GROUNDFISH MANAGEMENT TEAM REPORT ON BLOCK AREA CLOSURES FOR GROUNDFISH MITIGATION

Contents

Executive Summary

In response to projected declines in Pacific spiny dogfish harvest specifications, the Council tasked the GMT with analyzing the development of midwater trawl Block Area Closures (BACs) for groundfish mitigation purposes, including groundfish bycatch minimization, coastwide, as well as bottom trawl BACs for groundfish mitigation purposes off Washington (WA). The development of these BACs is being considered as a new management measure (Action Item #12j) in the 2023-24 harvest specifications package so that these spatial tools would be available for catch control use starting in 2023. BACs should be considered a last-resort measure behind industry-implemented avoidance measures and, compared to Rockfish Conservation Areas (RCAs), are designed to be short-term catch control tools rather than to provide long-term protections. For both types of trawl gear, BACs could be implemented within tribal Usual and Accustomed (U&A) fishing areas but would only apply to non-tribal vessels.

Bottom trawl BACs for groundfish mitigation off WA were already analyzed as part of Amendment 28. Those BACs would apply to vessels using bottom trawl gear in the Shorebased Individual Fishing Quota (IFQ) Program. Prior analysis considered landings data, not discards, and indicated that catch composition varied by both depth and latitude, concluding that more specific and situational analyses would be needed to choose which depth and latitudes should be closed to meet specific needs.

Midwater trawl BACs could apply to any combination of four sectors that use midwater trawl gear: shoreside whiting, midwater rockfish (i.e., non-whiting), at-sea Mothership (MS), and at-sea Catcher-Processor (CP). Fleet characteristics, catch patterns, and data availability vary by sector. Therefore, considerations for when and how to implement BACs, as well as the groundfish impacts from BACs, may also vary between sectors.

Situationally specific analyses will be necessary prior to implementation of future BACs. Such analyses would use the best available fishery information, which may include catch location data, landings, logbook information, and historical discard estimates. Haul-level catch location data, including fishing depth and bottom depth, are available inseason for the two at-sea sectors through the At-Sea Hake Observer Program (A-SHOP). For the shoreside whiting and midwater rockfish sectors, both sectors of the Shorebased IFQ Program, haul-level catch location data are only available the following year through the West Coast Groundfish Observer Program (WCGOP) and Electronic Monitoring (EM) Program, and only fishing depth is reported. For those sectors, trawl logbook information is available inseason as well as fish receiving tickets, which report trip-level catches by IFQ management area.

Based on aggregated historical mortality estimates and the analysis included in this report, the GMT concluded that midwater trawl BACs may be warranted and/or effective at controlling catches for only a handful of the 80+ groundfish species in the Groundfish Fishery Management Plan (FMP), including Pacific spiny dogfish, widow rockfish, and rougheye/blackspotted rockfish. Impacts to protected species (e.g., salmonids) from a BAC will depend on the precise location of the BAC but have the possibility of shifting effort into areas of higher salmon bycatch if implemented seaward of 200 fathoms. Midwater trawl BACs are likely to impact the four sectors disproportionately due to differences in horsepower, their ability to travel to areas outside of the closure, and their ability to switch between sectors.

Finally, the GMT provides a non-exhaustive list of situationally specific considerations and analyses the Council will need to undertake prior to implementation. Such detailed analyses are impossible at this time given the number of possible combinations of latitude and depth the Council could employ in implementing a BAC, along with the 80+ species for which BACs could be used.

Background

At their March 2022 meeting, the Council recommended that the GMT analyze the use of spatial management tools, including Bycatch Reduction Areas (BRAs) and BACs, to minimize Pacific spiny dogfish bycatch given expected declines in the annual catch limit (ACL) and, therefore, a higher risk of exceedance. In April 2022, the Council directed the GMT and Council staff to continue to develop and analyze BACs for catch minimization of any groundfish species by midwater and bottom trawl gears off all three states, as outlined in Agenda Item F.4.a, Supplemental GMT Report 2, April 2022.

BACs are defined as:

> "a type of groundfish conservation area… bounded on the north and south by commonly used geographic coordinates… and on the east and west by the EEZ, and boundary lines approximating depth contours, defined with latitude and longitude coordinates at §§ 660.71 through 660.74 (10 fm through 250 fm), and § 660.76 (700 fm)," (50 CFR 660.111 "Block area closures or BACs").

BACs have been previously analyzed during two separate actions: Amendment 28 to the FMP and the Endangered Species Act Mitigation Measures for Salmon (hereafter "Salmon Mitigation Item"). Amendment 28 analyzed BACs in association with opening the bottom trawl RCA, and the Salmon Mitigation Item added midwater trawl BACs for the purpose of salmon mitigation off OR and CA. Both actions allowed for the development of BACs in tribal U&As, but their use would only apply to non-tribal vessels. This policy would also apply to midwater and bottom trawl BACs developed under this action. In addition, neither midwater nor bottom trawl BACs implemented as part of this action would apply to vessels using non-groundfish trawl gear.

As part of Amendment 28, BACs were adopted for bottom trawl gear off of Oregon (OR) and California (CA) out to 700 fathoms, because bottom trawling had already been closed between 700 fathoms and the Exclusive Economic Zone (EEZ). Although not included in the final action, Amendment 28 did include BACs off WA in the range of alternatives. As a result of the Salmon Mitigation Item, midwater trawl BACs for salmon mitigation purposes are available for implementation from the shoreline to the outer boundary of the EEZ off OR and CA and out to 250 fathoms off WA. Table 1 lists the depth and latitude boundary lines currently described in federal regulation that the Council could use to establish the outer boundaries of a BAC used to mitigate groundfish catch by midwater and/or bottom trawl gear.

Table 1. Depth and latitude boundaries in regulation that would be available for use when implementing a BAC under this action (adopted from Table 2-4, Changes to Pacific Coast Groundfish Essential Fish Habitat Conservation Areas and Boundaries of the Trawl Gear Rockfish Conservation Area)

State	Commonly Used Geographic Coordinates (50 CFR 660.11)	Boundary Lines Approximating Depth Contours (50 CFR 660.71-74)
Washington	U.S./Canada Border, northern boundary of EEZ, Cape Alava, WA—48°10.00′ N. lat., Queets River, WA—47°31.70′ N. lat., Pt. Chehalis, WA—46°53.30′ N. lat., Leadbetter Point, WA— 46°38.17′ N. lat., Columbia River (WA/OR Border)—46°16.00′ N. lat.	10 fm, 20 fm, 25 fm, 25 fm modified, 30 fm, 50 fm, 60 fm, 75 fm, 100 fm, 125 fm, 150 fm, 150 modified, 180 fm, 200 fm, 200 fm modified, 250 fm, 250 fm modified
Oregon	Cape Falcon, OR—45°46.00′ N. lat., Cape Lookout, OR—45°20.25′ N. lat., Cascade Head, OR— 45°03.83′ N. lat., Heceta Head, OR—44°08.30′ N. lat., Cape Arago, OR—43°20.83′ N. lat., Cape Blanco, OR—42°50.00′ N. lat., Humbug Mountain—42°40.50′ N. lat., Marck Arch, OR—42°13.67′ N. lat.	20 fm, 25 fm, 25 fm modified, 30 fm, 40 fm, 50 fm, 60 fm, 75 fm, 100 fm, 125 fm, 150 fm, 150 fm modified, 180 fm, 200 fm, 200 fm modified, 250 fm, 250 fm modified
California	Oregon/California border—42°00.00′ N. lat., Cape Mendocino, CA—40°30.00′ N. lat., North/South management line—40°10.00′ N. lat., Cape Vizcaino, CA—39°44.00′ N. lat., Point Arena, CA—38°57.50′ N. lat., Point San Pedro, CA—37°35.67′ N. lat., Pigeon Point, CA—37°11.00′ N. lat., Año Nuevo, CA— 37°07.00′ N. lat., Point Lopez, CA—36°00.00′ N. lat., Point Conception, CA—34°27.00′ N. lat., U.S./Mexico Border, southern boundary of EEZ	30 fm, 40 fm, 50 fm, 60 fm, 75 fm, 100 fm, 125 fm, 150 fm, 150 fm modified, 180 fm, 200 fm, 200 fm modified, 250 fm, 250 fm modified

Purpose and Need

The purpose of this action is to expand and create more flexibility around BAC use so that this management tool can be used coastwide in the bottom trawl and midwater trawl fleets to mitigate groundfish impacts, as needed. This action would allow the Council to implement BACs that are applicable to any combination of midwater or bottom trawl sectors (i.e., shoreside whiting IFQ, midwater rockfish IFQ, at-sea MS, at-sea CP, or bottom trawl IFQ). This action would also align the outermost available depth boundaries (i.e., shoreline to 700 fathoms) across all midwater and bottom trawl BACs used for groundfish mitigation purposes.

