

The three port complexes in the area between 40° 10' and 37° 07' N. lat., Fort Bragg, Bodega Bay, and San Francisco, have a medium and low dependency on the commercial fishing industry, respectively, and have high to low social vulnerability as latitude decreases (Table 9). These port complexes rely heavily on Dungeness crab, and to a lesser extent, salmon and groundfish with the expectation of Fort Bragg, which is unique as it derives more of its proportional ex-vessel revenue

from groundfish than any other port other than Eureka. In Fort Bragg, groundfish ex-vessel revenue matches or exceeds the revenue from Dungeness crab (Figure 21). Although groundfish may not supply these ports with the most ex-vessel revenue in relation to other management groups, they are part of the fishery participation network for the port and often act as an income stabilizer between other seasons or closures.

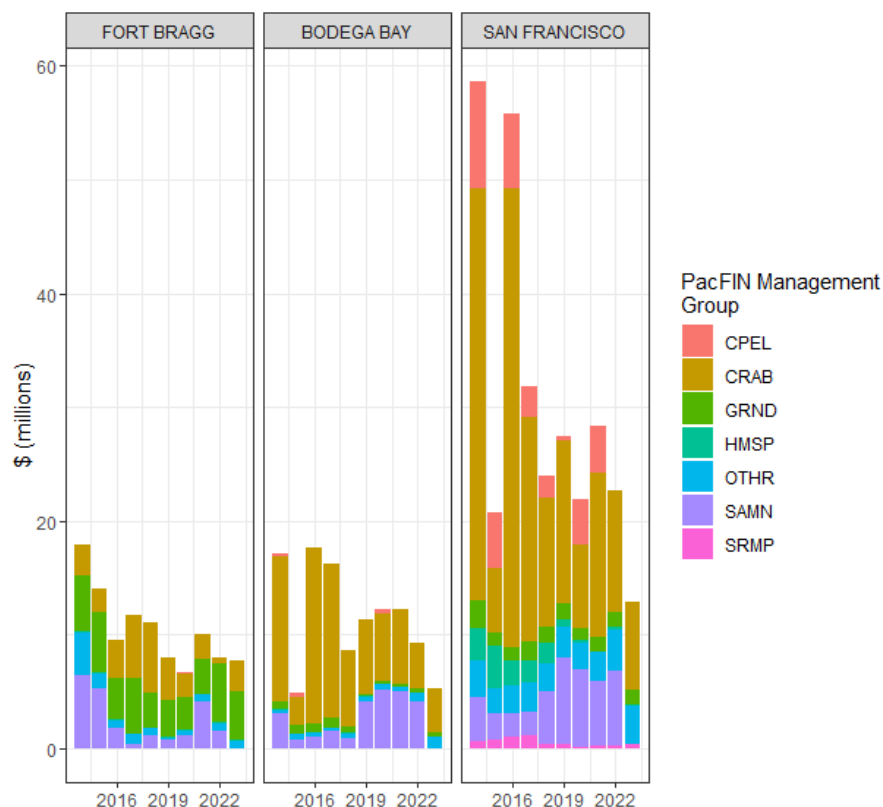


Figure 21. Commercial fish revenues by PacFIN Management Group for California IOPAC Port Areas between 40° 10' - 37° 07' N. lat. (2014 - 2023). Shellfish revenues are excluded. PacFIN Management Group acronyms are as follows: coastal pelagic (CPEL), crab, groundfish (GRND), highly migratory species (HMSP), other (OTHR), salmon (SALM), shellfish (SHLL), and shrimp (SRMP). [CODE010 - PacFIN Species Code List](#)

Fort Bragg's fixed gear groundfish landings, ex-vessel revenue, and number of participants are greater than Bodega Bay or San Francisco and among the highest in Northern or Central California (Figure 16, Figure 17, and Figure 18). Along with a higher proportion of the port's ex-vessel revenue being derived from groundfish and the limited diversity of other management groups landing into Fort Bragg (Figure 22), it is likely to be one of the port complexes most affected by either Alternative 2 or Alternative 4. San Francisco fixed gear sectors have been increasing in both landings and ex-vessel revenue over the last decade, which would be severely reduced under either alternative. Alternative 2 is similar to the management measures put in place in 2023, which have already greatly limited access in the commercial groundfish fishery. Similar to the Crescent City and Eureka ports, these impacts are felt substantially across these fishing communities, including vast area closures, gear restrictions, and prohibiting the entire nearshore complex in Federal waters. These ports generate a large portion of their fixed gear income from lingcod and nearshore and demersal shelf stocks, which can no longer be accessed inside of 75 fm where the majority of

the rocky reefs exist. Additionally, the diversity of the Central California bathymetry, with many canyons and shelf sections that extend the 75 fm depth curve far past the safe range for some of the smaller operations, could prevent vessels from replacing lost opportunity shoreward of the Non-Trawl RCA.

The current set of management measures adopted by the Council, in September 2023 and November 2023, for 2024, as inseason adjustments to reduce impacts to California quillback rockfish, are proposed for Alternative 2. Anecdotal evidence from public comment since September 2023 illustrates that these measures have had negative impacts in the form of decreasing landings and ex-vessel revenue in the region. As these measures are proposed under Alternative 2, a trend of reduced groundfish landings and ex-vessel revenue is expected to continue into the next biennium. Additionally, Alternative 4 could disproportionately impact Central California port complexes, notably Fort Bragg, as groundfish is a primary target in the industry's portfolio. Loss of the groundfish fishery would likely reduce, and potentially eliminate, infrastructure (e.g., processors, port services, etc.) linked to groundfish. Given the timeline to rebuild this stock, it is foreseeable that other community interests are likely to integrate into the port areas, (i.e., industry replacement). As California quillback recovers, these port communities likely will not be able to revert back to being fully supported by the fishing industry, considering the uncertainty of a future fishery. It is expected that densely populated ports with high property value such as San Francisco would see the loss of fishing infrastructure at a faster rate than less populated areas such as Fort Bragg. In San Francisco, it is highly unlikely for commercial real estate to return to fishing infrastructure after becoming a restaurant or apartment building, each of which would likely generate more revenue than a fishing port. Meaning, port communities may select for a known economic return rather than re-establish an unknown economy from fisheries, i.e., the loss of historic fishing communities to development.

Fort Bragg and San Francisco derive approximately half of the port complex's groundfish ex-vessel revenue from the trawl catch share sector (Figure 22). While there is uncertainty regarding the long term impacts to this fishery relative to Alternative 4, the near term impacts would likely be high in these ports. If the Council were to adopt the Alternative 4 ($F = 0$) rebuilding strategy, all directed groundfish sectors would need to be completely closed for the near term. In the long term, there is uncertainty regarding whether revisions to the rebuilding plan will be made. In addition, given that there is a non-zero chance that the trawl and fixed gear sectors may interact with at least a single quillback, management measures under an $F = 0$ strategy will likely need to be conservative, suggesting that the closures may be long term. A complete closure of the groundfish fishery in the Central California port complexes may result in a potential annual loss of approximately \$5 million dollars to these communities, as compared to the average groundfish landings for the last ten years, if Alternative 4 were adopted (Table 12). However, the actual impact would likely be less if State waters activity was excluded. Moreover, the management measures used to reduce the 10-year California quillback rockfish average mortality in this area, which is currently approximately 1 mt, would come at the potential loss of 793 mt of all other rockfish or 2,162 mt of all other groundfish per year (Table 11). Alternative 4 would have substantial adverse economic impacts to this area and would likely still result in California quillback rockfish mortality associated with bycatch in other non-groundfish fisheries like Pacific halibut, salmon, and California halibut among others.

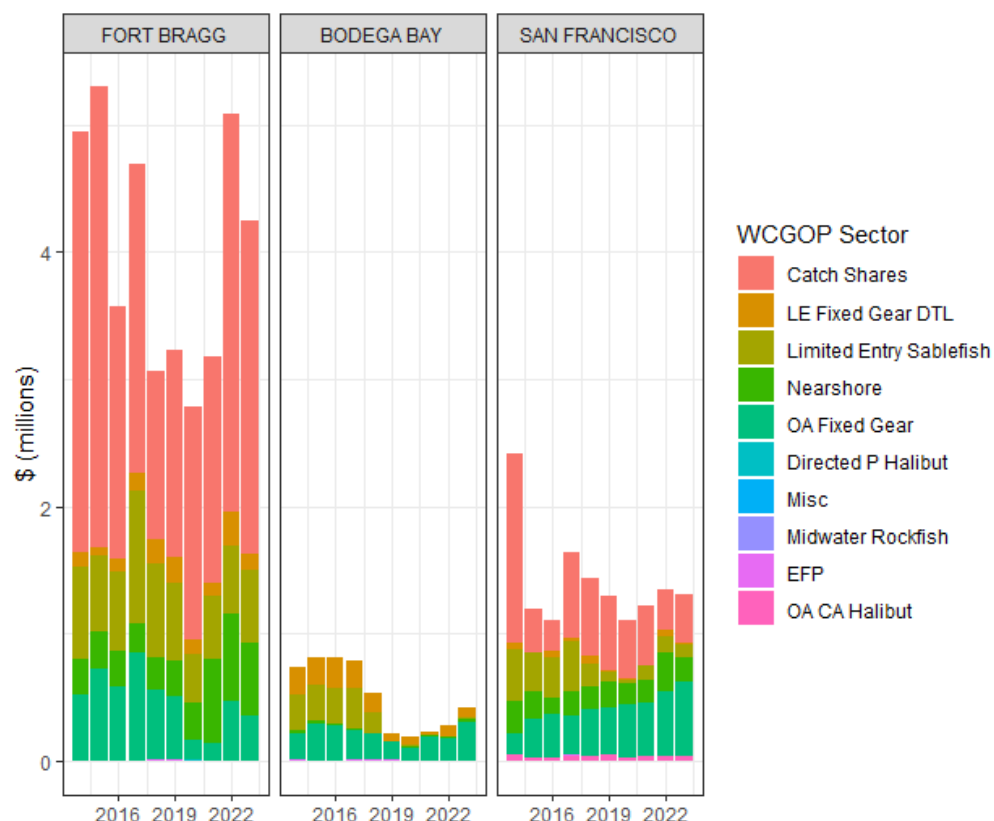


Figure 22. Groundfish revenue by West Coast Groundfish Observer Program sector code for IOPAC port areas between 40° 10'-37° 07' N. lat. The following modifications to original WCGOP codes have been made here for ease of presentation: “Catch Shares” and “Catch Shares EM” have been combined; “Midwater Rockfish” and “Midwater Rockfish EM” have been combined; “Pink Shrimp,” “Ridgeback Prawn,” “Sea Cucumber,” and “Research” have been combined into a “Misc” sector. There were no shoreside whiting landings into California ports, though note that the shoreside whiting fishery may possibly operate in California waters and land elsewhere.

