

## **6.0 SPECIES CO-OCCURRING WITH THE OVERFISHED SPECIES SUBJECT TO REBUILDING PLANS EVALUATED IN THIS EIS**

### **6.1 Affected Environment**

#### **6.1.1 Species Co-occurring with Bocaccio**

The portion of the West Coast bocaccio stock that is declared overfished occurs on the continental shelf south of 40°10' N latitude. Specifically, overfished bocaccio occur in the 15 fm to 180 fm depth range; however they are most prevalent in the 54 fm to 82 fm depth zone (Appendix A, Table 2-1). Other parademersal shelf species with an overlapping range are considered co-occurring species with bocaccio. The principal co-occurring groundfish species are California scorpionfish (*Scorpaena gutatta*), canary rockfish (*Sebastes pinniger*), chilipepper rockfish (*S. goodei*), cowcod (*S. levis*), lingcod (*Ophiodon elongatus*), vermilion rockfish (*S. miniatus*), widow rockfish (*S. entomelas*), and yelloweye rockfish (*S. ruberrimus*) (Appendix A, Figure 2-4). Secondary co-occurring groundfish species include Mexican rockfish (*S. macdonaldi*), tiger rockfish (*S. nigrocinctus*), and yellowtail rockfish (*S. flavidus*) (Appendix A, Figure 2-4). Other groundfish species that co-occur with the southern bocaccio stock include shelf flatfish species such as Dover sole (*Microstomus pacificus*), English sole (*Parophrys vetulus*), petrale sole (*Eopsetta jordani*), rex sole (*Glyptocephalus zachirus*), rock sole (*Lepidopsetta bilineata*), and Pacific sanddabs (*Citharichthys sordidus*); as well as sablefish (*Anoplopoma fimbria*), which co-occurs with bocaccio during summer months when they migrate onto the continental shelf. Important non-groundfish species that are caught in association with bocaccio in the south include California halibut (*Paralichthys californicus*), California sheephead (*Semicossyphus pulcher*), ocean whitefish (*Caulolatilus princeps*), white seabass (*Atractoscion nobilis*), and spot prawns (*Pandalus platyceros*).

#### **6.1.2 Species Co-occurring with Cowcod**

Cowcod also have a southern distribution on the West Coast within a similar assemblage as bocaccio. However, cowcod have a deeper distribution than bocaccio (out to about 200 fm) and can therefore associate with slope rockfish species such as blackgill rockfish (*Sebastes melanostomus*) and bank rockfish (*S. rufus*) (Appendix A, Table 2-1). Butler *et al.* (1999) report that primary species associations with cowcod vary by gear type. In the Monterey INPFC area north of Pt. Conception, CA, cowcod were most often taken in trawls and caught primarily with bocaccio, chilipepper rockfish, and widow rockfish. In the Conception INPFC area south of Pt. Conception, CA, cowcod were most often caught in hook-and-line and set net fisheries and taken primarily with bocaccio, bronzespotted rockfish (*Sebastes gilli*), and vermilion rockfish.

#### **6.1.3 Species Co-occurring with Widow Rockfish**

Widow rockfish are a shelf species with a coastwide distribution on the U.S. West Coast. Principal species co-occurring on the shelf with widow rockfish include canary rockfish, lingcod, vermilion rockfish, and yelloweye rockfish coastwide (Appendix A, Figure 2-4). Principal shelf species south of Cape Mendocino, CA include California scorpionfish, chilipepper rockfish, and cowcod; while tiger rockfish is included as a principal species in the north. However, widow rockfish have a midwater distribution and are most often caught with Pacific whiting (*Merluccius productus*) and yellowtail rockfish in midwater trawl fisheries.