This action is needed because the Council does not currently have appropriate spatial tools to mitigate trawl-based groundfish catches of ~~non-overfished~~ species such as Pacific spiny dogfish, which exhibit spatial and seasonal aggregations, while also minimizing economic impacts to the fishing industry. The GMT found that implementing BRAs or modifying the trawl RCA would likely be overly restrictive and less effective than BACs for accomplishing this goal (Agenda Item

F.4.a, Supplemental GMT Report 2, April 2022). Unlike BRAs, BACs are bound by both depth contours and latitudinal lines. They can be implemented inseason or preseason to control catch of groundfish or protected species but should be considered a last-resort measure behind industry-implemented avoidance measures. Additionally, BACs are intended to be inseason or preseason management tools for controlling harvest of target or non-target species, but they are not intended to be used for habitat protection because of their flexible nature.

Midwater Trawl BACs

BACs have been analyzed and are currently in regulation for salmon mitigation purposes by midwater trawl gear (Agenda Item H.9, Attachment 1 (Revised), November 2019). However, given that up to 74 percent of annual Pacific spiny dogfish mortality is attributed to midwater trawl gear, the GMT believes that the application of BACs to groundfish as a mechanism of catch control may be warranted. Although the impetus for developing midwater trawl BACs was Pacific spiny dogfish bycatch minimization, the GMT sees merit in developing them for use in minimizing catches of any groundfish species, as needed. As part of this analysis, the GMT identified key stocks from each midwater trawl sector that may warrant a BAC in the near future to give the Council a sense of the realistic scope of this action. The GMT offers the following options for the development of midwater trawl BACs:

- Status Quo: BACs cannot be used for the purposes of groundfish catch mitigation by midwater trawl gear. Potential use of BACs to mitigate salmon bycatch would remain status quo.
- Option 1: BACs can be used inseason, or preseason, to mitigate groundfish catches by midwater trawl gear at certain times and across a variety of depths and latitudes coastwide and shoreward of 700 fathoms. Potential use of BACs to mitigate salmon bycatch would remain status quo.

The GMT considered whether to extend the ability to implement BACs out to the EEZ but concluded that little to no fishing by midwater trawl vessels occurs beyond 700 fathoms and that the spatial extent of midwater trawl BACs should align with those of bottom trawl BACs, which are currently available out to 700 fathoms off Oregon and California, to reduce complexity in regulations to the extent practicable. As with bottom trawl BACs described above, it is the GMT's intent that BACs under this action could be implemented within tribal U&As but would only apply to non-tribal vessels, which aligns with intent of the Salmon Mitigation Item and therefore reduces regulatory complexity.

Available Data

The Council will want to consider the types of data available to inform implementation of a sector-specific or trawl-wide BAC. Data types and availability vary across the midwater trawl sectors. The only groundfish sectors that use midwater trawl gear are the shoreside Pacific whiting IFQ, midwater rockfish IFQ, and at-sea Pacific whiting MS and CP sectors.

The Salmon Mitigation Item, which analyzed BACs for salmon mitigation purposes by midwater trawl vessels, looked at salmon bycatch rates within specific depth bins, latitudinal bins, and months using WCGOP and EM haul-level data for the shoreside Pacific whiting fleet and A-SHOP haul-level observer data for the at-sea Pacific whiting fleet. Both data sources, along with aggregated mortality data (i.e., Groundfish Expanded Mortality Multiyear [GEMM]), are used in

this analysis to analyze potential groundfish impacts and identify key stocks that could warrant the use of BACs, at least in the 2023-24 biennium. The analysis for Amendment 28 qualitatively considered the scale of groundfish impacts using landings as a proxy, stratified by depth and latitude. However, landings are not as indicative of impacts to primarily discarded groundfish species such as Pacific spiny dogfish and, therefore, for the purposes of this analysis, are not considered a comprehensive metric of potential impacts.

However, it is worth noting that A-SHOP haul-level data includes fishing depth and bottom depth, whereas WCGOP haul-level data includes only fishing depth, therefore making it difficult to estimate where fishing occurs by shorebased IFQ vessels in relation to bottom depth boundaries available for use in BACs. Similarly, haul-level data is available at a finer scale for the at-sea sectors compared to the shoreside sector. Landings and discards are sorted and recorded at the haul-level for the at-sea sectors, while the shoreside whiting sector primarily does not sort at-sea while operating under maximized retention. This means that, while fishing locations are available from observer or logbook data in these sectors, catches are not directly attributed to a particular haul.

In addition to analyzing potential groundfish impacts from BACs as part of this action item, the Council will need to consider what data sources are available for tracking catches of groundfish species by midwater trawl gear inseason to determine the need for catch mitigation. Although total catch and location by midwater trawl vessels is only available inseason for the at-sea sectors (i.e., A-SHOP haul-level), the midwater trawl vessels in the shorebased IFQ fishery (whiting and non-whiting) generally land 90-100 percent of groundfish bycatch due to maximized retention. This means that bycatch data by midwater trawl vessels in the shorebased IFQ fishery are currently available inseason using landings as a proxy for at least 90 percent of total bycatch. In addition, the Pacific Fisheries Information Network (PacFIN) is in the process of finalizing a comprehensive trawl groundfish logbook data table that will make trawl logbook data available inseason, which the GMT can use in conjunction with landings from fish receiving tickets to monitor inseason catches by midwater trawl vessels in the shorebased IFQ fishery. Table 2 below summarizes the data available for tracking groundfish landings in each of the trawl sectors, including location data as described in the next paragraph.

Data on catch location, which is important for informing any spatial management tool, varies even more widely by sector. If the previously mentioned inseason data sources indicate a high bycatch concern for any groundfish species, A-SHOP haul-level data is available inseason to analyze high bycatch locations by the at-sea sectors using average latitude per haul and average bottom depth per haul. For midwater trawl vessels in the shorebased IFQ fishery, trawl logbook data will be available inseason through the newly developed PacFIN data table and is likely to include data on catch location. However, the GMT has yet to see the finalized product and is unclear on precisely what will be reported. Fish receiving tickets (or landing receipts) for all IFQ landings report location of catch by IFQ management area (e.g., 36° N. lat. to 40° 10′ N. lat.) but not at a scale as fine as the geographic coordinates listed in Table 1 above. Fish receiving tickets also do not record fishing or bottom depth, but haul-level fishing depths are available the following year, along with groundfish discard estimates, as described in Table 3 below.

Table 2. Summary of Current Landings Reporting Times and Available Data for Groundfish Species.

Sector	Sub-Sector	Reporting Time	Location Information Available	Source
Whiting	At-sea	24 hours	Haul-level coordinates & bottom depth	A-SHOP
	Shoreside (IFQ)	24 hours	IFQ catch area at the trip level	Fish receiving tickets entered into PacFIN with maximized retention
Non-Whiting	IFQ Midwater Rockfish & Bottom Trawl	24 hours	IFQ catch area at the trip level	Fish receiving tickets entered into PacFIN

Table 3. Summary of Current Discarded Catch Reporting Times and Available Data for Groundfish Species.

Sector	Sub-Sector	Reporting Time	Location Information Available	Source
Whiting	At-sea	24 hours	Haul-level coordinates & bottom depth	A-SHOP
	Shoreside (IFQ)	~1 week	Logbooks available within ~1 week. Haul-level estimates of groundfish discards and fishing depth available the following year.	WCGOP & EM (haul-level) & trawl logbooks
Non-Whiting	IFQ Midwater Rockfish & Bottom Trawl	~1 week	Logbooks available within ~1 week. Haul-level estimates of groundfish discards and fishing depth available the following year.	WCGOP & EM (haul-level) & trawl logbooks

Inseason Timeline

The shorebased IFQ fishery is open year-round for vessels using bottom trawl gear. However, vessels using midwater trawl gear to target either whiting or non-whiting stocks in the IFQ fishery may only fish during the Pacific whiting primary season (50 CFR 660.12(b)(1)(x) and 50 CFR 660.130(c)(3)(i)). The Pacific whiting primary season (shoreside and at-sea) opens April 15 south of 40° 30′ N. lat. and May 1 north of 40° 30′ N. lat. (starting 2023) and closes for a sector when that sector's Pacific whiting allocation is reached or projected to be reached. This means that, for all sectors using midwater trawl gear, the Council will not have sufficient inseason data at either the March or April Council meetings to assess the need for an inseason BAC applicable to midwater trawl gear.

Starting at the June Council meeting of any year, the Council will have access to total at-sea catch data, including discards, as well as shoreside whiting and midwater trawl fish ticket landings data and trawl logbook data. Starting in June 2023, the GMT can inform the Council of any species for which midwater trawl-based mortality could warrant a BAC to mitigate catches. The GMT also plans to include a Pacific spiny dogfish scorecard on inseason reports starting in June 2023. The Council could take routine action to implement a BAC applicable to midwater trawl gear at the June, September, or November Council meetings. However, the Pacific whiting sectors are

generally done fishing by the end of November. Thus, the June and September Council meetings are the most reasonable candidates for Council action.

