2.0 REBUILDING PLAN ALTERNATIVES

Rebuilding alternatives for bocaccio, cowcod, widow rockfish, and yelloweye rockfish within MSA, FMP, and other legal constraints are analyzed in this EIS. The action alternatives were decided by the Council in November 2003 and are compared with a No Action Alternative. There are three rebuilding parameters judged to be strategic in rebuilding overfished groundfish species: T_{TARGET} (the median year when spawning biomass is projected to reach B_{MSY}), P_{MAX} (the probability of the stock attaining B_{MSY} in the maximum allowable time (T_{MAX})), and the harvest control rule (i.e., F or harvest rate). Estimates of these strategic rebuilding parameters under each action alternative and under the No Action Alternative are derived in the most recent stock assessments and rebuilding analyses prepared for these species and presented in Tables 2-1 through 2-4. Relative risk and probability of rebuilding alternatives meeting rebuilding objectives is sensitive to our current state of knowledge and the harvest control rule (i.e., harvest rate) adopted as a rebuilding target and strategy. The harvest control rule varies between rebuilding alternatives analyzed in this rebuilding plan, the best available science in forming decisions, and our current state of knowledge, does not.

Incorporating habitat-protective measures, such as marine protected areas (MPAs) or marine reserves, in the alternatives analyzed in this EIS was recommended by some during scoping for this EIS. Although protecting critical habitats from the potential negative impacts of fishing may be an effective means to rebuild these species, such measures were considered beyond the scope of this EIS, which seeks to analyze the effects of alternative harvest levels on the affected West Coast physical, biological, and socioeconomic environments. However, area closures are considered in this EIS. Currently, depth-based closures are in place to move the fishery off areas where these species primarily reside to reduce the total mortality of adult fish. Additionally, the CCA closure is the primary means to minimize fishing mortality for this depleted stock. The Council and NMFS are developing a policy for habitat-based management that may result in modification to existing closures or other management measures intended to protect habitat deemed important to groundfish production. At issue in the development of this policy is the integration of habitat-based management with the harvest control management strategies that have historically been the foundation for Council actions. NMFS is currently preparing an EIS evaluating programmatic measures designed to identify and describe West Coast groundfish EFH and minimize potential fishing impacts on West Coast groundfish EFH. According to the current schedule, NMFS will publish a draft EIS for this action in February 2005. Publication of the final EIS for this action is scheduled for December 2005, with implementation of any measures pursuant to the EIS occurring in 2006 (contact Mr. Steve Copps, NMFS, 206-526-6187).

Other management measures are also addressed in this EIS, but are not structured in the alternatives analyzed. Such measures include trip, landing, and bag limits; seasonal fishery closures; gear restrictions; and capacity reduction mechanisms. While all of these strategies may aid the rebuilding of overfished groundfish species, they are ancillary to the analysis of the effect of managing the total mortality of these species to alternative levels. Catch monitoring in West Coast groundfish fisheries has been uncertain at best, but is improving with the advent of the NMFS Groundfish Observer Program and the development of the California Recreational Fisheries Survey (CRFS). These nascent monitoring systems have not been in place long enough to use as a "litmus test" of the efficacy of management measures to control total mortality of groundfish species. Therefore, it is anticipated that effective management measures will be adopted in biennial notice and comment rulemaking. Such measures will be analyzed using the best available science. This EIS simply analyzes the alternative harvest levels consistent with the framework provisions adopted in FMP Amendment 16-1. Once rebuilding plans are adopted for overfished groundfish species, it is expected that management measures adopted in subsequent rulemaking will effectively limit harvest to the total mortality levels specified in the rebuilding plans.

