

## GROUND FISH MANAGEMENT TEAM ON 2020 HARVEST SPECIFICATIONS FOR COWCOD AND SHORTBELLY ROCKFISH – FINAL ACTION

The Groundfish Management Team (GMT) was given a briefing by Mr. John DeVore, Pacific Fishery Management Council (Council) staff, and offers the following recommendations.

**The GMT recommends the Council adopt the purpose and need for both stocks from the September 2019 motion.** These provide a thorough overview of all objectives pertaining to the action.

### **Cowcod**

For cowcod south of 40° 10' N. lat., the GMT recommends the Council select their Preliminary Preferred Alternative (PPA) as Final Preferred Alternative (FPA) (i.e., Alternative 1, Option 2). As discussed in the September report ([Agenda Item H.6.a, Supplemental GMT Report 2, Sept 2019](#)), this would provide the most reduced constraints for all individual fishing quota vessels that fish in that area, would accommodate expected research mortality, and would not cause a risk to the annual catch limit.

### **Shortbelly Rockfish**

The GMT extensively discussed the issue of shortbelly rockfish bycatch by midwater trawl fisheries in September ([Agenda Item H.6.a, Supplemental GMT Report 1, September 2019](#)). We also provided a report in June 2019 that included the history of shortbelly rockfish harvest specifications, the previous management objective, a biological overview, and projections of potential bycatch ([Agenda Item I.7.a, Supplemental GMT Report 1, June 2019](#)).

Here, we examine shortbelly rockfish data from the Rockfish Recruitment and Ecosystem Analysis Survey (RREAS) and the California Cooperative Oceanic Fisheries Investigations (CalCOFI) survey (Figure 1) to help advise harvest decisions for 2020. Our goal is to gain insight on whether shortbelly rockfish bycatch in 2020 could appreciably harm the overall population by asking two questions. First, we ask what is the overall status of the stock? Second, has the distribution of the entire population shifted north, or did the northern limit range expand north while remaining in its historic range

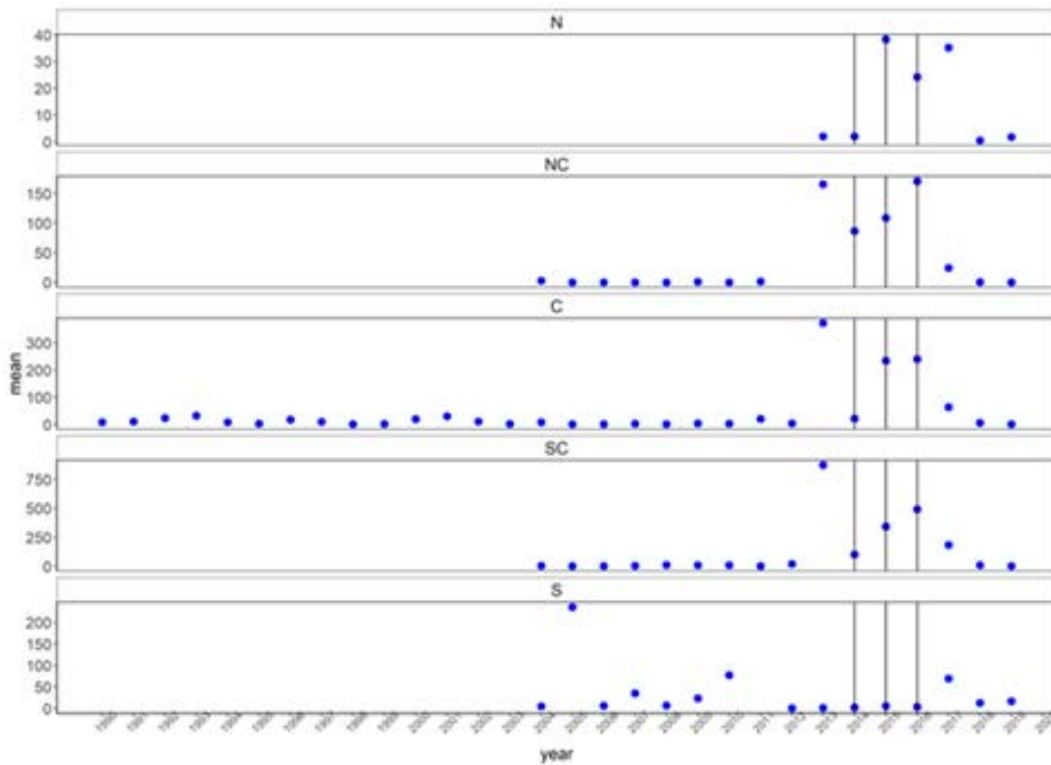
The RREAS trawls at a depth of 30 m to capture young-of-the-year rockfishes and provides species-specific indices of annual rockfish recruitment. The Core RREAS location lies between Monterey Bay and Bodega Bay, California, where shortbelly rockfish young-of-the-year abundance has been quantified since 1990 (Figure 1). The survey expanded to include North-Central, South-Central, and Southern parts of California in 2004 and far North California in 2013. The RREAS provides information on the number of rockfish that survive to become pelagic juveniles. Mortality for pelagic juveniles is much lower than for larvae, hence, the number of pelagic juveniles correlates positively with the number of one-year-olds the following year. Under prevailing assumptions, if the number of pelagic juveniles is high (i.e., recruitment is high), then it is likely that there will be high numbers of adults in the future.