As discussed further below, bycatch rates for certain species of concern in the Pacific whiting fishery tend to increase as the season progresses, and therefore, taking action at the September Council meeting may be more effective at minimizing both bycatch and economic impacts to the Pacific whiting sectors. The GMT also notes that the "B season" of the Alaska pollock fishery, in which many Pacific whiting vessels also operate, lasts from June 10 to October 31. For this reason, taking action in June to implement a BAC applicable to a Pacific whiting sector may not be appropriate given that vessels are still fishing in the pollock fishery through the summer months. However, this will also depend on inseason bycatch rates and the sense of urgency to mitigate bycatch of a species.

Implementation could take an estimated one to two weeks, or up to four weeks the first time a BAC is implemented, after Council action. This means that, while National Marine Fisheries Service (NMFS) is in the process of finalizing implementation, the area will remain open to fishing for up to four weeks, and impacts to the species of concern from fishing within that area during that time will be uncertain. As such, the GMT again reminds the Council that industry-implemented avoidance and move-along measures are generally more responsive than NMFS-implemented spatial closures.

Prior to implementation, the Council will need to consider the length of time in which the BAC will be closed to fishing, whether up to a specified end date or through the remainder of the calendar year or fishing season. If the Council takes action in September, it may be reasonable to enact the closure through the remainder of the calendar year or fishing season. Conversely, if the Council wished to not close the area through the remainder of the year or season and, instead, specified an end date to the closure as part of its September action (e.g., October 31), the issue of reopening the area would not need to be revisited at the November Council meeting under inseason action.

Enforceability

BACs can be applied to multiple locations for different sectors and different purposes. Closing a BAC to fishing for a specific trawl sector requires the ability to enforce that prohibition for only the intended sector. For vessels required to operate using Vessel Monitoring System (VMS) equipment as described in 50 CFR 660.14(b), a declaration report must be provided to NMFS. On the declaration report, the vessel must declare which sector they are fishing within for that trip and any similar trip consecutively thereafter, until a new gear or monitoring type is used or until the vessel intends to fish in a different sector. Relevant to this action, a vessel may declare that it is fishing in one of the following sectors, among others listed at §50 CFR 660.13(d)(4)(iv)(A):

- Limited entry midwater trawl, non-whiting shorebased IFQ
- Limited entry midwater trawl, Pacific whiting shorebased IFQ
- Limited entry midwater trawl, Pacific catcher/processor sector
- Limited entry midwater trawl, Pacific whiting mothership sector
- Limited entry bottom trawl, shorebased IFQ

This means that it is possible to enforce a sector-specific midwater or bottom trawl BAC for one of the sectors listed above. However, it is worth noting that vessels operating in the shorebased

IFQ program may change their gear-associated declaration (i.e., midwater or bottom trawl) while at sea (§50 CFR 660.13(d)(1)(i)). Additionally, limited entry midwater trawl vessels targeting Pacific whiting may change their declarations while at sea between the Pacific whiting shorebased IFQ sector and the MS sector (§50 CFR 660.13(d)(1)(ii)). Currently, the trawl RCA is closed to bottom trawl gear but not to midwater trawl gear, suggesting that this flexibility between gear and sector declarations while at sea may not pose issues with sector-specific BAC enforcement.

Option 1 Analysis

Unlike the Salmon Mitigation Item, in which salmonids were the only bycatch species analyzed, this action would allow the implementation of BACs to mitigate catches of any of the groundfish species listed in Table 3-1 of the FMP. This management measure would only apply to those species actively managed under the Groundfish FMP and would not apply to other species (e.g., Ecosystem Component species). The intent of implementing a BAC inseason would be to minimize catches of one or more species to the greatest extent possible while minimizing economic impacts to the fisheries. Therefore, the Council should consider the extent to which midwater trawl gear contributes to overall groundfish mortality for the species when determining whether a midwater trawl BAC is appropriate for minimizing catches.

It is difficult to estimate and capture potential impacts for all groundfish species impacted by a midwater trawl BAC, but the tables in the Appendix of this document attempt to narrow down the scope of groundfish species that may warrant the need for a sector-specific midwater trawl BAC. This is done by calculating the proportion to which each IFQ sector (whiting and non-whiting) and the combined at-sea sectors contribute to total mortality. For those species in which the sector has contributed 20 percent or more of total mortality for at least two years since 2016, the GMT further estimated the extent to which that sector's catches poses a risk to those species' ACLs (or ACL contributions for species in a complex) in 2023 by comparing the recent five-year average mortality in that sector to the 2023 ACL (Council's final preferred alternative, as of April 2022). The greater the proportion that a specific sector contributes to total mortality, and to the species' ACL, the more effective a sector-specific BAC is likely to be, depending on species-specific characteristics like aggregation patterns and seasonal overlap with the fishery.

Pacific whiting was not included in this analysis, because it is the target stock for the majority of vessels using midwater trawl gear, and if any of the at-sea or shoreside whiting sectors reach their sector-specific Pacific whiting allocation, that sector is required to cease fishing for the remainder of the season (§50 CFR 660.131(b)(2)(iii)). This ensures that the Pacific whiting Total Allowable Catch (TAC) for the United States is not exceeded thereby eliminating the need for spatial catch control measures such as a BAC.

The analysis uses 2011-2020 mortality data from the GEMM database and is categorized into the shoreside Pacific whiting IFQ sector, the midwater rockfish (i.e., non-whiting) IFQ sector, and the combined at-sea Pacific whiting sectors. The GMT chose these categories, because the target strategy between the two IFQ sectors are different enough to impact bycatch rates, and both IFQ sectors operate differently from the at-sea MS and CP sectors. Although there are some operational, and therefore bycatch, differences between the MS and CP sectors, the GMT ultimately chose to combine the two given that they operate under combined sector set-asides and have generally similar bycatch amounts. Differences in at-sea sector operations are also discussed under the

Economic Impacts section below. It is also worth noting that some Pacific whiting catcher vessels operate in both the shoreside whiting and at-sea MS sectors in the same fishing season.

Groundfish Impacts - Shoreside Pacific Whiting

In at least two years since 2016, the shoreside whiting sector contributed at least 20 percent of the total mortality for darkblotched rockfish, Pacific spiny dogfish, splitnose rockfish, yellowtail rockfish, harlequin rockfish, redstripe rockfish, and silvergray rockfish (Table A-1). The only two stocks for which the shoreside whiting sector could account for a notable portion of the 2023 ACL are yellowtail rockfish (20 percent) and Pacific spiny dogfish (17 percent), as shown in Table A-2. However, total mortality of yellowtail rockfish north of 40° 10′ N. lat. has been less than 27 percent of the stock's ACL since 2011, and therefore, the GMT does not expect the 2023 or 2024 ACLs for yellowtail rockfish north of 40° 10′ N. lat. to be at risk. Although the proportion for Pacific spiny dogfish is below 20 percent, total trawl-wide bycatch of Pacific spiny dogfish could warrant the need for a BAC, particularly if multiple sectors experience unusually high bycatch events, as discussed in Agenda Item F.4, Attachment 2, April 2022. Shoreside whiting catches do not appear to pose a risk to the 2023 ACLs for darkblotched rockfish and Pacific ocean perch (Table A-2). The same applies to splitnose rockfish, harlequin rockfish, redstripe rockfish, and silvergray rockfish, all of which are managed within a complex. This suggests that, of the more than 80 species managed under the Groundfish FMP, the only stock, at least in the 2023-24 harvest specifications cycle, that might warrant a BAC applicable to the shoreside whiting sector is Pacific spiny dogfish.

Figure 2-1 in Agenda Item F.4, Attachment 2, April 2022 shows the proportion of Pacific spiny dogfish mortality by the bottom trawl, shoreside whiting (i.e., midwater hake), and midwater rockfish sectors of the IFQ program. Up until 2017, bottom trawl gear contributed the most to IFQ mortality, but the shoreside whiting sector has been the largest contributor since 2018. Figure 1 below demonstrates that the haul-level bycatch rate of Pacific spiny dogfish (mt; per 1,000 mt of Pacific whiting) in the shoreside whiting sector increases throughout the Pacific whiting season, with a large jump in November, suggesting that a BAC used to mitigate Pacific spiny dogfish bycatch in the shoreside whiting sector would likely be most effective during the last few months of the season. Prior to implementation of a BAC, the Council will need to consider when, and for how long, the closure would be in effect.