5.3.3 Area Between 37° 07' North latitude and the US Mexico Border

The five port complexes in the area between 37° 07' N. lat. and the U.S./Mexico Border, which includes Monterey Bay, Morro Bay, Santa Barbara, Los Angeles, and San Diego, have a high to low dependency on the commercial fishing industry. They rate moderate to low on the social vulnerability scale with the exception of Moss Landing and Los Angeles which rate high to medium high (Table 9). Though quillback rockfish's range extends to Anacapa Island, California (approximately 34° N. lat.; Love et al., 2002), this species is extremely rarely recorded south of Point Conception in any commercial fishery data and never in California Collaborative Fisheries Research Program or the CDFW and MARE ROV survey data ([Agenda Item F.8.a Supplemental GMT Report 1 March 2024](#)). Therefore, it is unclear whether the impacts will be only to ports between 37° 07' and 34° 27' N. lat., namely Monterey Bay, Morro Bay, and Santa Barbara, or to all ports south of 37° 07' N. lat. No commercial landings of California quillback rockfish have been reported in ports south of Morro Bay, though two encounters with quillback rockfish were observed in the State-permitted nearshore fishery south of Point Conception. In addition, quillback rockfish were reported for only one year and month (December 2012) in the South District (San Diego, Orange and Los Angeles Counties) in CRFS data. Data are provided for all ports between 37° 07' N. lat. and the U.S./Mexico Border.

Monterey Bay, Morro Bay, and Santa Barbara ports are more similarly related than the southern ports in this area, as ocean dynamics and species composition shift from Central California into the South California Bight. Additionally, they have a much larger portion of the fixed gear groundfish landings, ex-vessel revenue, and participants (Figure 16, Figure 17, and Figure 18) than the ports south of Point Conception. Monterey Bay generates most of their ex-vessel revenue from coastal pelagic species (CPS) and to a lesser extent salmon and groundfish; however, the groundfish fishery has been expanding in recent years (Figure 23). The shift to groundfish is likely due to the uncertainty in salmon/Dungeness crab and the boom and bust cycles of CPS. Morro Bay has a diverse portfolio which has relied more heavily on groundfish in recent years and Santa Barbara is primarily generating ex-vessel revenue from CPS or the “other” category, consisting primarily of spiny lobster and red sea urchin. The groundfish fishery has historically been the income stabilizer that provides stability throughout changes and closures to salmon, crab, coastal pelagic, and lobster seasons in this region. None of the five ports in this area will be affected by Alternative 2 if the management line remains at 37° 07' N. lat. other than the prohibition to retain California quillback rockfish as proposed above. Under the 2023 and 2024 framework, which would be continued under Alternative 2, the management measures associated with this region are not as restrictive as measures applied to the north due to the rare occurrence of California quillback rockfish ([Agenda Item E.9.a, Supplemental GMT Report 2, November 2023](#)). Alternative 2, however, may shift effort from the areas described above into Central and Southern California. This effort shift, in conjunction with the opening of the Cowcod Conservation Areas, and opening of the Non-Trawl RCA seaward of 75 fathoms, could concentrate effort south of 37° 07' N. lat., which may create other management issues that may need to be addressed with inseason management changes.

However, under Alternative 4, Monterey Bay, Morro Bay, Santa Barbara, Los Angeles, and San Diego groundfish fisheries would likely be closed to reach $F = 0$. As mentioned above, commercial quillback rockfish encounters are extremely rare south of Point Conception, but not zero, and therefore this area may need to be closed along with more centrally located ports. To reach $F = 0$, the Council would likely need to adopt a complete closure of the groundfish fishery, resulting in a yearly loss to the area of a potential \$7 million dollars compared to the ten year average of groundfish landings (Table 12). However, the actual impact would likely be less if State waters activity was excluded. Moreover, the management measures used to reduce the 10-year California quillback rockfish average mortality in this area, which is currently less than 0.01 mt, would come at the potential loss of 427 mt of all other rockfish or 1,230 mt of all other groundfish per year (Table 11). Such an action would have substantial adverse economic impacts to Monterey Bay, Morro Bay, Santa Barbara, Los Angeles, and San Diego, and likely would still have quillback rockfish mortality associated with bycatch in other non-groundfish fisheries.



Figure 23. Commercial fish revenues by PacFIN Management Group for California IOPAC Port Areas south of 37° 07' N. lat. (2014 - 2023). Shellfish revenues are excluded. PacFIN Management Group acronyms are as follows: coastal pelagic (CPEL), crab, groundfish (GRND), highly migratory species (HMSP), other (OTHR), salmon (SAMN), shellfish (SHLL), and shrimp (SRMP). [CODE010 - PacFIN Species Code List](#)

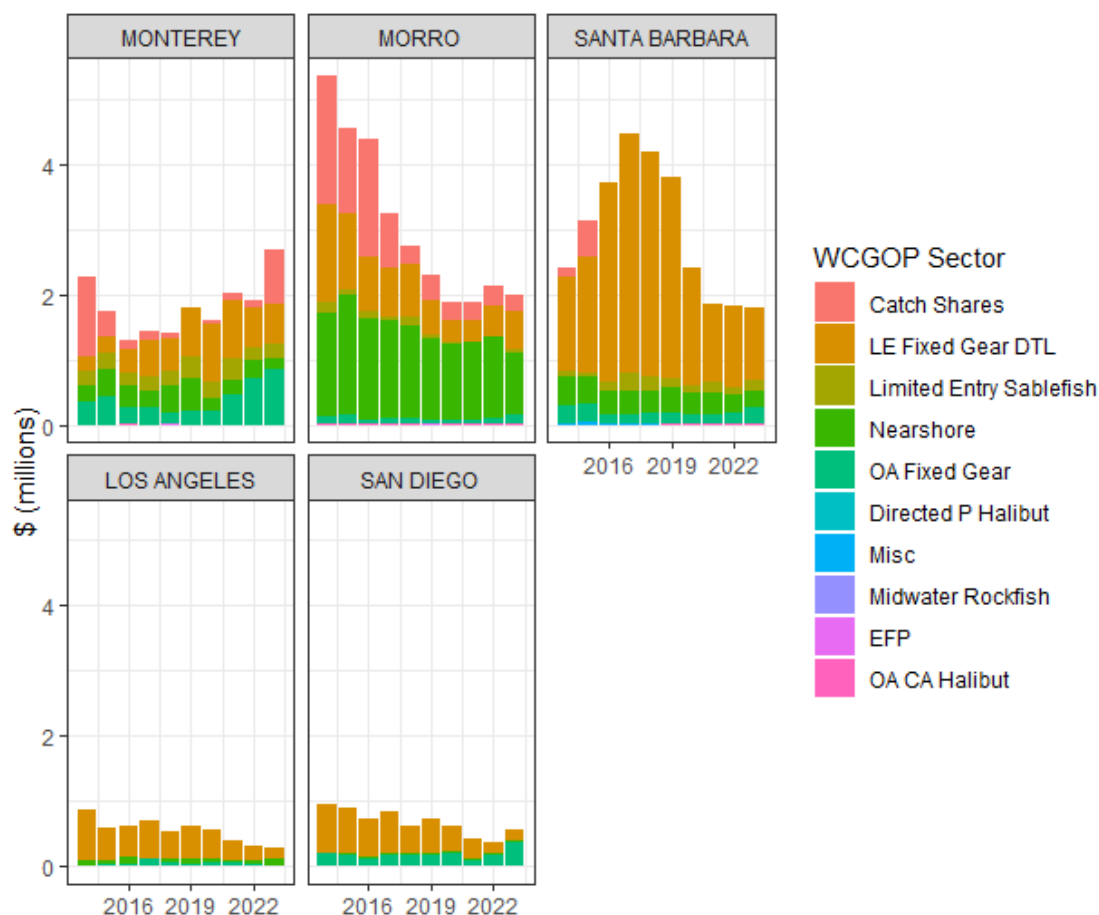


Figure 24. Groundfish revenue by West Coast Groundfish Observer Program sector code for IOPAC port areas south of 37° 07' N. lat. The following modifications to original WCGOP codes have been made here for ease of presentation: “Catch Shares” and “Catch Shares EM” have been combined; “Midwater Rockfish” and “Midwater Rockfish EM” have been combined; “Pink Shrimp,” “Ridgeback Prawn,” “Sea Cucumber,” and “Research” have been combined into a “Misc” sector. There were no shoreside whiting landings into California ports, though note that the shoreside whiting fishery may possibly operate in California waters and land elsewhere.