#### **6.1.4 Species Co-occurring with Yelloweye Rockfish**

Yelloweye rockfish are a principal shelf species coastwide on the U.S. West Coast (Appendix A, Figure 2-4). Yelloweye rockfish are most abundant north of central California with highest densities on the West Coast in waters off of northern Washington (Methot, *et al.* 2003). Therefore, they are most associated with the

principal shelf groundfish species that occur north of Cape Mendocino, CA. They are also caught in close association with Pacific halibut (*Hippoglossus stenolepis*) in recreational and commercial longline fisheries. Casillas *et al.* (1998) note that yelloweye rockfish share many of the same trophic features as quillback rockfish (*Sebastes maliger*). However, their depth distribution is deeper; they occur out to 300 fm and are commonly found out to 220 fm (Appendix A, Table 2-1). Yelloweye rockfish can, therefore, co-occur with some slope rockfish species such as darkblotched rockfish (*Sebastes crameri*) and Pacific ocean perch (*S. alutus*) in the deeper portion of their range.

## 6.2 Criteria Used to Evaluate Impacts

The impacts on co-occurring species from rebuilding alternatives for bocaccio, cowcod, widow rockfish, and yelloweye rockfish mostly accrue from the species' associations in the groundfish fisheries where these species are targeted or incidentally caught. While co-occurring species may inhabit similar habitats and reside in the same area as these four overfished species, they are often caught at disparate rates from their relative ratio of abundance due to species-specific gear selectivities. In fact, one oft-used strategy by the Council and NMFS to reduce fishing mortality on overfished groundfish species is to reduce trip limits and/or OYs for co-occurring species in order to reduce the incidental mortality on the species of concern. The ratio of prescribed trip limits for these co-occurring species is determined from the ratios observed in fishery catches. Therefore, species' co-occurrence in fisheries catches is a key criterion used to evaluate impacts.

If establishing marine protected areas is one of the cornerstones to a species rebuilding plan (i.e., the CCAs for cowcod and the YRCA for yelloweye rockfish), then co-occurring species residing in those specific areas will experience less exploitation. In effect, the current management regime, where depth-based RCAs have been established to reduce mortality of overfished groundfish species, does significantly reduce fishing mortalities of many co-occurring species by closing a wide swath of the West Coast shelf to fishing. To the extent that protection of critical habitats will enhance species' productivity, there would be a commensurate benefit to co-occurring species. It is assumed, under the auspices of the current depth-based management regime, that the extent of an RCA is proportional to the available rebuilding OYs for the most constraining stock in a given area. Therefore, the extent of closed areas or RCAs is used as a criterion to evaluate impacts to co-occurring species as well.

## 6.3 Discussion of Direct and Indirect Impacts

In general, there is a gradient of expected fishing mortalities for co-occurring species from the alternatives analyzed, where Action Alternative 1 provides the highest harvest rates and Action Alternative 4 provides the lowest harvest rates. As rebuilding OYs are reduced, fisheries are increasingly constrained to avoid exceeding these OYs. This, in turn, affects the opportunity to harvest healthy co-occurring species. A sense of the species catch composition in different groundfish sectors by target strategy can be gleaned from information in Appendix B.

### 6.3.1 Impacts to Species Co-occurring With Bocaccio

Bocaccio rebuilding alternatives are likely to affect fishing opportunities for healthy co-occurring stocks, most notably, chilipepper rockfish and other principal shelf rockfish species south of Cape Mendocino, CA, shelf flatfish species, California scorpionfish, California halibut, ocean whitefish, and white seabass. The elimination of spot prawn trawls in 2003 was based on concerns of high bycatch of shelf rockfish, including bocaccio. This should reduce mortality of bocaccio. It is noted that the close association of bocaccio and chilipepper rockfish compelled the Council and NMFS to specify a precautionary reduction in the chilipepper rockfish OY and consequent trip limits in the past to reduce bocaccio mortalities. This may continue to be a bocaccio rebuilding strategy, unless fishermen can determine an effective gear or strategy to selectively harvest chilipepper rockfish. The size of the trawl, non-trawl, and recreational RCAs has largely been based

on the need to reduce bocaccio mortalities; however, the need to reduce mortalities of canary rockfish, cowcod, and yelloweye rockfish contributed to these decisions.