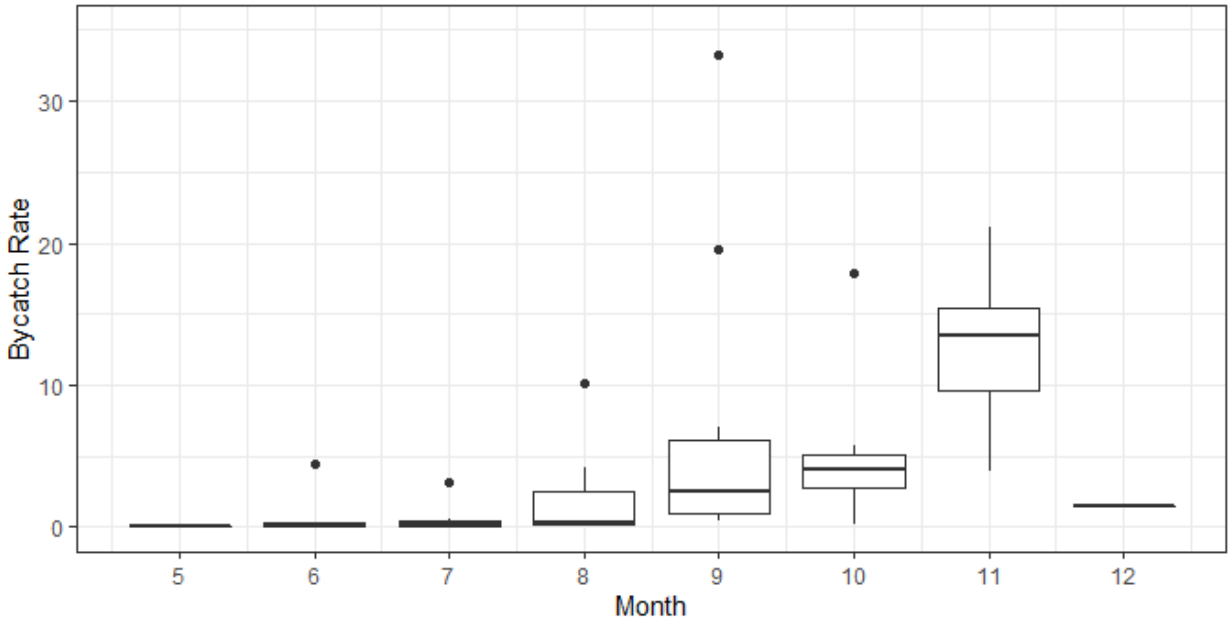

Figure 1. Average monthly haul-level bycatch rate of Pacific spiny dogfish (mt) per 1,000 mt of Pacific whiting in the shoreside whiting sector from hauls that caught >0 mt of Pacific spiny dogfish between 2011 and 2020. For visual clarity, the y-axis scale has been capped at 35 mt, but one outlier is not shown in the graph, which represents an average bycatch rate in November 2019 of 104 mt of Pacific spiny dogfish per 1,000 mt of Pacific whiting. Data Source = WCGOP

Table 2-20 in Agenda Item F.4, Attachment 2, April 2022 demonstrates that, within the shorebased IFQ fishery as a whole, the largest single hauls of Pacific spiny dogfish (5+ mt) tend to occur in waters shallower than 150 fathoms and above 47° N. lat. However, given that WCGOP only records fishing depth, as opposed to bottom depth, it is difficult to say precisely how deep midwater trawl vessels in the IFQ fishery tend to catch Pacific spiny dogfish.

Groundfish Impacts - Midwater Rockfish

In at least two years since 2016, the midwater rockfish sector contributed at least 20 percent of the total mortality for widow rockfish, yellowtail rockfish, and redstripe rockfish (Table A-3). Widow and yellowtail rockfishes are two of the sector's most heavily targeted stocks, along with canary rockfish. The midwater rockfish sector's contribution to the widow rockfish total mortality has steadily increased since the start of the IFQ program, from 5 percent in 2011 to 90 percent in 2020, as the stock was rebuilt. The 2023 and 2024 ACLs for widow rockfish are roughly 25 percent higher than the maximum annual total mortality since 2011, and therefore, the GMT does not consider widow rockfish to be a species that will likely warrant BACs to control catch in the next biennium. However, if, for example, the widow rockfish ACL were at risk in future biennia, a sector-specific BAC applicable to the midwater rockfish sector may be an effective tool for minimizing widow rockfish mortality, because the vast majority of the species is caught by the midwater rockfish sector. However, given that widow rockfish is a target stock, considerable thought should be given to the economic impacts of closing productive target stock grounds prior to implementation.

As stated above, the 2023 and 2024 ACLs for yellowtail rockfish north of 40° 10′ N. lat. are not likely at risk due to historically low (<27 percent) attainment. Redstripe rockfish north of 40° 10′

N. lat. is managed within a complex. Although the stock's OFL contribution to the shelf rockfish complex north of 40° 10′ N. lat. was exceeded twice between 2017 and 2020, the stock's total mortality averages 230 mt below the OFL contribution (Table 3, Agenda Item E.3.a, GMT Report 2, November 2021). Therefore, while the GMT did not identify a likely need for a BAC applicable to the midwater rockfish sector within the next biennium, such a BAC could be helpful in minimizing widow rockfish mortality in future biennia, if warranted.

Groundfish Impacts - At-Sea Pacific Whiting

As noted above, the GMT chose to combine the MS and CP at-sea sectors for the purposes of preliminarily analyzing potential uses of a midwater trawl BAC, given that the sectors are currently managed with combined sector set-asides and that bycatch rates are often similar across the two sectors due to similar target strategies and operations. Prior to implementation, the Council will want to take a more nuanced look at the individual at-sea sectors to determine whether a BAC needs to be applicable to either sector, independently, or to both.

In at least two years since 2016, the at-sea Pacific whiting sectors contributed at least 20 percent of the total mortality for Pacific ocean perch, harlequin rockfish, Pacific spiny dogfish, rougheye/blackspotted rockfish, and splitnose rockfish (Table A-5). Pacific ocean perch north of 40° 10′ N. lat. is currently managed with a 300 mt set-aside, which is 158 mt higher than the historical maximum at-sea mortality since 2011. Additionally, the ACLs for Pacific ocean perch north of 40° 10′ N. lat. is not likely to be exceeded in 2023 or 2024, because the maximum total mortality since 2011 was 611 mt, which represents 17 percent and 18 percent of the ACLs, respectively.

Other than Pacific spiny dogfish, the remaining three species (harlequin, rougheye/blackspotted, and splitnose rockfishes) are managed within a complex, and among those species, rougheye/blackspotted rockfish is the only in which the OFL contribution was exceeded at least once between 2017 and 2020 (Agenda Item E.3.a, GMT Report 2, November 2021). However, the annual mortality of rougheye/blackspotted rockfish north of 40° 10′ N. lat. averages 32 mt below the stock's OFL contribution. The GMT also notes that the stock's vulnerability score is 2.27, which indicates that rougheye/blackspotted rockfish north of 40° 10′ N. lat. is a stock of major concern. Thus, as the Council further explores the Stock Definitions item, consideration of whether and how BACs may or should be used in the event that a stock's OFL or ACL contribution to a complex is exceeded may be warranted. If the Council wishes to use BACs to prevent complex contributions from being exceeded, a sector-specific BAC applicable to the at-sea sector(s) may be a useful tool in minimizing mortality of rougheye/blackspotted rockfish north of 40° 10′ N. lat, given that 20 to 67 percent of the stock's total mortality was attributed to the at-sea sectors between 2016 and 2020.

The at-sea fleet's recent five-year average mortality for splitnose rockfish north of 40° 10′ N. lat. accounts for only 8 percent of the stock's 2023 ACL contribution, and total mortality of splitnose rockfish north of 40° 10′ N. lat. has been less than 30 percent of the ACL since 2017. For Pacific spiny dogfish, the at-sea fleet's recent five-year average mortality accounts for 28 percent of the stock's 2023 ACL, and as noted above, trawl-wide bycatch of the species could warrant consideration of a BAC, particularly given the wide variability in sector-specific annual catches. Given that 19 to 49 percent of Pacific spiny dogfish mortality was attributed to the at-sea sectors between 2016 and 2020, a midwater trawl BAC applicable to one or both of the at-sea sectors may

help to minimize mortality, if needed. As shown in Figure 2-2 of Agenda Item F.4, Attachment 2, April 2022, Pacific spiny dogfish bycatch in the at-sea sectors generally follows the same trend as the Pacific whiting TAC, and certain upcoming changes to the Pacific whiting fishery may reduce expected Pacific spiny dogfish bycatch impacts in 2023 and beyond.