5.4 Social Considerations Related to West Coast Fisheries

5.4.1 Equity and Fairness

Both MSA and [Executive Order 13985](#) emphasize principles of fairness and equity in decision making. While these mandates are clear in their direction to consider fairness and equity, they are less clear in specifying precisely how these concepts should be evaluated. Household income is often seen as a factor describing underserved communities and is observable for a sample of West Coast fishery participants. Additionally, the vulnerability framework developed by Jepson and Colburn (2013) and utilized in the [2023 California Current Ecosystem Status Report](#) uses household income as a determinant of vulnerability for communities of place. Using these survey data, we can directly observe this important determinant of vulnerability for fishery participants. In this section we examine the extent to which groundfish fishermen likely to be most severely impacted by rebuilding measures exhibit household income characteristics making them particularly vulnerable to disruption.

The [West Coast Fisheries Participation Survey](#) is conducted regularly (every three years since 2017) by Social Scientists at the NWFSC. Its primary purpose is to help researchers and managers understand individuals’ choices to participate in commercial fishing and the benefits, both monetary and non-monetary, that they derive from fishing. Survey questions 31 (from the 2023 survey) and 32 (from the 2020 survey) ask respondents for their approximate household income from the previous year.

Household income is defined categorically with 7 possible levels. Differences in distributions across these income categories for individuals most affected⁸ by rebuilding measures versus those not directly affected can be evaluated using a χ^2 test-statistic. Under the null hypothesis, observations are distributed across the income levels independent of individual status (affected/unaffected). Figure 25 shows observed and expected observation counts under the null hypothesis for affected and unaffected fishermen, where the “affected” group includes all previously defined affected fishermen in California.



Figure 25. Observed and expected distribution of household income for 2023 survey respondents. “Affected” group includes affected fishermen in California.

⁸ Here “affected” individuals are those participating in fixed gear groundfish fisheries and “unaffected” includes all other respondents. The primary negative impacts of both Alternative 2 and Alternative 4 (loss of access to historical fishing grounds) will fall disproportionately on fixed gear groundfish fishermen in California.

5.4.2 Social Capital and Community Identity

Fishing is more than just a source of income to many fishers. It is a source of enjoyment and fulfillment that other available jobs apparently cannot match for most fishers. It is a way of life and an important part of social identity to many. How fisheries impact the wellbeing of participants and coastal communities is influenced by factors aside from how much fish can be harvested and the profits the fishery generates. (Holland et al. 2019, p.638)

Impacts to communities from loss of access to historically utilized fishing grounds generally extend beyond the financial impacts from loss of income to fishermen and loss of ex-vessel revenue to port communities. Social or non-monetary impacts of restricting access to fishing grounds may include loss of a sense of identity and belonging as well as loss of community cohesion that is important in sustaining fishing communities. Richmond and Casali (2008) identify social capital as a key determinant of fishing community sustainability and resilience.

While these impacts are difficult to quantify, the [West Coast Fisheries Participation Survey](#) was designed to help researchers and managers understand these social dynamics. Several questions from the 2023 vintage of this survey can offer important insights on social implications of a prolonged fishery closure:

1. Question 24: *Have you ever continued fishing in order to provide employment for crew when you thought the profits earned by the vessel might fail to cover expenses?* 57% of respondents answered in the affirmative to this question.
2. Question 12 asks respondents to indicate their agreement with a series of statements regarding connection to their community.
 - a. 80% of respondents “Strongly Agree” with the statement: *Being a fisherman is important to me.*
 - b. 63% “Strongly Agree” with the statement: *My fishing community is important to me.* Additionally, 62% “Strongly Agree” with the statement: *Continuing a community tradition is important to me.*
 - c. 42% “Strongly Agree” with the statement: *Continuing a family tradition is important to me.*

Item #1 suggests that providing for the financial needs of their community is important to West Coast commercial fishermen. Item #2 suggests that West Coast commercial fishermen value their identity as fishermen and supports the perception of fishermen as emotionally connected to their communities.

The loss of access to a key target species like groundfish, and the fleet attrition likely to accompany that loss, will have impacts on well-being of individual fishermen as well as adverse impacts to communities stemming from degradation of social capital. While these potential social impacts are likely to be felt to some extent under either Alternative 2 or Alternative 4, they are likely to be more severe under Alternative 4.

5.4.3 Long-term considerations to commercial communities

Fuller et al. (2017) described three choices that fishery participants might make when faced with environmental, technological or management changes as 1) change spatial distribution of fishing,

2) find alternative sources of income and even stop fishing altogether, or 3) change how they distribute effort among the fisheries they participate in. The long term social and economic difference between the two rebuilding alternatives are difficult to quantify because they are uncertain for three major reasons. First, the response of the stock to rebuilding efforts and the time needed for rebuilding is uncertain, which could require additional management measures to achieve rebuilding. Second, management measures for the duration of the rebuilding period are uncertain, as managers will need to respond to new information that comes from the newly emerged fishery, i.e., the use of non-bottom contact hook-and-line gear, and any other future changes to the fishery and/or ecosystem. The third source of uncertainty is fishery participant behavior.

The long term decline in overall commercial fishing activity in California, and its association with deteriorating commercial fishing support infrastructure⁹, is well documented. Pomeroy et al. (2011) profiled the California North Coast ports of Crescent City, Eureka, and Fort Bragg, making the following observations:

“Aging infrastructure, the closure of support businesses such as Eureka Fisheries in 2000 and Eureka Ice and Cold Storage in 2008, and increasingly expensive real estate prices and permitting requirements for maintaining and developing Eureka’s working waterfront, have complicated efforts by fishermen and others to maintain viable operations. Receiving and processing capacity has contracted geographically and become consolidated. Where multiple providers of goods and services (e.g., marine supply, fuel dock, vessel maintenance and repair) once were needed to meet local demand, only one or two of each type remain, serving communities elsewhere along the North Coast as well as Eureka. While this consolidation suggests increased efficiency, the limited number of goods and service providers makes the local fishing community vulnerable to further regulatory, economic and environmental change. (p.9)”

“The decline in fishing activity at Crescent City over the last 30 years has reduced shoreside activity, leading businesses to close, reduce services and/or inventory, or diversify their operations. With limited alternative sources of revenue, harbor infrastructure has deteriorated. Insufficient provision for basic maintenance and repair of docks and related infrastructure has led to their disrepair and vulnerability to events such as the 2006 tsunami. These and other costs, particularly for dredging and dredge material disposal, and maintaining and operating the wastewater treatment plant, have become significant. (p.9)”

“As fishing activity has declined over the last 30 years, so has the Noyo Harbor District’s revenue base, making it difficult to maintain and improve infrastructure, while costs, particularly for dredging and dredge material disposal, have become significant both for the harbor district, and Dolphin Isle Marina. Use of other infrastructure, including receiving stations, fuel docks and the ice plant, which are privately owned, has declined as well, leading to reductions in the number and types of support businesses. With only a core group of support businesses remaining, fishery participants are concerned about the potential for further loss

⁹ Here “infrastructure” is used to encompass physical commercial fishery support infrastructure as well as commercial fishing support services (vessel and gear maintenance for example), and markets.

of infrastructure, and its implications for the viability of local fisheries and the fishing community. (p.10)”

Infrastructure concerns specific to groundfish are documented in the Pacific Coast Groundfish Fishery Social Study (PCGFSS) led by Suzanne Russell. [Appendix J of the West Coast Groundfish Trawl Catch Share Program Five Year Review](#) presents results from this survey relating to commercial fishing support infrastructure by homeport area. The overarching theme of responses from California’s North Coast area is that persistent disruptions to groundfish participation (combined impacts of the Trawl Buyback Program and implementation of RCAs in 2003 permanently removed significant groundfish harvesting capacity from the Crescent City, Eureka, and Fort Bragg area; implementation of Catch Shares in 2011 which led to industry consolidation and further vessel attrition) has led to a loss of infrastructure and support services, creating a hardship for remaining fishermen. Similar losses in California port infrastructure resulting from restrictive management measures could be felt by the commercial fixed gear fishery under this rebuilding plan.

While it is difficult to project the magnitude, it is likely that reductions in groundfish fishing opportunity under Alternatives 2 and 4 will exacerbate the ongoing deterioration in commercial fishery infrastructure at California ports. As with most impacts in this analysis, the potential adverse infrastructure implications of Alternative 4 can reasonably be assumed to be more severe than Alternative 2, as Alternative 4 is expected to result in larger reductions in groundfish fishing activity.

5.5 Recreational Communities

Recreational anglers often report deriving value from fishing in the form of: health and wellness benefits of outdoor exercise and relaxation, spiritual and cultural benefits of connecting with nature, subsistence benefits, and social benefits of spending time with friends and loved ones (Young et al. 2016). Economic evaluation of recreational fishing, such as is commonly done through estimation of angler willingness to pay, encompasses the many dimensions of value anglers derive from fishing.

When recreational fishing access is limited, anglers are impacted through the loss of cultural, spiritual, social, and financial values associated with fishing. Economic evaluation of this loss implies consideration of the many distinct and unique sources of value (see Oleson et al. 2015). When referencing methodology or approach to inferring welfare losses from regulatory restrictions on recreational fishing we will use the term “economic analysis” or “economic impact analysis.” When referencing particular potential or realized impacts to anglers and communities we will use the term “social and economic impacts” in recognition of the diverse sources of value recreational fishing provides.