**Figure 1. Locations of RREAS (blue) and CalCOFI (green) sampling. RREAS locations are subdivided among North, North-Central, Core, North-Southern and Southern regions. The CalCOFI stations depict the 66 Core stations that have been sampled regularly since 1951.**

The California Current Ecosystem (CCE) experienced a Marine Heatwave (MHW) from 2014 to 2016, resulting in the warmest three-year period on record. Observed shortbelly rockfish young-of-the-year numbers during the MHW oceanographic conditions were high relative to previous years, implying that these unusual conditions were conducive to shortbelly rockfish recruitment (Figure 2). All RREAS regions recorded historically high shortbelly rockfish recruitment between 2013 and 2016, and recruitment in the Core region was more than an order of magnitude higher than previous values dating back to 1990 (Figure 2). Recruitment remained high in 2017 throughout California, and recruitment in the north was the second highest in 2017 since 2013 in the north (Figure 2). The extraordinarily high recruitment events between 2013 and 2017 suggest

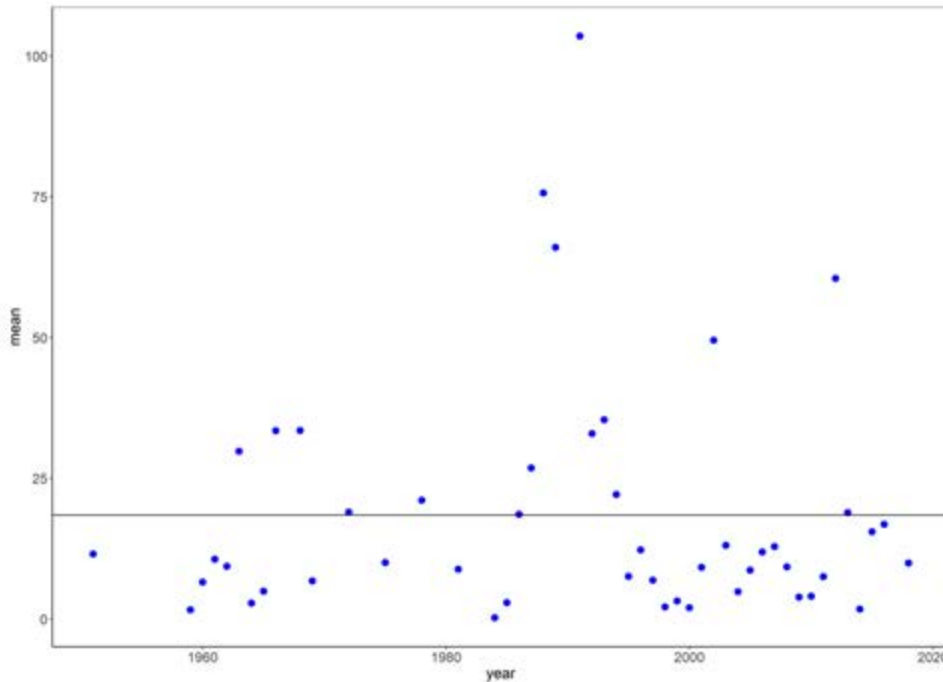
that overall adult shortbelly rockfish population size was very high in 2018 and 2019 and will continue to be high into 2020.



**Figure 2. Mean abundance of young of the year shortbelly rockfishes from North (N), North-Central (NC), Core (C), South-Central (SC) and South (S) regions of the RREAS.**

CalCOFI has systematically collected plankton samples off California since 1951. We examine patterns of mean annual shortbelly rockfish larvae abundance collected by oblique net tows during winter, which is the peak shortbelly rockfish spawning season. We use larval abundance as an index of spawning stock biomass. If larval abundance is low in southern California, then it is likely that adult population size is also low.