Similar to the shoreside whiting sector, the haul-level bycatch rate of Pacific spiny dogfish (mt; per 1,000 mt of Pacific whiting) increases as the fishing season progresses, with a mean rate of just under 10 mt of Pacific spiny dogfish per 1,000 mt of Pacific whiting by November (Figure 2). As with the shoreside whiting sector, the bycatch rate can occasionally be exceptionally high for some individual hauls, such as in November 2019 when the average bycatch rate jumped to 229, which was largely driven by a handful of hauls that caught fewer than 3 mt of Pacific spiny dogfish but also very little Pacific whiting. One haul, however, caught 28 mt of Pacific spiny dogfish and 55 mt of Pacific whiting, while another caught 58 mt of Pacific spiny dogfish and virtually no Pacific whiting. These types of large individual bycatch events are more likely to occur late in the fishing season. Further analysis prior to BAC implementation may be able to identify such at-sea "hot spots" of extremely high bycatch using A-SHOP haul-level data which does record bottom depth, making it feasible to narrow down bycatch rates within specific depth and latitude bins.

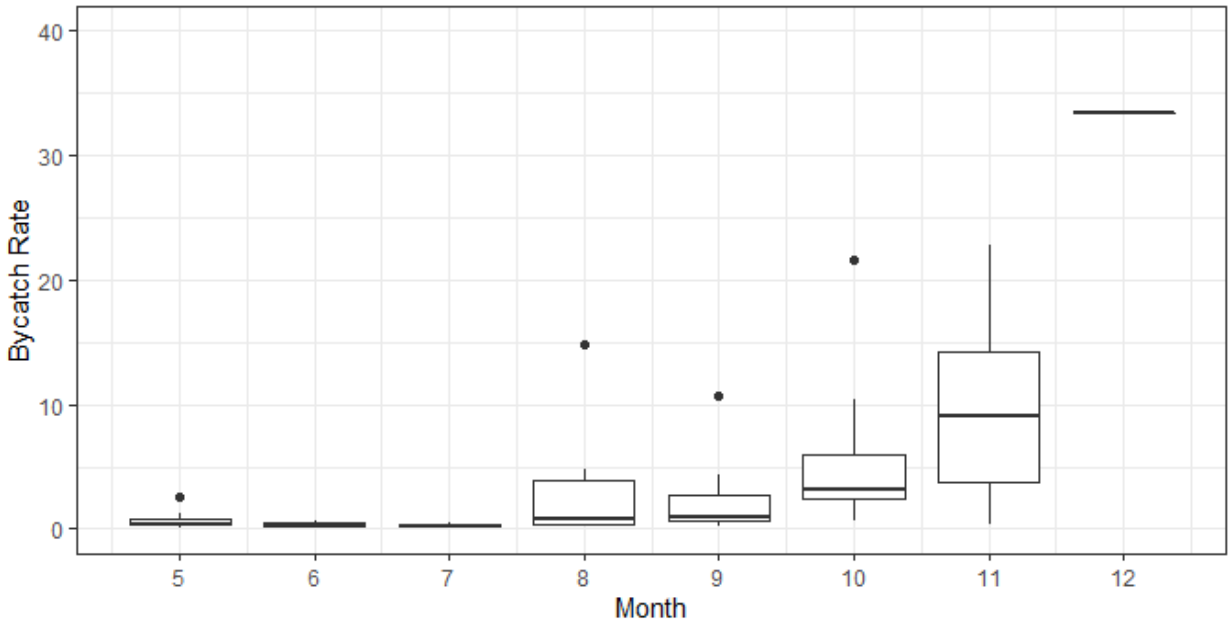

Figure 2. Average monthly haul-level bycatch rate of Pacific spiny dogfish (mt) per 1,000 mt of Pacific whiting in the at-sea sectors (MS and CP combined) from hauls that caught >0 mt of Pacific spiny dogfish between 2011 and 2020. For visual clarity, the y-axis scale has been capped at 40 mt, but one outlier is not shown in the graph, which represents an average bycatch rate in November 2019 of 229 mt of Pacific spiny dogfish per 1,000 mt of Pacific whiting. Data Source = NorPAC/A-SHOP

Thus, the stocks most likely to warrant and/or provide the most effective bycatch minimization using a BAC applicable to the at-sea sectors in at least the 2023-24 biennium are Pacific spiny dogfish and, depending on Council preference when managing stock complexes, rougheye/blackspotted rockfish north of 40° 10′ N. lat.

Protected Species Impacts

Salmonids are the most commonly caught protected species in the midwater fleet (both whiting and non-whiting). In order to mitigate salmon and other bycatch, the whiting co-op currently operates under self-imposed area restrictions and move-along measures that are faster and nimbler than BACs put in place by NMFS. The use of BACs would be a last resort in addition to the measures that the whiting co-op currently takes. Although the intention of this action would be to use BACs to protect and mitigate harvest of groundfish species, a midwater trawl BAC may reduce trawl gear interactions with protected species as well, if those species occur in areas closed to midwater trawling. However, given that effort will likely shift outside of the closed area (as opposed to ceasing entirely), there is also potential for greater interaction with salmonids based on the time of year and where the closure is implemented. A full analysis of where potential effort could shift into adjacent areas and the impacts to protected species would be done inseason, once an area has been identified for closure.

Generally, greater impacts to salmon species might be expected if a fleet is forced to shift their effort shoreward of 200 fathoms in the fall months due to a BAC seaward of 200 fathoms. This is important to note, because Pacific spiny dogfish has been identified as the species most likely to warrant a midwater trawl BAC, and the at-sea sectors catch an average of 86 percent of Pacific spiny dogfish in waters deeper than 200 fathoms. The MS sector, however, catches, on average, slightly more Pacific spiny dogfish in areas shallower than 200 fathoms than the CP sector, given catcher vessel horsepower constraints. The Salmon Mitigation Item concluded that the majority of salmon bycatch for the at-sea sectors occurs shallower than 200 fathoms. However, salmon bycatch rates are typically higher in southern latitudes, and therefore, while impacts to either species are still difficult to predict due to strong interannual variability (as described and noted in Figure 15 of Agenda Item G.3., Attachment 1, March 2021), the likelihood that a BAC for Pacific spiny dogfish will push a particular sector into higher salmon bycatch areas (or vice versa) depends on the sector's operational capacity, including horsepower, as discussed in the following section. Additionally, the at-sea sectors cannot process south of 36° N. lat., and, therefore, even if a BAC is implemented north of ~~36°~~ 42° N. lat., fishing impacts will likely remain low south of that latitude even though catcher vessels can fish in those areas.

BACs can also be implemented for salmon mitigation by midwater trawl gear, and, therefore, the Council could consider implementing both BAC types (most likely in different locations), if necessary. However, this would impose the greatest negative economic impacts to the midwater trawl fleet (or specific sectors). The whiting utilization agenda item, which is set to be implemented for the 2023 season, might lead to some shifts in effort toward earlier in the Pacific whiting season, which is likely to result in lower impacts to salmonids and Pacific spiny dogfish bycatch, as the Pacific whiting TAC could be attained prior to when the bycatch rates for both species peaks (Pacific spiny dogfish; Figure 1, Agenda Item C.3.a, Supplemental GMT Report 1, September 2021; Chinook salmon; Figures 4 & 5, Agenda Item H.5.a, GMT Report 1, March 2018). Therefore, a BAC to control catch of either or both species may be even less warranted in the future.

Economic Impacts

A BAC would prohibit fishing with the specified gear type within latitude- and depth-based boundaries for the specified sector(s) and for the amount of time specified as part of the Council's action. As described above, the sectors that could be impacted by a midwater trawl BAC for

groundfish mitigation purposes are the shoreside whiting and midwater rockfish sectors within the IFQ fishery, as well as the MS and CP at-sea sectors. The Pacific whiting sector co-ops implement self-imposed area restrictions and move-along measures to minimize bycatch of non-whiting species, particularly because catching non-whiting species reduces processing space and capacity for Pacific whiting. These industry-implemented measures have fewer expected economic impacts to the fishery because they are less spatially restrictive and more flexible than BACs put in place by NMFS.

Figure 16 from Agenda Item G.3., Attachment 1, March 2021 showcases that the Pacific whiting sectors operate in somewhat different areas along the coast, most notably different depth ranges due to differences in horsepower capacity across the sectors. Table 14 of that document demonstrates that MS processors and CP vessels have an average of 4,500 more mean horsepower capacity than their shoreside or catcher vessel counterparts. Vessels in the midwater rockfish sector, which target canary, yellowtail, and widow rockfishes, on average, have lower horsepower capacities than the shorebased whiting fleet and therefore are typically found closer to shore and in shallower depths (Agenda Item G.3., Attachment 1, March 2021). Given the differences in mean horsepower between these sectors (and the importance of the MS catcher vessels to the MS processors), each sector will react differently to a BAC and therefore be impacted differently.