Off California, groundfish are a common target for recreational anglers. Effort is variable but relative to time of year, port area, and presence of other target species. The majority of groundfish, including California quillback rockfish, are caught by boat-based anglers, either private vessels (PR mode) or party/charter vessels (PC mode). Recreational effort is correlated with population density, meaning areas of higher population density are expected to have higher effort than those with lower density. Additionally, differentiation of trips to target a particular species group (trip type) is generally reflective of stocks available to anglers in a given area. For example, in the

northern ports, recreational anglers may preferentially target ocean salmon during the salmon season and in southern ports, recreational anglers may target kelp bass or highly migratory species (e.g., tuna) at certain points of the year. The presence of other fisheries allows for anglers to diversify their effort. In areas with more target species, anglers can target species other than groundfish or groundfish that do not co-occur with California quillback rockfish. Overall, based on RecFIN data, bottomfish is the dominant target for recreational anglers in California (Figure 26).

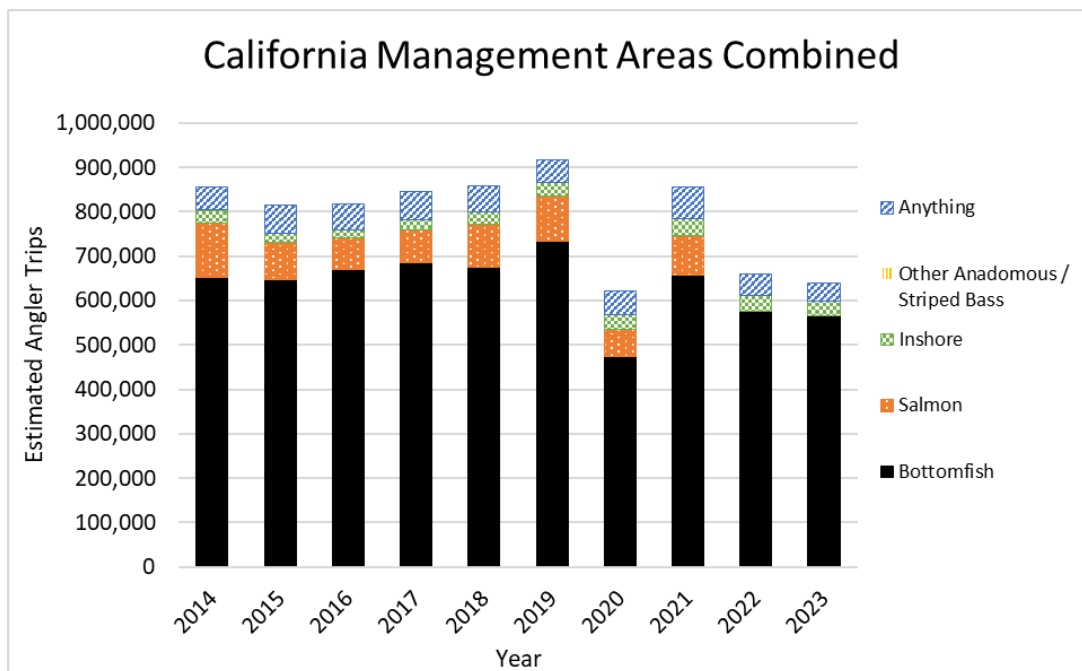


Figure 26. Statewide. Recreational angler trips in all Management Areas of the California recreational fishery by RecFIN trip type target from 2014-2023 for the private rental and party charter boat modes in ocean waters. Highly migratory species and invertebrate data is not included in RecFIN data for California. Salmon data only available through 2021 and is from the Council's [Salmon Historical data \("blue book"\)](#). RecFIN trip type "bottomfish" includes groundfish, Pacific halibut and some State managed species. Examples of target species and/or groups in the trip type category can be found in Table 1.1 of the [CRFS Methods](#) document.

5.5.1 California Recreational Management Areas Fisheries

California manages the recreational fishery in five MAs: Northern (Oregon/ California border to 40°10' N. lat.), Mendocino (40°10' N. lat. to Point Arena 38°57.5' N. lat.), San Francisco (Point Arena, 38°57.5' N. lat. to Pigeon Point 37°11' N. lat.), Central (Pigeon Point, 37°11' N. lat. to Point Conception 34°27' N. lat.), and Southern (Point Conception 34°27' N. lat. to the US/Mexico Border). In terms of fisheries, there are noticeable differences between the Southern MA and the Northern MAs. For all MAs, groundfish provide a reliable opportunity and is a primary driver for fishing effort; however, each MA is not limited to groundfish as alternative targets are available. These other fisheries could provide positive benefits to recreational anglers and communities; however, these benefits may be limited to anglers who are able to access these non-groundfish fisheries and those communities where these alternate fisheries are accessible.

Fishery effort in the Northern (Figure 27), Mendocino (Figure 28), San Francisco Bay (Figure 29), and Central MAs (Figure 29) is primarily focused on groundfish and salmon (when available). Groundfish effort is the primary driver of the recreational fishery in these MAs. Recreational effort for salmon is second to groundfish in these MAs; however, annual salmon abundance can fluctuate and opportunity can be very limited in certain years. From 2008 to 2010 and again in 2023-24, increased salmon fishing restrictions, including full season closures, were implemented to address the collapse of Sacramento River fall run Chinook salmon. Recreational anglers in these MAs target other species (Dungeness crab, albacore, and California halibut, etc.) based on the availability of the resource (i.e., time of year, proximity to port, abundance, etc.).

In the Northern and Mendocino MAs, Pacific halibut fishery provides an additional source of opportunity in this portion of the coast which is not available in all MAs. The halibut fishery is a quota fishery scheduled May through November, though the fishery may need to close early if quota is attained (or projected to be attained) prior to the scheduled end date. Reduced groundfish and salmon opportunities, however, have resulted in additional angling effort into this fishery, increasing the likelihood that the quota will be attained earlier in the year. Alternative targets could displace some of the angler effort and provide a positive impact to communities, as anglers have something to target, but it is unclear if they could offset the benefits provided by anglers who target groundfish. A reduction in overall fishing effort has a negative economic impact to revenue in local communities through reductions

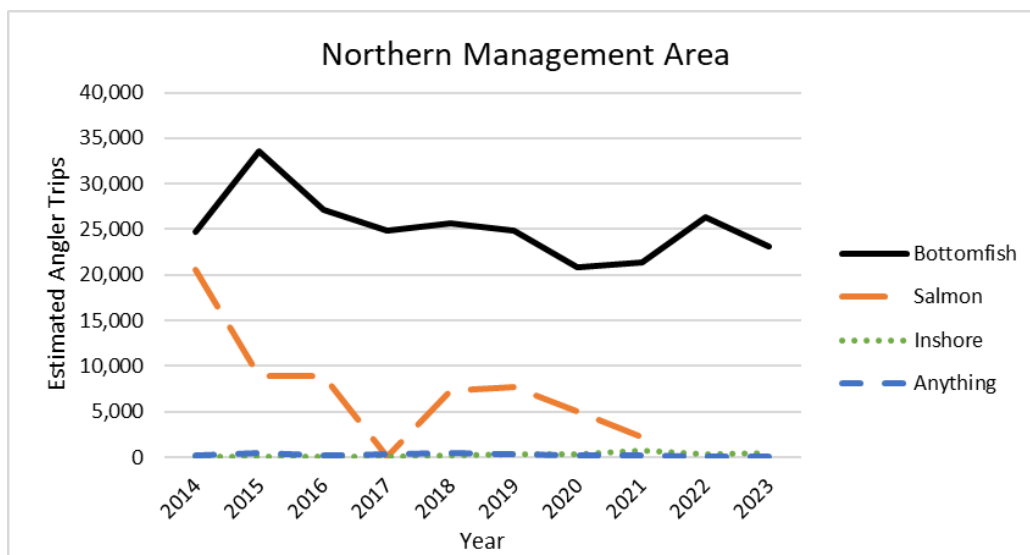


Figure 27. Recreational angler trips in the Northern Management Area of the California recreational fishery by RecFIN trip type target from 2014-2023 for the private rental and party charter boat modes in ocean waters. Salmon data only available through 2021 and is from the Councils [Salmon Historical data](#) (“blue book”). RecFIN trip type “bottomfish” includes groundfish, Pacific halibut and some State managed species.

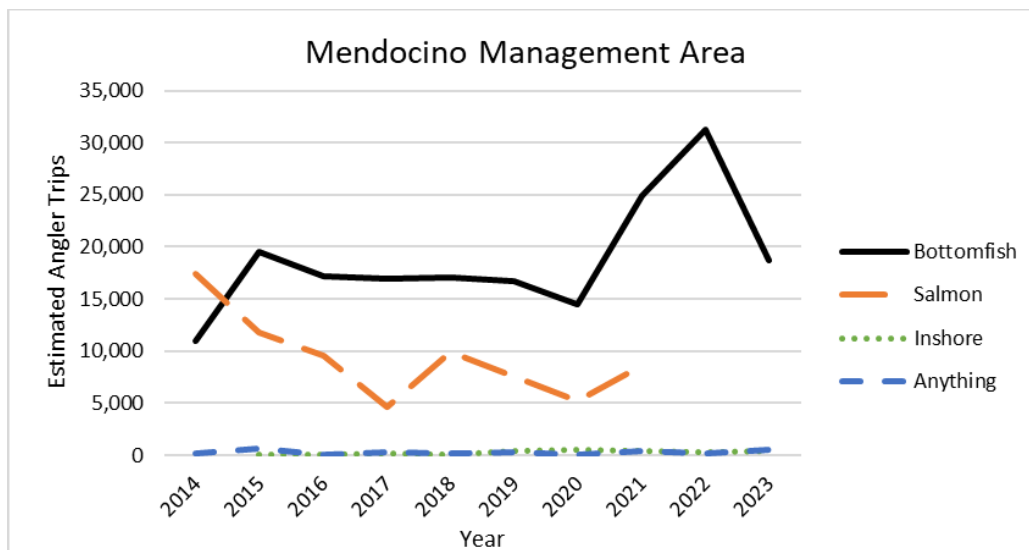


Figure 28. Recreational angler trips in the Mendocino Management Area of the California recreational fishery by RecFIN trip type target from 2014-2023 for the private rental and party charter boat modes in ocean waters. Salmon data only available through 2021 and is from the Councils [Salmon Historical data \(“blue book”\)](#). RecFIN trip type "bottomfish" includes groundfish, Pacific halibut and some State managed species. Examples of target species and/or groups in the trip type category can be found in Table 1.1 of the [CRFS Methods](#) document.