The rebuilding alternatives have varying effects to co-occurring species with the No Action Alternative constraining fisheries the most in the next two years, followed by action alternatives 4, 3, 2, and 1, respectively. The No Action Alternative is predicted to remain the most binding for bocaccio until about 2011, when Action Alternative 4 is projected to have lower harvests under the STATc model (Table 5-6a).

### **6.3.2 Impacts to Species Co-occurring With Cowcod**

The current strategy of protecting critical cowcod habitats and the existing population with the specification of the CCAs, coupled with non-retention regulations to eliminate targeting, has proven to be effective at keeping impacts below the prescribed OYs south and north of Pt. Conception, CA (Butler, *et al.* 2003). The elimination of spot prawn trawls, where cowcod bycatch had been a concern, will aid in cowcod rebuilding by reducing incidental mortalities. Prohibiting most bottom fishing opportunities in the CCAs will protect other demersal shelf and shallow slope species, especially those species that have a sedentary lifestyle like cowcod. Important co-occurring groundfish species that are found in the CCAs include bocaccio, blackgill rockfish, bank rockfish, bronzespotted rockfish, lingcod, vermilion rockfish, and yelloweye rockfish. While canary rockfish occur south of Pt. Conception, CA and have been observed within the CCAs, their abundance in the Southern California Bight is very low. Fishing restrictions in the CCAs may only provide a marginal benefit for canary rockfish.

There is a negligible difference in the expected impacts to co-occurring species from the cowcod action alternatives given the slight difference in OY. The No Action Alternative is not legally viable and therefore, impacts to co-occurring species are not addressed under No Action.

### **6.3.3 Impacts to Species Co-occurring With Widow Rockfish**

The interim strategy for rebuilding widow rockfish has been to eliminate the target widow/yellowtail midwater trawl fishery and to actively manage the whiting fishery for widow bycatch. However, the significantly low OYs under the more conservative rebuilding alternatives and/or more conservative competing Model 7 would require more stringent management measures. Therefore, the effects on co-occurring species vary widely by alternative.

The No Action Alternative for widow rockfish is not legally viable and not addressed further. Action alternatives 1 and 2 under the base model 8 and all the action alternatives under competing Model 9 specify OYs that are high enough in the short term to consider continuing the interim strategy of managing the widow bycatch in the whiting fishery. In these cases, fishing mortalities for Pacific whiting and yellowtail rockfish would be expected to be significantly reduced, with some reduced mortality of canary rockfish, darkblotched rockfish, POP, widow rockfish, and lingcod (Appendix A, Table 6-13). However, OYs under action alternatives 3 and 4 under the base Model 8 and all action alternatives under competing Model 7 would affect a greater number of shelf fisheries including recreational groundfish fisheries, especially under the alternatives with the lowest OYs. The impacts (reduced fishing mortalities) to co-occurring shelf species (Appendix A, Table 2-1 and Figure 2-4) would be consequently greater under these more conservative cases.

### **6.3.4 Impacts to Species Co-occurring With Yelloweye Rockfish**

The interim rebuilding strategy for yelloweye rockfish has been to specify the small footrope restriction for landing shelf rockfish, specify the non-trawl RCA, specify the YRCA for recreational groundfish and recreational Pacific halibut fisheries, and specify non-retention regulations to eliminate targeting. All of these measures are estimated to significantly reduce mortalities on co-occurring shelf species (Appendix A,

Table 2-1 and Figure 2-4). The non-trawl RCA and the YRCA should significantly reduce mortalities of bocaccio, canary rockfish, cowcod, lingcod, and widow rockfish; all of which are under rebuilding.