The ability for a vessel to move out of the closed area and into another area, particularly for BACs that are implemented in shallower waters, will be limited by that vessel's horsepower capacity. The shoreside whiting and midwater rockfish sectors would likely be most impacted by a BAC within 200 fathoms. The MS sector would be limited by the horsepower capacity of MSCVs and, therefore, also likely be impacted by such a BAC. Smaller catcher vessels may not have the ability to travel to deeper fishing grounds or farther from their homeport, and, therefore, a BAC might effectively eliminate the opportunity for some vessels in that sector to fish. The cost of fuel will also impact which vessels are able to participate and adapt their fishing strategy in the event of a BAC implementation. It is more likely that the at-sea fleet (specifically the CP sector), which has the highest average horsepower among the midwater trawl sectors, will be able to move out of or avoid the closed area while continuing to fish productive grounds. Therefore, while dependent on the precise area closed to fishing by a BAC, there may be disproportionate economic impacts to the various midwater trawl sectors if the area is closed to multiple sectors. When conducting pre-implementation analysis, the Council will also want to consider how much of the prohibited sector's target stock (e.g., Pacific whiting) is generally caught within the area under consideration and to what extent a closure of that area will economically impact the sector(s), particularly if the sector(s) are limited in their ability to move to other productive grounds.

Pacific whiting is a fish that spoils particularly quickly while at sea, which is largely why the MS and CP sectors process Pacific whiting at sea. However, the shoreside whiting fleet lands and delivers their Pacific whiting catch at shoreside processing facilities, which means that a BAC that requires the fleet to move further away from shore, or from important shoreside ports, could negatively impact the value of their product and their overall profitability. Additionally, unlike the at-sea fleets, maximized retention in the shoreside whiting sector requires those vessels to retain and land the majority of their non-whiting catch. Thus, the sector already takes measures to avoid non-whiting species in order to maximize the amount of vessel space available for their target species.

Given the ability for MS catcher vessels to change their sector declaration to shoreside whiting while at sea, and the significant cross-over between the two fleets, a BAC applicable to just the MS sector and not the shoreside whiting sector would likely impact MS processor platforms and their ability to process and sell fish to the market without sufficiently accomplishing bycatch minimization. MS catcher vessels could theoretically switch their declaration to shoreside whiting in order to continue fishing in the closed area. Therefore, bycatch impacts may not be lowered to the extent intended by the closure.

Considerations and Analyses Prior to Implementation of Midwater Trawl BACs

As a reminder, BACs may be implemented via routine action and do not require a three-meeting process to implement. The GMT provides the following as a non-exhaustive list of situationally specific considerations and analyses that would likely need to be done prior to implementation:

Some considerations prior to implementation:

- What species is the BAC intended to protect? Is it a target stock, and, if so, what are the unique economic implications as a result?
- Is a BAC likely to sufficiently accomplish catch mitigation of the species of concern, balancing its effectiveness with the impacts to fishing operations?
- Which sector(s) would the BAC apply to?
- When will the BAC be implemented following Council action, i.e., immediately or at a specified date in the future?
- When, and for how long, would the BAC be in effect? Through the remainder of the calendar year or fishing season or up to a specified date?
- Would the implementation of a BAC effectively close the fishery for some or all of the fleet?
- Would impacts be equitable among vessels within a sector or across midwater trawl sectors?
- How might an effort shift resulting from a BAC closure impact protected species or other stocks of concern (e.g., rebuilding stocks)?
- Would shifts in effort create conflict with other fisheries in the open areas?

Potential quantitative analyses prior to implementation:

- Where is the species of concern largely caught and by which sector(s)?
- How much catch is expected to be mitigated within the area being proposed for closure?
- What is the spatial extent of catches? A BAC may not be appropriate for a species that is caught consistently coastwide.
    - Are there any “hot-spots” (i.e., exceptionally large individual hauls)?
- What is the seasonality of catches/bycatch rates for the species of concern, if any?
- Does the probability of encounters change throughout the season?
- What are the bycatch rates (if a bycatch species) by depth and latitude? (potentially using historical data where inseason data at this scale is unavailable)
- How much of the target stock has been caught in areas under consideration for closure?
    - For Pacific whiting, are move-along measures likely sufficient in the event that very little Pacific whiting is caught within or near bycatch hot-spots?
    - How will the BAC closure economically impact the sector’s harvest of their target stock(s)?
- Where is effort likely to shift as a result of a BAC closure?

Bottom Trawl BACs

BACs for bottom trawl gear were developed as part of the Amendment 28 package and are currently in regulation for groundfish mitigation purposes off Oregon and California only. Although included in the range of alternatives, this action did not include adoption of BACs off WA in the final preferred alternative, because BACs were intended to replace some of the protections given by the trawl RCA, which was ultimately only removed off OR and CA. The Council could consider expanding the trawl RCA off WA, which is closed to bottom trawl gear, to encompass any other groundfish catch mitigation. However, while RCA boundaries may be modified through inseason action, establishment of a new trawl RCA not previously analyzed would have to be done under a future harvest specifications process.

RCAs are intended to be a long-term tool to protect important areas of abundance for a complex of groundfish species, such as overfished shelf rockfish species, whereas BACs are designed to be a short-term catch control mechanism. With that distinction in mind, BACs may be warranted to control catch of groundfish species by bottom trawl gear, such as Pacific spiny dogfish, that exhibit more seasonal and/or geographic variance than the species intended to be protected by RCAs. Thus, although the Council chose not to develop BACs off Washington as part of Amendment 28, new information (i.e., Pacific spiny dogfish catches and harvest specifications) justifies their development as part of the 2023-24 harvest specifications package, given that they do not in effect serve the same purpose as RCAs. Additionally, BACs are likely to impose fewer socioeconomic impacts on fishery participants than a modification or further establishment of the trawl RCA, since they can generally be more precise.

To aid in the decision making process, the GMT provides two options for the Council to consider:

- Status Quo: BACs can be used inseason or preseason shoreward of 700 fathoms to mitigate groundfish catch by bottom trawl gear off OR and CA.
- Option 1: BACs can be used inseason, or preseason, shoreward of 700 fathoms to mitigate groundfish catch by bottom trawl gear off WA, in addition to off OR and CA.

It is the GMT's intention that, to align this action with the existing availability of bottom trawl BACs off OR and CA, and with what was analyzed in the Amendment 28 package, BACs could be implemented within tribal U&As off WA but would only apply to non-tribal vessels.

The bottom trawl sector, like shoreside whiting and midwater rockfish, is part of the Shorebased IFQ Program, which is managed with stock-specific quota pounds (QP) that must cover any catch of IFQ stocks. Stocks managed with IFQ allocations, and therefore QP, are listed in Table 1 of 50 CFR 660.140(d)(1)(ii)(D). However, the bottom trawl sector targets different species than the midwater trawl sectors, the most common and economically important of which are the Dover-Sablefish-Thornyhead complex (DTS) and petrale sole. It is important to note that sablefish are also targeted by vessels in the IFQ fishery who use allowed fixed gear (i.e., "Gear Switchers") and who would not be subject to a bottom trawl BAC even if the species of concern is also caught by fixed gear in the same location.

The bottom trawl fishery occurs year-round, but the timeline of inseason action will likely be the same as that of midwater trawl BACs, with the exception that inseason landings and logbook data will be available at both the March and April meetings. The same data types are available for

bottom trawl catches as for the shoreside whiting and midwater rockfish sectors. However, it is important to note that only the discards of IFQ species/species groups are required to be covered with QP (or Individual Bycatch Quota in the case of Pacific halibut). Discards of non-IFQ species are recorded by WCGOP observers but are not reported, and, therefore, discard estimates of those species are not available inseason. For a species like Pacific spiny dogfish, for which more than 95 percent of bottom trawl catch is discarded and not accounted for with QP, this means that landings data on fish receiving tickets will not reflect actual catches and cannot be used to determine a risk of high catches. While logbook information will be available inseason, it is the GMT's understanding that logbooks do not account for discarded catch.

At-sea discards of quota-managed species in the Shorebased IFQ Program are monitored 100 percent via an observer of EM. In the 100 percent observed portion of the fleet, and on non-whiting EM trips selected for scientific observer coverage, discards of all species are recorded by an observer. EM video reviewers do not estimate discards of non-quota species, so EM trips that do not carry an observer do not have available information about non-quota discards. Therefore, annual discard estimates of non-quota-managed species, including Pacific spiny dogfish, on EM trips are derived from the roughly 20 percent of non-whiting EM trips that carry a WCGOP scientific observer. While these annual discard estimates are important for managing bycatch species in the bottom trawl fleet, they are generally less informative for the shoreside whiting sector of the IFQ fishery, because that sector operates under maximized retention, and therefore, discard estimates are generally low.