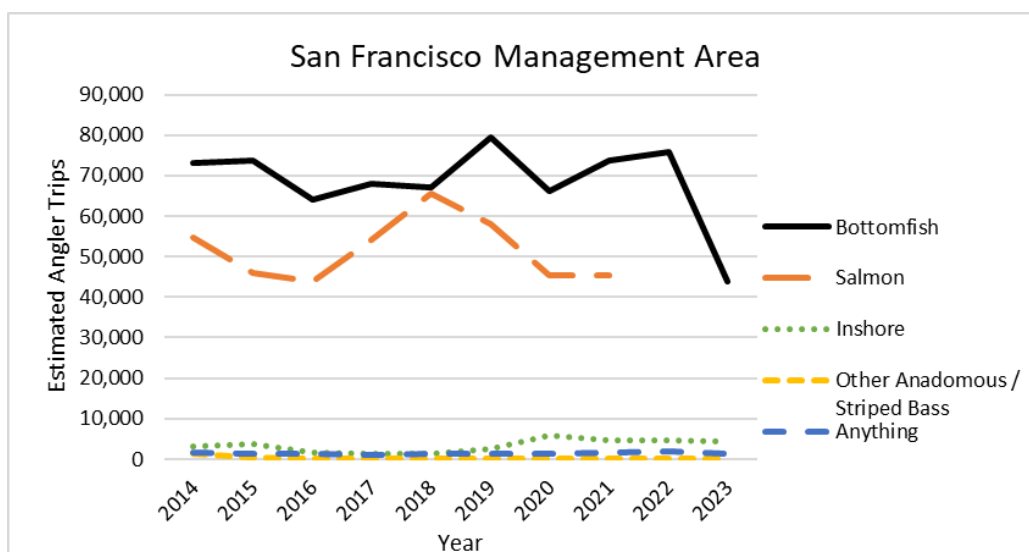


Figure 29. Recreational angler trips in the San Francisco Management Area of the California recreational fishery by RecFIN trip type target from 2014-2023 for the private rental and party charter boat modes in ocean waters. Salmon data only available through 2021 and is from the Councils [Salmon Historical data \(“blue book”\)](#). RecFIN trip type "bottomfish" includes groundfish, Pacific halibut and some State managed species. Examples of target species and/or groups in the trip type category can be found in Table 1.1 of the [CRFS Methods](#) document.

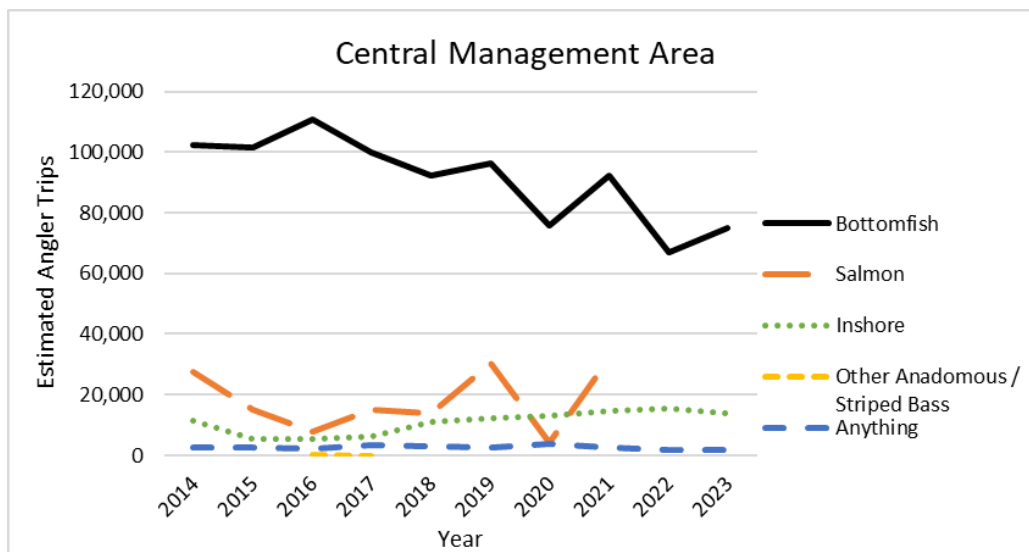


Figure 30. Recreational angler trips in the Central Management Area of the California recreational fishery by RecFIN trip type target from 2014-2023 for the private rental and party charter boat modes in ocean waters. Salmon data only available through 2021 and is from the Councils [Salmon Historical data \(“blue book”\)](#). Limited salmon effort occurs in the Southern MA, however salmon management reports trips from Monterey Bay to the Mexico border as one management area. The limited salmon effort which occurs in the Southern MA is displayed in the Central MA graphs. RecFIN trip type "bottomfish" includes groundfish, Pacific halibut and some State managed species. Examples of target species and/or groups in the trip type category can be found in Table 1.1 of the [CRFS Methods](#) document.

The San Francisco Bay MA offers the most opportunity for anglers north of the Southern MA, ranging from inshore bay fisheries (striped bass, shark, CA halibut, etc.) to nearshore groundfish to salmon and pelagic species (i.e., albacore). Anglers in this MA can shift to other fisheries more easily than other northern California MAs due to the diversity of target species.

The Southern MA offers anglers a wide diversity of target species. While primary angler effort is for groundfish in the Southern MA there are multiple alternatives for anglers to target, including California halibut, California sheephead, white seabass, and highly migratory species, and risk of California quillback rockfish interactions in this area are low, there is a non-zero chance it could be caught. Many of the alternative fisheries which have rockfish bycatch are State managed (e.g., California halibut, white seabass, ocean whitefish, sandbasses, and California sheephead). These fisheries, in general, have a low potential for California quillback rockfish bycatch and are outside the regulatory authority of the Council and the NMFS.

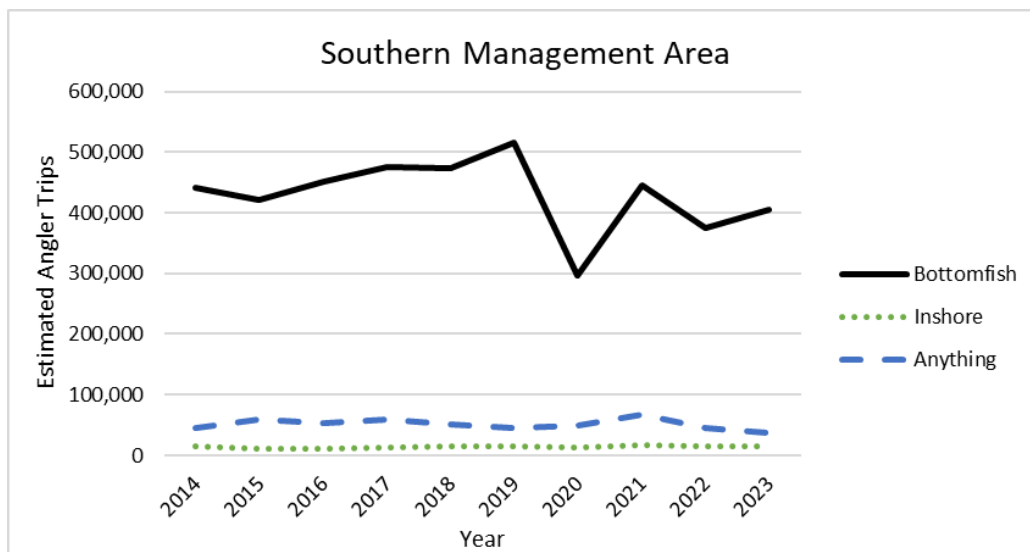


Figure 31. Recreational angler trips in the Southern Management Area of the California recreational fishery by RecFIN trip type target from 2014-2023 for the private rental and party charter boat modes in ocean waters. Limited salmon effort occur in this area; however, salmon management reports the limited trips from Monterey Bay to the Mexico border as one management area. The limited salmon effort which occurs is displayed in the Central MA graphs. RecFIN trip type "bottomfish" includes groundfish, Pacific halibut and some State managed species. Examples of target species and/or groups in the trip type category can be found in Table 1.1 of the [CRFS Methods](#) document

Depth Restrictions and Angler Effort Considerations

Opportunity in nearshore waters close to coastal reefs is the primary driver of recreational groundfish effort and provides social and economic benefits in California. From 2013-24, just over 71% of bottomfish trips took place within 3 miles of the coast.

Alternative 2, the season structure for MAs north of 36 N. lat. would allow an offshore fishery in a few months, and would otherwise be closed in the EEZ. This structure prohibits access to depths less than 50 fathoms in the EEZ, year round, as catch information suggests the abundance of California quillback rockfish is highest in these depths ([Agenda Item E.7.a Supplemental CDFW Report 2, November 2021](#)). The same strategy is implemented for 2024 ([Agenda Item Supplemental CDFW Report 2, March 2024](#) and [Agenda Item F.8.a Supplemental GMT Report 1 March 2024](#)) and is mirrored for the 2025-26 seasons. This “offshore only” depth restriction is expected to allow for recreational fishing opportunities to continue; however, due to localized bathymetry, the presence or absence of rocky reefs outside of 50 fathoms and the proximity of the 50 fathom line to shore are not universal throughout the California Coast (Table 13). These factors are likely to reduce overall angler effort as private vessels may not be able to access these depths, safety, etc. Commercial Passenger Fishing Vessels (CPFV), however, may offer anglers a means to access these depths.