The No Action Alternative is not legally viable for rebuilding yelloweye rockfish and, therefore, not discussed further. There is only a slight variance in OYs among the yelloweye rockfish action alternatives and, therefore, a slightly varying impact on co-occurring species.

## **6.4 Discussion of Cumulative Impacts**

Bocaccio, cowcod, widow rockfish, and yelloweye rockfish are all shelf species and, therefore, affected by rebuilding plans for other co-occurring overfished shelf species. Canary rockfish rebuilding OYs currently constrain shelf fisheries to the greatest extent coastwide making it unlikely that low OYs for bocaccio and yelloweye rockfish can be attained (Table 5-12). Cowcod rebuilding and, to a lesser extent, bocaccio and yelloweye rebuilding needs will greatly influence fishing opportunities in the Southern California Bight south of Pt. Conception, CA. Access to healthy groundfish and some non-groundfish stocks in the Conception area may, therefore, be limited by all the cowcod action alternatives. However, if the fishing restrictions in the current CCAs continue to provide adequate cowcod protection, then bocaccio or yelloweye rebuilding needs could constrain Conception area fisheries outside the CCAs. Widow rockfish rebuilding needs will significantly affect midwater trawl opportunities for Pacific whiting and yellowtail rockfish. The more conservative action alternatives for rebuilding widow rockfish could constrain most all of the other groundfish sectors operating on the shelf. Widow rockfish could be the most constraining stock for most shelf fisheries under the most conservative alternatives.

### **6.4.1 Potential Unintended Consequences**

Unpredictable trophic interactions can occur as fishing mortalities are selectively reduced for some species under rebuilding. For instance, lingcod rebuilding has undoubtedly increased predation on rockfish and other co-occurring species, since lingcod are such voracious predators. There can also be area displacement in critical habitats by co-occurring species as their numbers increase, which could prevent colonization by juvenile rockfishes. Other trophic interactions, such as the tendency for some small rockfish species to selectively prey on juveniles of larger rockfish species (see Section 5.4.1) can also have the potential unintended consequence of retarding the rebuilding of large-sized overfished rockfish species such as cowcod and yelloweye rockfish.

## **6.5 Summary of Impacts**

### **6.5.1 No Action Alternative**

The No Action Alternative is only legally viable for bocaccio rebuilding since it is predicted to rebuild by  $T_{MAX}$  with at least a 50% probability. There would be a significant impact to co-occurring species in the short term under the No Action Alternative assuming the STATc base model due to the prescribed near-zero harvests (Table 2-1). This alternative would therefore significantly constrain shelf fisheries south of Cape Mendocino, CA with a consequent reduction of fishing mortalities for co-occurring species (Appendix A, Table 2-1 and Figure 2-4). This impact on co-occurring species would probably not be significant in the long term as the OY increases significantly in the next ten years (Table 5-6a).

### **6.5.2 Action Alternative 1**

Action Alternative 1 generally prescribes the highest harvests considered by the Council for rebuilding bocaccio, cowcod, widow rockfish, and yelloweye rockfish. It is unlikely that this level of harvest will be

attained for bocaccio, cowcod, and yelloweye rockfish under the current management regime because of the constraints imposed by the need to rebuild canary rockfish (Table 5-12). Active management of the midwater trawl fisheries targeting Pacific whiting (see section 5.3.3) may be all that is required to restrict widow rockfish bycatch under Action Alternative 1. This alternative assumes the greatest impacts (in terms of higher fishing mortalities) to co-occurring species since it prescribes the highest OYs that may result in the least extensive RCA designations.

### **6.5.3 Action Alternative 2**

Action Alternative 2 is more constraining to shelf fisheries than Action Alternative 1, but may have similar effects as Action Alternative 1 for non-whiting shelf fisheries due to canary rockfish rebuilding constraints. The whiting fishery would be more dramatically constrained under Action Alternative 2, since there is very little available widow rockfish OY if non-whiting fisheries continue to be held harmless. In this case, species incidentally caught in the whiting trawl fishery (i.e., widow, yellowtail darkblotched, POP, canary rockfish, and lingcod) would likely experience less mortality. Widow bycatch rates would have to be similar to that experienced in 2003 (Figure 5-6) to avoid more stringent management of the whiting-directed fishery.