The Council could consider using a BAC to control catch of species with IFQ QP, but it is worth noting that any vessel that exceeds its allocated QP for an IFQ species is prohibited from fishing in the IFQ fishery until sufficient QP are transferred into the vessel account to remove the deficit, for example by purchasing unused QP from another vessel (50 CFR 660.140(b)(1)(iv)). Similar to the management of Pacific whiting catch in the Pacific whiting fishery, this is essentially a system designed to prevent the total IFQ allocation for any individual IFQ species from being exceeded. Therefore, IFQ species are less likely to warrant a bottom trawl BAC than non-IFQ species caught as bycatch in both the bottom and midwater trawl fisheries. However, what makes this back-stop different from the at-sea sectors ~~Pacific whiting fishery~~ is that this requirement to cease fishing is at the vessel level rather than the sector level, and therefore, the remaining vessels in the bottom trawl sector could continue catching the particular IFQ species. Yet, given that the requirement still applies to all vessels in the sector, the risk of exceeding the IFQ allocation of any QP-managed species is still expected to be low.

Therefore, it may be unlikely that high bottom trawl catches trigger consideration of a bottom trawl BAC for non-IFQ species. What is more likely is that non-IFQ species with high midwater trawl catches may trigger consideration of trawl-based catch controls, at which point the Council should consider historical bottom trawl mortality of the species, along with inseason midwater trawl data. If the species is historically caught by the bottom trawl fleet in significant amounts (e.g., >20 percent of total mortality for X number of years), it may be appropriate to implement a BAC applicable to both bottom trawl and midwater trawl sectors for equity reasons.

There are also some differences in the considerations and analysis the Council may need to explore prior to implementing a bottom trawl BAC compared to a midwater trawl BAC. Specifically, the sectors target different stocks, and bottom trawl gear tends to catch a wider diversity of species,

especially compared to midwater vessels targeting Pacific whiting. Also compared to Pacific whiting sectors, bottom trawl vessels are not engaged in a similar level of cooperative self-management. This means that bottom trawl vessels may not have a way to rapidly communicate bycatch "hot spots" with the rest of the fleet as efficiently as the Pacific whiting fleets. Bottom trawl vessels are likely to have horsepower capacities more similar to shoreside whiting and midwater rockfish vessels than to the CP vessels or MS processor platforms and, therefore, may be limited in their ability to move to other fishing grounds, if required.

Lastly, there is the possibility for cumulative impacts to the bottom trawl fleet if a bottom trawl BAC is implemented to control catches off WA while the trawl RCA remains in effect 100-150 fathoms off WA. Prior to implementation, the Council should consider whether an extension of the trawl RCA is more appropriate and whether, if implementing a bottom trawl BAC, the cumulative impacts from both the trawl RCA and the bottom trawl BAC would effectively close the fishery for any vessels.

Appendix

I. Shoreside Pacific Whiting Mortality Tables

Table A-1. Percent of total mortality attributed to the shoreside whiting sector of the IFQ fishery, 2011-2020, for groundfish species with average shoreside whiting mortality of 0.01 mt or greater (i.e., non-zero) during those years. Bolded species are those with at least two years since 2016 in which shoreside whiting catch was greater than 20 percent of total mortality. Data Source = GEMM

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Species WITH Species-Specific IFQ Allocations										
Arrowtooth Flounder	0%	1%	0%	0%	0%	1%	0%	1%	1%	1%
Bocaccio Rockfish	0%	0%	0%	0%	0%	0%	1%	2%	5%	1%
Canary Rockfish	1%	5%	4%	5%	22%	9%	18%	32%	15%	18%
Chilipepper Rockfish	0%	0%	0%	0%	0%	4%	21%	2%	3%	0%
Darkblotched Rockfish	**1%**	**4%**	**2%**	**6%**	**21%**	**11%**	**13%**	**24%**	**18%**	**20%**
Dover Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
English Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lingcod	1%	0%	1%	1%	0%	0%	0%	1%	1%	1%
Longspine Thornyhead	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pacific Cod	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pacific Ocean Perch	**0%**	**21%**	**12%**	**18%**	**33%**	**41%**	**38%**	**31%**	**3%**	**19%**
Pacific Spiny Dogfish	**11%**	**19%**	**12%**	**11%**	**27%**	**23%**	**20%**	**20%**	**23%**	**40%**
Petrale Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sablefish	0%	1%	0%	0%	0%	0%	2%	1%	3%	2%
Shortspine Thornyhead	0%	1%	0%	0%	2%	1%	0%	0%	0%	3%
Splitnose Rockfish	**6%**	**14%**	**5%**	**20%**	**52%**	**26%**	**21%**	**27%**	**25%**	**11%**
Starry Flounder	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Widow Rockfish	57%	38%	39%	41%	36%	24%	15%	8%	9%	8%
Yellowtail Rockfish	**30%**	**23%**	**18%**	**20%**	**7%**	**32%**	**42%**	**29%**	**34%**	**42%**

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Species WITHOUT Species-Specific IFQ Allocations										
Aurora Rockfish	1%	1%	0%	1%	0%	0%	1%	8%	0%	0%
Bank Rockfish	0%	0%	0%	0%	0%	0%	0%	5%	1%	0%
Big Skate	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Black Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Blackgill Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Flathead Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Greenstriped Rockfish	0%	0%	1%	0%	0%	0%	0%	0%	1%	0%
Harlequin Rockfish	**0%**	**0%**	**0%**	**0%**	**0%**	**54%**	**70%**	**32%**	**19%**	**0%**
Longnose Skate	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pacific Sanddab	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%
Quillback Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Redbanded Rockfish	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%
Redstripe Rockfish	**0%**	**0%**	**2%**	**9%**	**26%**	**34%**	**47%**	**40%**	**40%**	**22%**
Rex Sole	0%	1%	0%	0%	1%	1%	0%	0%	0%	1%
Rosethorn Rockfish	3%	0%	0%	0%	5%	0%	0%	0%	1%	8%
Rougheye/Blackspotted Rockfish	2%	19%	2%	4%	15%	11%	2%	1%	4%	27%
Sand Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Silvergray Rockfish	**15%**	**11%**	**16%**	**15%**	**2%**	**43%**	**26%**	**28%**	**5%**	**0%**
Stripetail Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Yelloweye Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Yellowmouth Rockfish	0%	3%	1%	0%	35%	0%	1%	7%	9%	1%

Table A-2. Annual average shoreside whiting mortality for 2011-2020 and 2016-2020 of those groundfish species bolded in Table A-1, their respective 2023 ACLs, and the recent 5-year average shoreside whiting mortality as a percent of those stocks' 2023 ACLs. Italics indicate that the stock is managed within a complex. Bolded stocks are those for which average recent shoreside whiting mortality (2016-2020) constitutes 20 percent or more of the 2023 ACL for that stock. Data Source = GEMM (mortality); PacFIN (ACLs)

Stock	Average Shoreside Whiting Mortality (mt), 2011-2020	Average Shoreside Whiting Mortality (mt), 2016-2020	2023 ACL (mt) a/	Recent 5-Yr Avg. Shoreside Whiting Mortality as % of 2023 ACL	# of years over OFL contribution (2017-2020) b/
Stocks WITH IFQ Allocations (or Complex-Level IFQ Allocations)					
Darkblotched Rockfish	32.1	54.5	785	7%	N/A
Pacific Ocean Perch	29.6	49.1	3,573	1%	N/A
Redstripe Rockfish North of 40° 10′ N. lat.	*6.3*	*12.2*	*210*	*<1%*	*2*
Silvergray Rockfish North of 40° 10′ N. lat.	*1.4*	*2.4*	*124*	*<1%*	*0*
Yellowtail Rockfish North of 40° 10′ N. lat.	**724.8**	**1,142.3**	**5,666**	**20%**	**N/A**
Stocks WITHOUT IFQ Allocations (or Complex-Level IFQ Allocations)					
Harlequin Rockfish c/	*0.01*	*0.02*	*N/A*	*N/A*	*N/A*
Pacific Spiny Dogfish	192.9	249.6	1,456	17%	N/A
Splitnose Rockfish North of 40° 10′ N. lat.	*35.1*	*41.6*	*888*	*<1%*	*0*

a/ ACL values are rounded to the nearest whole number.
b/ Only for stocks in a complex. The GMT conducted detailed analysis of existing stock complexes and species contributions in Agenda Item E.3.a, GMT Report 2, November 2021.
c/ Harlequin rockfish has never been assessed and therefore does not have a specified ACL contribution.