Additionally, kayak fishing has increased significantly over the last 20 years. The majority of MAs contain a number of smaller launch sites where kayaks and other smaller vessels are the most effective means to access local reefs. In all management areas, the offshore-only fishery would likely eliminate kayak fishing effort as kayaks are not often able to safely travel long distances

from shore. Nearshore or All-Depth opportunities are the only times kayak anglers can access the groundfish fishery.

Recreational fisheries in the Northern MA are highly centered on nearshore waters due to the prevalence of coastal reefs, as this MA has limited rocky reef habitat beyond 50 fms close to the ports shown in Table 13. The average distance from port to 50 fm is 9.7 nm. The Mendocino MA has limited rocky reef habitat beyond 50 fms close to port (Table 13). The average distance from port to the 50 fm boundary is 3.8 nm. In the San Francisco MA there is good rocky reef habitat beyond 50 fms, however the distance to these areas is substantially greater than any other management area with an average of 21.5 miles from major launch ramps (Table 13). The Central management area has one of the starkest contrasts in distance to the 50 fm RCA line due to the Monterey Bay Canyon, as compared to other areas of the coast. Moss Landing is one of the closest launch ramps to the 50 fm RCA line at just under three miles, however the ports of Morro Bay and Avila in the southern portion of the MA are over nine miles to the 50 fm RCA line (Table 13).

The offshore-only season structure is not considered under Alternative 4 as it is expected that the entire groundfish fishery off California would be closed.

Table 13. The distance in miles to the 50 fm RCA line from CRFS highest effort launch ramps (PR1 sites) in California and the average distance to the 50 fm RCA line in each management area.

CRFS PR1 Site Name	Management Area	Miles to 50 fathom RCA
Crescent City Inner Boat Basin docks	Northern	8.78
Crescent City Harbor launch ramp	Northern	8.78
Trinidad hoist	Northern	7.53
Trinidad docks (water taxi)	Northern	7.53
Eureka Marina launch ramp	Northern	13.5
	Avg. Northern	9.74
Shelter Cove launch	Mendocino	4.24
Noyo River launch ramp	Mendocino	3.28
	Avg. Mendocino	3.76
Bodega Westside launch ramp	San Francisco	9.67
Berkeley Marina launch ramp	San Francisco	38.4
Princeton-Pillar Point launch ramp	San Francisco	16.4
	Avg. San Francisco	21.49
Santa Cruz Marina launch ramp	Central	9.36
Moss Landing launch ramp	Central	2.92
Monterey Marina launch ramp	Central	6.47
Coast Guard Jetty launch ramp	Central	6.44

CRFS PR1 Site Name	Management Area	Miles to 50 fathom RCA
Morro Bay launch ramp	Central	9.93
Avila Boat Sling	Central	9
	Avg. Central	7.35
	Avg. N. of Pt. Conception	10.27
Santa Barbara launch ramp	Southern	6.17
Ventura launch ramp	Southern	10.5
Channel Islands launch ramp	Southern	1.98
Marina Del Rey launch ramp	Southern	1.25
Cabrillo launch ramp	Southern	3.73
Dave's launch ramp	Southern	11.5
Sunset Aquatic launch ramp	Southern	10.4
Dana Point launch ramp	Southern	2.29
Dana Basin launch ramp	Southern	6.71
Shelter Island launch ramp	Southern	8.89
	Avg. Southern	6.3
	Statewide Avg.	8.81

5.5.2 California Groundfish Management Area Recreational Communities

As noted above, recreational effort for groundfish primarily occurs in nearshore waters. In general, nearshore waters are within State territorial boundaries. This rebuilding plan is specific to Federal waters. The following analysis assumes the State of California would take complementary action to implement similar rebuilding measures in State waters. However, management measures in State waters are outside the scope of this action and the authority of the Council and NMFS. Because the majority of California recreational fishing activity occurs in the nearshore in State waters, any significant fishing opportunities that would be maintained under Alternative 2 would likely occur in State waters. In the following descriptions of MAs, No Action represents the current state of knowledge, i.e., as of 2023, regarding fishery income in those MAs. The reason to show this is to provide a reference point for comparison of the effects the Alternatives could have on the MAs. These data and other statistics are further elaborated in the @Agenda Item F.6. Attachment 7, June 2024, -the socio-economic analysis for the 2025-26 biennium.

Northern MA

The Northern Management Area encompasses the major ports of Crescent City and Eureka with a number of smaller landings (e.g., Trinidad and Fields Landing). The ports of Crescent City and Eureka were identified as having medium high social vulnerability; whereas, Crescent City displays medium reliance on recreational fisheries and Eureka has low reliance (Table 9). The

reliance rating suggests that under both alternatives, the social and economic impact to these communities is differential. Crescent City could be expected to incur higher impacts due to regulatory changes related to California quillback rockfish than would Eureka.

The groundfish season in the Northern MA is highly depth restrictive as quillback rockfish are common in this MA. The season structure to support Alternative 2 would be closed in the EEZ for nine months of the year and would restrict access to greater than 50 fathoms for the other 3 months of the year.

Management measures to achieve Alternative 2 would likely result in a reduction of overall fishing effort in this MA which may correspond to reduced economic benefits. However, alternative fishing target opportunities (e.g., salmon, Pacific halibut) may offset some of the negative impacts due to groundfish effort reductions at times when those fisheries are not restricted as well. Under Alternative 4, all recreational groundfish effort in the EEZ would cease, though anglers could only be able to target non-groundfish species. This Alternative would result in negative economic impacts to these fishing communities.

Under Alternative 2, this MA is expected to adversely affect ports in terms of constraints on season and depth restrictions to minimize California quillback rockfish mortality. Table 14 evaluates income impacts resulting from recreational fishing trips projected under the alternatives. This Table overestimates impacts directly tied to restrictions in the EEZ because of the difficulty in disentangling State waters versus Federal waters fishing activity and impacts For the Crescent City - Eureka area Alternative 2 results in a \$3.4 million increase in income relative to Alternative 4. Income impacts of recreational fishing under Alternative 4 management measures are negative relative to No Action. While Alternative 2, would present a restrictive management scenario for the recreational groundfish fishery in this MA, it would allow for fishing which may provide some positive economic impact to businesses that provide goods and services to recreational anglers (e.g., freshwater, crab, salmon, etc.). Alternative 4 is the most restrictive management scenario and businesses that are centered on marine recreational groundfish fisheries (e.g., tackle shops, charter boats, etc.) would likely see adverse economic impacts, and businesses that are linked to marine recreational groundfish fisheries (e.g., hotels, restaurants, etc.) could be negatively impacted as well.

Table 14. Expected recreational fishery income and income change under the Alternatives for the Northern Management Area (\$millions). After [Agenda Item F.5 Supplemental Attachment 4, April 2024](#)

Community Groups	No Action	Alternative 2	Alternative 4
Recreational Fishery income impacts	2.6	3.4	0.0
Change in recreational fishery income impacts	2.6	+0.9	-2.6

Mendocino Management Area

The Mendocino MA encompasses the major port of Shelter Cove and Fort Bragg, with several rural ports (e.g., Albion). Fort Bragg and Shelter Cove were identified as having medium social vulnerability and reliance on groundfish in the recreational fisheries by NMFS (Table 9). These ratings suggest these communities could be negatively impacted due to the integration of recreational fisheries into their industrial profiles.

The groundfish season in the Mendocino MA is highly depth restrictive as California quillback rockfish are common in this MA. Like in the Northern MA, the season structure to support Alternative 2 in the Mendocino MA would be closed in the EEZ for nine months of the year and would restrict access to greater than 50 fathoms for the other 3 months of the year.

Alternative 2 would likely result in a reduction of overall fishing effort in this MA which may correspond to reduced social and economic benefits. However, alternative fishing target opportunities (e.g., salmon, Pacific halibut) may offset some of the negative impacts due to groundfish effort reductions at times when those fisheries are not restricted as well. Under Alternative 4, all groundfish effort would be curtailed and anglers would only be able to target non-groundfish species. Alternative 4 would result in greater income losses and associated job losses, which would likely impose negative social and economic impacts to these fishing communities compared to Alternative 22.

Table 15. Expected recreational fishery income and income change under the Alternatives for the Mendocino Management Area (\$millions). After [Agenda Item F.5 Supplemental Attachment 4, April 2024](#)

Community Groups	No Action	Alternative 2	Alternative 4
Recreational Fishery income impacts	3.7	5.0	0.0
Change in recreational fishery income impacts	3.7	+1.3	-3.7

Table 15 evaluates management measures similar to those expected under Alternative 2 of this rebuilding plan. This Table overestimates impacts directly tied to restrictions in the EEZ because of the difficulty in disentangling State waters versus Federal waters fishing activity and impacts. For the Fort Bragg - Bodega Bay area, Alternative 2 results in a \$5 million increase in income relative to Alternative 4. Income impacts of recreational fishing under Alternative 4 are negative relative to No Action. Although Alternative 2 presents a restrictive management scenario for the recreational groundfish fishery in this MA, it does allow for fishing which, relative to No Action, provides positive economic impact to businesses that provide goods and services to recreational anglers (e.g., freshwater, crab, salmon, etc.). Alternative 4 is the most restrictive management scenario. Businesses that are centered on marine recreational groundfish fisheries (e.g., tackle shops, charter boats, etc.) would likely experience financial losses associated with the reduction in recreational groundfish trips. Businesses indirectly linked to marine recreational groundfish fisheries (e.g., hotels, restaurants, etc.) could be negatively impacted as well

San Francisco Management Area

The San Francisco MA encompasses the major recreational ports of Bodega Bay, Sausalito, Berkeley, Emeryville, San Francisco and Half Moon Bay, as well as a number of minor ports. Bodega Bay was identified as having low social vulnerability and medium to high dependence and San Francisco, which this analysis treats as proxy for the Bay Area, has low dependence on groundfish in the recreational fisheries (Table 9). These ratings suggest differential social and economic impacts to port communities could occur due to regulatory changes to the groundfish fishery. It could be expected that impacts to social and economics of Bodega Bay would be more negative than impacts to San Francisco, suggesting that recreational fishing is more integrated into the industries of Bodega Bay than San Francisco.