### **6.5.4 Action Alternative 3**

Action Alternative 3 is more constraining than action alternatives 1 and 2. The cowcod OY under Action Alternative 3 is the same as for action alternatives 2 and 4. It is likely that the available widow rockfish OY under this alternative will not accommodate current non-whiting shelf fishing opportunities since widow bycatch probably cannot be managed solely within the whiting fishing sectors under this alternative. Therefore, the expected impacts to co-occurring shelf species are likely to be more significant as RCAs are extended and consequent estimated mortalities of shelf species are lessened.

### **6.5.5 Action Alternative 4**

Action Alternative 4 specifies the lowest OYs considered by the Council for bocaccio, cowcod, widow rockfish, and yelloweye rockfish. However, this is the same cowcod OY specified under action Alternatives 2 and 3. The bocaccio OY under Action Alternative 4, assuming the STATc base model, becomes much more constraining to shelf fisheries south of Cape Mendocino, CA. Current fishing opportunities in these waters would not likely be fully accommodated under this level of harvest (Tables 2-1 and 5-12). Therefore, it is likely that fishing mortalities of species co-occurring with the southern bocaccio stock would be lessened under this alternative. The widow rockfish OY under Action Alternative 4 is near-zero and would result in very stringent management measures on the shelf coastwide. The whiting fishery could not be accommodated at all under this alternative and any non-whiting shelf fishery with an estimated bycatch of widow (Table 5-12) would have to be dramatically displaced or eliminated altogether. Therefore, under this alternative, widow rockfish becomes the most constraining stock for most shelf fisheries on the U.S. West Coast. Management under this alternative would dramatically lower fishing mortalities for all species co-occurring with widow rockfish.

### **6.5.6 Action Alternative 5 (Council-Preferred)**

The Council-Preferred Alternative for rebuilding bocaccio, cowcod, widow rockfish, and yelloweye rockfish will have dramatic effects on the future prospects of co-occurring species residing on the West Coast continental shelf and slope (cowcod and yelloweye rockfish have a deeper distribution). Important fisheries operating on the shelf will be constrained by Council-Preferred rebuilding plans. Nearshore and shelf fisheries for California halibut, Pacific halibut, ridgeback prawn, California sheephead, ocean whitefish, and other co-occurring fisheries will likely be constrained by the need to rebuild these species. Gear restrictions,

such as the mandatory use of Bycatch Reduction Devices (BRDs) or Finfish Excluders in pink shrimp trawls will likely be continued to reduce mortality of these overfished species in that fishery. Such a gear restriction should also be considered for ridgeback prawn trawls that operate south of Point Conception if it can be shown that use of BRDs works to avoid bocaccio, cowcod, canary rockfish, and yelloweye rockfish without overly compromising catch efficiency of ridgeback prawns. Continued use of the CCAs and the YRCA will affect fisheries targeting co-occurring species in the Southern California Bight and in the waters off northern Washington. Target fisheries for spot and ridgeback prawns, California sheephead, and ocean whitefish did occur in the CCAs prior to the cessation of bottom fishing activities in these areas in 2000. Likewise, the YRCA was an area where anglers and commercial longliners targeted Pacific halibut prior to closing the area to these fisheries in 2003. Fishing mortality of Pacific halibut may decrease in future years if this area closure continues.

Implementation of Council-Preferred rebuilding plans for these four species will result in a different dynamic equilibrium of co-occurring species than currently exists. It is beyond the ability of current ecosystem models to predict how inter-specific interactions will be affected by these rebuilding plans and the ensuing abundances of co-occurring species.