II. Midwater Rockfish Mortality Tables

Table A-3. Percent of total mortality attributed to the midwater rockfish sector of the IFQ fishery, 2012-2020, for groundfish species with average midwater rockfish mortality of 0.01 mt or greater (i.e., non-zero) during those years. There was no data from 2011 for this sector. Bolded species are those with at least two years since 2016 in which midwater rockfish catch was greater than 20 percent of total mortality. Data Source = GEMM

Species	2012	2013	2014	2015	2016	2017	2018	2019	2020
Species WITH Species-Specific IFQ Allocations									
Arrowtooth Flounder	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bocaccio Rockfish	0%	0%	0%	0%	0%	1%	3%	4%	2%
Canary Rockfish	1%	4%	3%	5%	8%	9%	11%	6%	17%
Chilipepper Rockfish	0%	0%	0%	0%	0%	2%	2%	1%	0%
Darkblotched Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dover Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%
English Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lingcod	0%	0%	0%	0%	0%	0%	0%	0%	0%
Longspine Thornyhead	0%	0%	0%	0%	0%	0%	1%	0%	0%
Pacific Cod	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pacific Ocean Perch	0%	0%	0%	0%	0%	0%	2%	2%	19%
Petrale Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sablefish	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shortspine Thornyhead	0%	0%	0%	0%	0%	0%	1%	0%	0%
Splitnose Rockfish	0%	0%	0%	0%	0%	1%	1%	1%	1%
Widow Rockfish	**5%**	**33%**	**40%**	**54%**	**54%**	**76%**	**89%**	**88%**	**90%**
Yellowtail Rockfish	**11%**	**16%**	**37%**	**57%**	**34%**	**30%**	**54%**	**37%**	**39%**
Species WITHOUT Species-Specific IFQ Allocations									
Aurora Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bank Rockfish	0%	0%	0%	0%	0%	0%	1%	0%	0%
Big Skate	0%	0%	0%	0%	0%	0%	0%	0%	0%

Species	2012	2013	2014	2015	2016	2017	2018	2019	2020
Black Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%
Blue/Deacon Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%
Species WITHOUT Species-Specific IFQ Allocations									
Flathead Sole	0%	0%	0%	0%	0%	1%	0%	0%	0%
Greenstriped Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%
Longnose Skate	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pacific Sanddab	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pacific Spiny Dogfish	0%	0%	0%	8%	0%	0%	0%	12%	0%
Redbanded Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%
Redstripe Rockfish	**0%**	**1%**	**3%**	**23%**	**16%**	**29%**	**48%**	**48%**	**74%**
Rex Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%
Rosethorn Rockfish	0%	0%	0%	1%	0%	0%	0%	0%	36%
Rougheye/Blackspotted Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%
Silvergray Rockfish	2%	1%	4%	2%	1%	3%	20%	2%	1%
Stripetail Rockfish	0%	0%	0%	0%	0%	0%	0%	1%	0%
Yellowmouth Rockfish	0%	0%	0%	0%	0%	0%	82%	1%	3%

Table A-4. Annual average midwater rockfish mortality for 2012-2020 and 2016-2020 of those groundfish species bolded in Table A-3, their respective 2023 ACLs, and the recent 5-year average midwater rockfish mortality as a percent of those stocks' 2023 ACLs. Italics indicate that the stock is managed within a complex. Bolded stocks are those for which average recent midwater rockfish mortality (2016-2020) constitutes 20 percent or more of the 2023 ACL for that stock. Data Source = GEMM (mortality); PacFIN (ACLs)

Stock	Average Midwater Rockfish Mortality (mt), 2011-2020	Average Midwater Rockfish Mortality (mt), 2016-2020	2023 ACL (mt) a/	Recent 5-Yr Avg. Midwater Rockfish Mortality as % of 2023 ACL	# of years over OFL contribution (2017-2020) b/
Stocks WITH IFQ Allocations (or Complex-Level IFQ Allocations)					
Redstripe Rockfish North of 40° 10′ N. lat.	*9.6*	*17.0*	*210*	*8%*	*2*
Yellowtail Rockfish North of 40° 10′ N. lat.	**938.5**	**1,256.0**	**5,666**	**22%**	**N/A**
Widow Rockfish	**3,533.3**	**6,168.2**	**12,624**	**49%**	**N/A**
Stocks WITHOUT IFQ Allocations (or Complex-Level IFQ Allocations)					
NONE					

a/ ACL values are rounded to the nearest whole number.
b/ Only for stocks in a complex. The GMT conducted detailed analysis of existing stock complexes and species contributions in Agenda Item E.3.a, GMT Report 2, November 2021.

III. At-Sea Pacific Whiting Mortality Tables

Table A-5. Percent of total mortality attributed to the at-sea Pacific whiting sectors, 2011-2020, for groundfish species with average catches greater than 0.01 mt in those sectors during those years. Bolded species are those with at least two years in which at-sea mortality was at least than 20 percent of total mortality.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bycatch Species WITH Species-Specific Set-Asides										
Arrowtooth Flounder	2%	0%	1%	1%	4%	1%	1%	5%	4%	1%
Canary Rockfish	1%	1%	1%	1%	0%	1%	2%	1%	1%	0%
Darkblotched Rockfish	10%	2%	5%	8%	5%	4%	16%	19%	18%	11%

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bycatch Species WITH Species-Specific Set-Asides										
Dover Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lingcod	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pacific Ocean Perch	**12%**	**8%**	**9%**	**7%**	**14%**	**15%**	**21%**	**37%**	**23%**	**1%**
Sablefish	0%	0%	0%	0%	0%	0%	3%	2%	1%	0%
Shortspine Thornyhead	1%	0%	2%	2%	1%	1%	2%	8%	8%	2%
Widow Rockfish	17%	28%	6%	8%	4%	18%	7%	2%	2%	1%
Yellowtail Rockfish	6%	3%	18%	3%	4%	4%	9%	6%	8%	4%
Bycatch Species WITHOUT Species-Specific Set-Asides										
Aurora Rockfish	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%
Bank Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Big Skate	0%	0%	0%	1%	0%	0%	1%	1%	1%	1%
Blackgill Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Bocaccio Rockfish	0%	0%	0%	0%	0%	0%	0%	1%	2%	1%
Chilipepper Rockfish	0%	0%	0%	0%	0%	2%	5%	1%	1%	0%
English Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Flathead Sole	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Harlequin Rockfish	**0%**	**39%**	**87%**	**100%**	**0%**	**29%**	**12%**	**36%**	**36%**	**0%**
Longspine Thornyhead	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pacific Cod	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pacific Sanddab	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pacific Spiny Dogfish	**45%**	**21%**	**15%**	**9%**	**14%**	**24%**	**28%**	**49%**	**37%**	**19%**
Redbanded Rockfish	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%
Redstripe Rockfish	0%	1%	22%	2%	5%	26%	3%	8%	1%	0%
Rex Sole	1%	1%	2%	2%	1%	0%	1%	6%	7%	1%

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bycatch Species WITH Species-Specific Set-Asides										
Rougheye/Blackspotted Rockfish	**37%**	**22%**	**11%**	**6%**	**16%**	**20%**	**24%**	**67%**	**55%**	**39%**
Sharpchin Rockfish	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Shortraker Rockfish	1%	2%	0%	0%	0%	0%	0%	1%	10%	1%
Silvergray Rockfish	22%	19%	4%	4%	33%	5%	8%	9%	1%	0%
Splitnose Rockfish	**17%**	**18%**	**21%**	**13%**	**9%**	**35%**	**49%**	**47%**	**36%**	**13%**
Stripetail Rockfish	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%
Yellowmouth Rockfish	4%	3%	0%	0%	0%	2%	5%	7%	1%	0%

Table A-6. Annual average at-sea mortality for 2011-2020 and 2016-2020 of those groundfish species bolded in Table A-5, their respective 2023 ACLs, and the recent 5-year average at-sea mortality as a percent of those stocks' 2023 ACLs. Italics indicate that the species is managed within a complex. Bolded species are those for which average recent at-sea mortality (2016-2020) constitutes 20 percent or more of the 2023 ACL for that species. Data Source = GEMM (mortality); PacFIN (ACLs)

Stock	Average At-Sea Mortality (mt), 2011-2020	Average At-Sea Mortality (mt), 2016-2020	2023 ACL (mt) a/	Recent 5-Yr Avg. At-Sea Mortality as % of 2023 ACL	# of years over OFL contribution (2017-2020) b/
Stocks WITH Set-Asides (or Complex-Level Set-Asides)					
Harlequin Rockfish c/	*0.00*	*0.01*	*N/A*	*N/A*	*N/A*
Pacific Ocean Perch	26.9	47.9	3,573	1%	N/A
Rougheye/Blackspotted Rockfish North of 40° 10' N. lat.	***57.4***	***79.3***	***189***	***42%***	***2***
Silvergray Rockfish North of 40° 10' N. lat.	*0.5*	*0.7*	*124*	*<1%*	*0*
Stocks WITHOUT Set-Asides (or Complex-Level Set-Asides)					
Pacific Spiny Dogfish	**315.8**	**399.8**	**1,456**	**28%**	**N/A**
Splitnose Rockfish North of 40° 10' N. lat.	*44.5*	*70.4*	*888*	*8%*	*0*

a/ ACL values are rounded to the nearest whole number.

b/ Only for stocks in a complex. The GMT conducted detailed analysis of existing stock complexes and species contributions in Agenda Item E.3.a, GMT Report 2, November 2021.

c/ Harlequin rockfish has never been assessed and therefore does not have a specified ACL contribution.