This MA has the largest coastal population in northern California, with a seemingly corresponding amount of recreational fishing effort (Figure 29). While overall California quillback rockfish encounter rates are lower than in the Mendocino and Northern MAs, the high angler effort for groundfish appears to correlate with high California quillback rockfish mortality. Unlike other MAs, the San Francisco MA offers unique fishing opportunities (e.g., California halibut, striped bass, etc.) inside San Francisco Bay (State waters), which provides additional fishing alternatives when other fisheries are closed or when weather is inclement. Historically, effort within San Francisco bay has fluctuated based on target species abundance. Groundfish has been, historically, a reliable fishery for recreational anglers given the seasonality and variability in availability of other targets in this MA. Other opportunities include albacore and other tunas seasonally, and Dungeness crab. Recreational salmon opportunities in this region can be limited in some years. From 2008 to 2010 and again in 2023-2024, restrictions were implemented to address the collapse of Sacramento River fall-run Chinook salmon. Restrictions on salmon and other fisheries typically coincide with increased groundfish effort and clearly demonstrate the importance of alternative fishing opportunities when salmon fishing is closed (Figure 29). Alternative opportunities will be particularly important for 2024 and in future years given the likely event of continued restrictions on salmon stocks in the near future. With no or reduced salmon seasons, restrictions on groundfish seasons to reduce impact on California quillback rockfish would likely result in a reduction of overall fishing effort in this MA, as was seen from 2022 and 2023 in Figure 30.

The groundfish season in the San Francisco MA is highly depth restrictive as California quillback rockfish are somewhat common in this MA. Anecdotally, the summer months are thought to provide the bulk of the social and economic benefits to fishing communities in this area; however, this major metropolitan area generates substantial fishing effort year round if opportunity is provided. Alternative 2 would likely result in a reduction of overall fishing effort in this MA which may correspond to reduced social and economic benefits. However, alternative fishing target opportunities (e.g., salmon, California halibut, striped bass, etc.) may offset some of the negative impacts due to groundfish effort reductions at times when those fisheries are not restricted as well. Under Alternative 4, all groundfish effort would be curtailed and anglers would only be able to target non-groundfish species. Alternative 4 would result in negative social and economic impacts to these fishing communities; however, these impacts could be limited to ports that primarily focus on groundfish. Ports inside of San Francisco Bay may be able to better diversify as non-groundfish species are prevalent and easily accessible.

Table 16. Expected recreational fishery income and income change under the Alternatives for the San Francisco Management Area (\$millions). After [Agenda Item F.5 Supplemental Attachment 4, April 2024](#)

Community Groups	No Action	Alternative 2	Alternative 4
Recreational Fishery income impacts	11.5	20.5	0.0
Change in recreational fishery income impacts	11.5	+9.0	-11.5

Table 16 evaluates income impacts resulting from recreational fishing trips, for the San Francisco area. This Table overestimates impacts directly tied to restrictions in the EEZ because of the difficulty in disentangling State waters versus Federal waters fishing activity and impacts. Alternative 2 results in a potential \$20.5 million increase in income relative to Alternative 4. Income impacts of recreational fishing under Alternative 4 management measures are negative relative to No Action. While Alternative 2 presents a restrictive management scenario for the

nearshore groundfish fishery in this MA, it does allow for fishing which may provide some positive economic impact to businesses that provide goods and services to recreational anglers (e.g., freshwater, crab, salmon, etc.). Alternative 4 is the most restrictive management scenario, and businesses that are centered on marine recreational groundfish fisheries (e.g., tackle shops, charter boats, etc.) would likely result in adverse economic impacts and businesses that are linked to marine recreational groundfish fisheries (e.g. hotels, restaurants, etc.) could be negatively impacted as well. It may be more adverse for isolated communities, such as Half Moon Bay, which do not have the fishery diversity that the interior San Francisco Bay communities have.

Central Management Area

The Central Management Area encompasses the major recreational ports of Santa Cruz, Moss Landing, Monterey, Morro Bay and Avila and a number of rural landings. Excepting Moss Landing, the port communities listed have low social vulnerability and low reliance on recreational fishing (Table 9). The reliance rating suggests that under both alternatives, the social and economic impacts to these communities may not be highly affected by regulatory changes. These port areas may be more diversified in terms of other industries available to residents and could potentially withstand impacts from recreational fishery regulatory changes.

Under Alternative 2, differential impacts could occur to communities north and south of 36° N. lat. As noted above in Table 7, the season structure PPA divides the Central MA into two areas, one north of 36° N. lat. and one south of 36° N. lat. North of 36° N. lat., there would be increased recreational fishery restrictions in terms of where and when anglers could fish. The ports impacted are Monterey, Moss Landing, and Santa Cruz. The season structure in this area would be the same as the three management areas to the north. South of 36° N. lat., season structure more closely resembles the Southern Management area, which is to say there are fewer restrictions on season restrictions for anglers in Morro Bay and Avila compared to the fishery north of 36° N. lat. The bifurcation of the Central MA in 2024 was intended to lessen the social and economic impacts to port areas south of 36° N. lat. which have little to no impact on California quillback rockfish. South of 36° N. lat., season structure and management measures are primarily designed to avoid impacts on species other than California quillback rockfish such as vermilion/sunset rockfish and copper rockfish. Under Alternative 4, the entire recreational fishery in the EEZ would be closed to groundfish for all of the Central district

Despite the northern portion of the MA benefiting from the unique bathymetry of the Monterey Bay, nearshore opportunities in summer months (June - September) still provide the bulk of the social and economic benefits to fishing communities in this area. In 2024, the Central MA was split into two sub areas with different regulations north and south of 36° N. lat. Almost all California quillback rockfish mortality in recreational fisheries occurs north of 36° N. lat. ([Agenda Item F.8.a Supplemental GMT Report 1 March 2024](#), [Agenda Item F.8.a, Supplemental CDFW Report 2, March 2024](#)).

Table 17. Expected recreational fishery income and income change under the Alternatives for the Central Management Area (\$millions). After [Agenda Item F.5 Supplemental Attachment 4, April 2024](#)

Community Groups	No Action	Alternative 2	Alternative 4
Recreational Fishery income impacts	12.4	19.7	0.0
Change in recreational fishery income impacts	12.4	+7.3	-12.4

Table 17 evaluates income impacts resulting from recreational fishing trips. This Table overestimates impacts directly tied to restrictions in the EEZ because of the difficulty in disentangling State waters versus Federal waters fishing activity and impacts. The Table shows Alternative 2 resulting in a potential \$19.7 million income increase for Santa Cruz – Monterey – Morro Bay relative to Alternative 4. Income impacts of recreational fishing under Alternative 4 management measures are negative relative to No Action. In the northern part of this MA, Alternative 2 presents a restrictive management scenario for the recreational groundfish fishery in this MA, it does allow for fishing which may provide some positive economic impacts to businesses that provide goods and services to recreational anglers (e.g., California halibut, salmon, etc.). Impacts to the southern portion of this MA would not be as restrictive as in the northern part of this MA since California quillback rockfish are rare in this part of the Central MA. This area, along with the Southern MA, have the most liberal season and regulations in the State.

Under Alternative 4, businesses that are centered on marine recreational groundfish fisheries (e.g., tackle shops, charter boats, etc.) would likely result in adverse economic impacts and businesses that are linked to marine recreational groundfish fisheries (e.g., hotels, restaurants, etc.) could be negatively impacted as well.

Southern Management Area

The Southern MA encompasses the ports of Santa Barbara, Ventura, Long Beach, Los Angeles, Marina Del Rey, Dana Point, Oceanside and San Diego as well as numerous other minor ports and launch ramps. This area is the largest population center in California and a far greater amount of boat-based effort is exerted in this MA than in MAs north of Point Conception (Figure 31). The community reliance on recreational fishing in this MA is low; however, Santa Barbara, Oxnard, Los Angeles, Newport Beach and San Diego have high vulnerability. The reliance rating suggests that under both alternatives, the social and economic impact to these communities may not be highly affected by regulatory changes (Table 9). This could indicate there are other, more dominant factors that impact these communities more so than recreational fishing. In contrast to an Alternative 2 scenario, under Alternative 4, all recreational groundfish effort would likely have to cease to eliminate the small chance of California quillback rockfish mortality, and anglers would only be able to target non-groundfish species.

The proposed Southern MA season structure under Alternative 2 are primarily designed to avoid impacts on species other than California quillback rockfish, such as vermilion/sunset rockfish and copper rockfish. In the Southern MA, the fishery would be closed January – March, open in all depths from April 1 through June 30, open shoreward of 50 fm July 1 through September 30, and open for an offshore only fishery (>50 fm RCA line) from October 1 – December 31. This season is similar to the 2024 season and impacts are expected to be similar.