Shortbelly rockfish larval abundance was slightly below average in 2018 in southern California. Larval abundance in 2018 was the 26<sup>th</sup> highest out of 48 sample years. It thus appears that while shortbelly rockfish are not booming in southern California, they are present at levels consistent with the long-term average.



**Figure 3. Mean winter larval shortbelly rockfish abundances from Core CalCOFI stations from 1951-2018. Identification of 2017 are not yet complete, so 2017 data was excluded from the plot.**

Taken together, RREAS and CalCOFI data suggests that the overall shortbelly rockfish population size was very high from 2017-2019, will likely continue to be high in 2020, and that the population size in southern California was close to average in 2018. The presence of shortbelly rockfish in southern California does not necessarily preclude the possibility that the bulk of the population moved from central or northern California into Oregon and Washington, but it does show that this species has not abandoned the southern portion of its range within California.

In addition to potentially harming the shortbelly rockfish population, shortbelly rockfish bycatch could result in a paucity of prey for marine predators. To further contextualize the importance of removing shortbelly availability to predators via bycatch, the GMT explored the status of the broader forage and predator communities that was documented in the 2019 State of the California Current report that will be published in the scientific journal CalCOFI Reports in December, 2019. The most unusual feature of the forage community in 2019 was that northern anchovy (*Engraulis mordax*) larval abundances from CalCOFI were nearly double the previous highs from the 1960s. Further, adult northern anchovy were at record highs throughout most of California based on RREAS midwater trawl surveys. California sea lions (*Zalophus californianus*) fed copiously on northern anchovy and had very high pup productivity in recent years. High northern anchovy recruitment from 2014-2019 suggest that high northern anchovy abundance will continue in coming years. Further north in Oregon, the reproductive rate of a piscivorous bird, common murre (*Uria aalge*), was positively anomalous in 2018 and 2019 for the first time since 2010. Common murre fed mostly on smelts and juvenile flatfishes in 2018, suggesting that abundances of these forage fishes were high in Oregon waters in 2018. Taken together, surveys of forage and predators throughout the CCE in 2018 and 2019 indicate that forage species other than shortbelly rockfish were unusually abundant, and that there was higher than average production of several marine

predators. The high abundance of forage species other than shortbelly rockfish may mitigate the impact of shortbelly rockfish bycatch on higher trophic level species in the CCE.

**The GMT once again recommends that the Council select a FPA for shortbelly rockfish other than No Action from the Council’s revised range of alternatives from the September 2019 motion (Table 1).** As described in our September report ([Agenda Item H.6.a, Supplemental GMT Report 1, Sep 2019](#)), the No Action annual catch limit (ACL) (500 mt) would provide the greatest protections to shortbelly rockfish for forage purposes, but would likely constrain fisheries.

1,000 mt continues to be our best higher end projection of potential total mortality based on a 100 simulation bootstrap model that randomly draw hauls from the high bycatch years (2017-2019). We again caution that any projections will be highly speculative. Bycatch has been highly volatile with several large magnitude lightning strikes; this volatility makes projections very uncertain and can result in rapid accumulations of bycatch.

Because of the unpredictability of catch and management uncertainty in catch projections, the GMT recommends the Council include some additional buffer above the 1,000 mt projection. The Council selected Alternative 1 (3,000 mt ACL), as PPA in September because it would provide some cushioning to reduce potential fishery constraints without appreciably harming the shortbelly rockfish population. However, the Council should also consider potential unknown ecosystem impacts that have not been quantified.

The GMT believes that both Alternative 1 and Alternative 2 (2021-22 ABC = ACL = 4,184 mt) would fulfill objectives to ensure that shortbelly rockfish provide an important forage base. As we discussed in June, September, and above, the shortbelly stock appears to be thriving. Further, other forage species are abundant (e.g., anchovy) throughout the California Current Ecosystem. Even relatively high bycatch (e.g., Alternative 2) is unlikely to appreciably harm the shortbelly stock and appears improbable to result in a scarcity of prey to higher trophic level species.

**Table 1. Council’s revised ROA for shortbelly rockfish harvest specifications for 2020.**

<b>Alternative</b>	<b>Sub-option</b>	<b>Comment</b>
No Action	500 mt ACL	Status quo ACL for 2019-2020
Alternative 1 (PPA)	3,000 mt ACL	Groundfish Advisory Subpanel (GAP) proposal to buffer the GMT high projection of ~1,000 mt
Alternative 2	4,184 mt ACL	The 2021-22 ABC, a decrease from the 2020 ABC of 5,789 mt due to the application of the new time-varying sigmas