Table 18 evaluates income impacts resulting from recreational fishing trips. This Table overestimates impacts directly tied to restrictions in the EEZ because of the difficulty in disentangling State waters versus Federal waters fishing activity and impacts. The Table shows Alternative 2 resulting in a potential \$162.5 million income increase relative to Alternative 4. Income impacts of recreational fishing under Alternative 4 management measures are negative relative to No Action. Complete closure of the groundfish fishery would have substantial adverse economic impacts to this area.

Table 18. Expected recreational fishery income and income change under the Alternatives for the Southern Management Area (millions). After [Agenda Item F.5 Supplemental Attachment 4, April 2024](#)

Community Groups	No Action	Alternative 2	Alternative 4
Recreational Fishery income impacts	104.2	162.5	0.0
Change in recreational fishery income impacts	<i>104.2</i>	+58.3	-104.2

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6. Conclusions

The California stock of quillback rockfish is overfished and requires a rebuilding plan. The goal of a rebuilding plan is to rebuild the stock in the shortest time possible taking into account the status and biology of the stock and the needs of fishing communities. This rebuilding plan analysis considers two rebuilding strategies, Alternative 2: the ABC rule, and Alternative 4: $F = 0$.

Under the ABC rule strategy (i.e., Alternative 2), the stock is expected to rebuild by 2060 (73.6 percent probability of rebuilding by 2071 (T_{MAX})) and under the $F = 0$ strategy, the stock is expected to be rebuilt by 2045 (99.9 percent probability of rebuilding by 2071 (T_{MAX})). The ABC rule allows for ACLs of 1.3 mt and 1.5 mt for 2025 and 2026, respectively, whereas the $F = 0$ strategy has a 0 ACL until the stock is rebuilt. Under the $F = 0$ strategy, ABCs would increase during the rebuilding period, but the ACLs remain at 0. The simple difference between the two strategies is Alternative 4 is predicated on zero fishing mortality of California quillback rockfish.

Management measures to support Alternative 2, the ABC rule, allow for minimal California quillback rockfish mortality in the groundfish fishery. The ACLs for this strategy could be interpreted as a *de minimis* strategy, in that no directed fishery could be prosecuted on this stock and the ACLs are likely to only support minor bycatch of California quillback rockfish. Management measures for Alternative 2 would allow for both recreational and commercial fishing; however, these fisheries would be managed with restrictions designed to avoid California quillback rockfish. In brief, these management measures would remove effort from areas and depths where California quillback rockfish have been historically caught off of California and move the fishery to depths where they are uncommon or rarely observed. The management measures to achieve Alternative 2 are primarily focused on recreational and commercial non-trawl fisheries. California quillback rockfish abundance increases in a northerly direction. Proposed management measures under Alternative 2 reflect the fishery's encounters of California quillback rockfish in accordance to their range. In brief, the State is subject to two commercial management regimes, one that is north of $37^{\circ} 07' N.$ lat. and one that is south of $37^{\circ} 07' N.$ lat., and two recreational management regimes, one that is north of $36^{\circ} N.$ lat. and one that is south of $36^{\circ} N.$ lat. In the northern area, management measures are designed to restrict access through time/depth closures, sub-bag and trip limits of zero, and highly restrictive commercial fishery trip limits of other co-occurring stocks. The northern area is subject to higher restrictions through a more conservative approach to managing the fisheries, whereas in the southern area, fisheries are still managed through a series of time/area closures, a recreational sub-bag limit of zero, and commercial trip limits. However, as California quillback rockfish encounters are expected to be extremely rare in the southern area, a more liberal management approach is proposed.

Alternative 4 would require imposing more prohibitive and widespread closures on all directed groundfish fisheries, including trawl fisheries and southern non-trawl fisheries which would not be restricted under Alternative 2. The extent of depth and gear restrictions off of California necessary to achieve zero mortality of quillback rockfish are unknown at this time, noting that some vessels generally operate much deeper than areas considered "nearshore" where California quillback rockfish reside.

The Council would likely be required to close the entire groundfish fishery in the EEZ off of California under Alternative 4 to achieve zero mortality in directed groundfish fisheries; however, zero mortality across all West Coast fisheries is likely unachievable, as mortality has occurred incidentally in non-groundfish fisheries (e.g., Pacific halibut) and in State managed groundfish fisheries in State waters. These fisheries are not subject to this rebuilding plan. It is unrealistic to expect zero mortality from fisheries not subject to the rebuilding plan and any mortality would violate the assumption in the rebuilding plan of no fishing mortality under $F = 0$.

Fishery diversity increases from north to south in California. Port communities in the northern portion of the State (i.e., N of 36° N. lat.) could potentially be able to fish Dungeness crab and salmon when opportunities to fish groundfish is limited; however, in recent years, these fisheries have not been consistent due to a multitude of issues (e.g., abundance, whale entanglement, etc.) and are not year-round fisheries. Port communities in the southern portion of the State (i.e., S of 36° N. lat.) in the areas affected by the California quillback rockfish closures, where fishery diversity is higher, would have increased opportunity to target State-managed non-groundfish fisheries, lobster, and some HMS stocks. However, the extent to which these fisheries could replace groundfish is uncertain, as they too are seasonal, whereas groundfish previously provided the bridge between other high value non-groundfish target stocks.

Alternative 4 would likely result in complete economic failure for those businesses heavily integrated and/or businesses primarily dependent on groundfish in California ports. The MSA states that a stock's rebuilding time should be as short as possible, taking into account the status and biology of the overfished stock and the needs of fishing communities (See § 304(e)(A)(i)). A rebuilding plan must specify a target year for rebuilding based on the time required for the stock to reach BMSY. This target is bounded by a lower limit (TMIN) defined as the time needed for rebuilding in the absence of fishing (i.e., $F = 0$). In most cases, because of the biology of the stocks and the needs of fishing communities, the rebuilding time, or the target year, for an overfished species will be greater than the minimum rebuilding time (TMIN). Alternative 4 is clearly projected to rebuild the stock in the shortest amount of time; however, in doing so it could require a near complete groundfish closure in Federal waters off of California.

Based on the above analyses, impacts from the implementation of a rebuilding plan would likely be disproportionately felt in different California management areas. California quillback rockfish displays an abundance cline from north to south, with the stock's presence increasing from 36° N. lat. north. South of this latitude, abundance is low and encounter rates are rare. The northerly ports tend to rely on groundfish, crab, and salmon. As noted above, Dungeness crab and salmon fisheries have been in rapid decline for multiple reasons, which leaves groundfish as the primary target. Under Alternative 4, removing groundfish as a target could have disastrous short term (and potentially long term) impacts to fishing communities north of 36° N. lat. South of 36° N. lat, fishing communities are dependent on groundfish, but can also target a variety of other fish (HMS, State managed stocks, etc.) that are not available to the north. Thus, while these communities would be severely impacted by a closure of the groundfish fishery in Federal waters, as groundfish is the primary fishery in the southern part of California, the impact may be less than to the north. Still, while there is potential for some ports to support non-groundfish fisheries, the benefits could be limited as groundfish generally provides stability to ports. Other non-groundfish fisheries, which have historically provided positive economic benefits (e.g., Dungeness crab, salmon, etc.), are

becoming increasingly unstable foundations for ports due to such factors as lack of certainty regarding season structure, abundances, and regulator changes.

Alternative 2 management measures are preferred as compared to Alternative 4 because they offer more management flexibility and the ability to adapt to new information, while being more surgical with openings and gear allowances than Alternative 4 management measures. As noted, Alternative 2 management measures are restrictive for half of the State and do not include trawl fishery restrictions. Thus, some groundfish and alternative non-groundfish opportunities will allow for some stability to the fishery overall. Alternative 4 would decrease fishery stability in the entire State, including because the alternative stocks available do not provide the same benefits across the State. Ports north of 36° N. lat. are less flexible in reacting to groundfish closures due to the lack of fishery diversity. These ports are highly focused on groundfish and target salmon and crab based on their intermittent availability. Ports south of 36° N. lat. are more flexible to groundfish closures as there is more diversity in fisheries; however, groundfish in this area provides a consistent source of positive benefits to communities. Availability of non-groundfish stocks can be intermittent (e.g., salmon, crab) or unavailable to large portions of the State, e.g., kelp bass, white seabass, salmon, crab, etc.

Commercial non-trawl management measures under Alternative 2 are only proposed from 42° to 37° 07' N. lat., whereas management measures for the recreational sector are proposed from 42° to 36° N. lat. Under Alternative 2 management measures, the economic benefits from the groundfish fishery in areas closed to protect California quillback rockfish will be reduced relative to historical benefits. The net result in this area from Alternative 2 is likely to have increased negative impacts to fishing communities relative to past benefits and the commercial management structure. Economic impacts for southern fishing communities are not expected to incur the same level of negative impacts as to more northern communities where California quillback rockfish are more common. Other than the prohibition of California quillback rockfish the management measures for this area are not expected to change from status quo, thus allowing the groundfish fishery to largely continue as it has in the past. While the social and economic impacts are likely to produce fewer benefits overall to fishing communities in the north, the management measures would still allow for fishing to occur at select depths and times during the year, which will provide some relief to communities.

Alternative 4 would impose large burdens on the economy and devastate coastal fishing communities in California, which may never return to groundfish once the stock is rebuilt. As has been noted, groundfish supports most California ports, or at least significantly contributes to these communities. Alternative 4 would likely close all groundfish effort off of California. Some communities may be able to replace groundfish, but likely not to the same level of benefits for port communities as those provided by, or with the same financial security created by, the groundfish fishery. Other industries may replace fishing in communities; however, it is unclear if and when this would occur

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