2.1 No Action Alternative (40-10 Rule)

Section 4.5.1 in the Groundfish FMP describes the default OY/rebuilding policy, which according to the FMP framework applies to all stocks below B_{MSY}, absent rebuilding plans for overfished species incorporated into the FMP. However, the Council has chosen to manage overfished stocks under interim rebuilding plans, using the targets and parameters described in Section 1.3.1 of this EIS. But the default policy was chosen as the No Action Alternative for the four overfished groundfish species subject to rebuilding plans analyzed in this EIS because it provides the most informative contrast between the consequences and tradeoffs of rebuilding these stocks under the current NSG 1 framework and the default rebuilding strategy formalized in the FMP. In addition, without the framework and policies adopted by Amendments 16-1, 16-2, and 16-3, and the Court remand of the Amendment 12 rebuilding framework, the default OY/rebuilding policy is the only rebuilding strategy currently in the FMP. If the Council chooses to adopt the interim rebuilding plan targets, then the preferred alternative would carry forward the interim policies currently in place. Interim rebuilding targets for the four species subject to rebuilding plans analyzed in this EIS are as follows:

Species	2004 OY (mt)	Strategic Rebuilding Parameters		
		T_{TARGET}	P_{MAX}	Harvest Control Rule (F)
Bocaccio[a/]	250	2021	79%	0.0403
Cowcod	4.8	2095	55%	0.0100
Widow Rockfish[b/]	284	2038	60%	0.0093
Yelloweye Rockfish	22	<2054	>90%	<0.0142

a/ These strategic rebuilding parameter estimates are based on the output from the STATc base model used in the MacCall 2003 rebuilding analysis. The Council chose a bocaccio OY of 250 mt for 2004 with no stated or inferred preference for which model represents the true state of nature. While the OY specification is 250 mt, the Council decided to target a harvest limit of 199 mt; the difference representing a buffer against catch estimation uncertainty.

b/ These strategic rebuilding parameter estimates are based on the output from the base Model 8 used in the He *et al.* 2003 rebuilding analysis. The Council chose a widow rockfish OY of 284 mt for 2004, with no stated or inferred preference for which model represents the true state of nature.

The default OY/rebuilding policy, or precautionary management strategy comprising No Action, is to decrease the OY (or target harvest level) from the ABC using the 40-10 adjustment, which is intended to rebuild stocks to $B_{MSY.}$ (For the stocks analyzed in this EIS, the B_{MSY} proxy is 40% of initial, unfished biomass, or $B_{40\%}$.) This 40-10 adjustment is a scaled decrease in the OY from the ABC as the spawning stock biomass varies downward from $B_{40\%}$, until at $B_{10\%}$, the OY is set to zero (see Figure 2-1). Conversely, when the stock is rebuilt, or at $B_{40\%}$, the OY would be set equal to the ABC. Therefore, the harvest control rule is a variable harvest rate based on the stock's biomass relative to its initial, unfished biomass.

2.1.1 Bocaccio

The No Action Alternative for bocaccio specifies significantly lower harvest levels than any of the action alternatives in 2004-2006 with a zero harvest in 2004 under the STATc base model used in the rebuilding analysis (MacCall 2003a) (Table 2-1). This is a legally viable rebuilding alternative since the T_{TARGET} rebuilding year is estimated to occur prior to T_{MAX} with a rebuilding probability greater than 70% (P_{MAX} = 77.6% under the STATc model and higher under the competing STARb1 and STARb2 models). However, zeroing fishing mortality until stock abundance exceeds 10% of unfished biomass is extremely punitive to California shelf fisheries, especially given the ramping up of the harvest rate as the stock rebuilds. This rebuilding strategy would, therefore, lead to much greater instability in California fisheries relative to any of the action alternatives, which specify alternative constant harvest rate strategies.

2.1.2 Cowcod

The No Action Alternative for cowcod specifies a zero fishing mortality strategy for the foreseeable future (Table 2-2), and perhaps considerably longer, given the extremely poor recruitment estimated in the assessment (Butler, *et al.* 1999) and rebuilding analysis (Butler and Barnes 2000). The input data for these cowcod analyses were too sparse to provide the same stochastic results and long-term projections to better understand, whether the No Action Alternative is even legally viable (i.e., it is uncertain whether the stock could rebuild by 2099 [= T_{MAX}]) with at least a 50% probability using the default 40-10 harvest control rule). However, it is reasonable to conclude that the No Action Alternative is similar to the action alternatives for cowcod in that minimal fishing mortalities are required to achieve rebuilding. In fact, the difference in harvest levels between all cowcod rebuilding alternatives is negligible and should be considered zero harvest strategies.

2.1.3 Widow Rockfish

The No Action Alternative for widow rockfish under Model 8 does specify some harvest in 2004-2006, since the stock's current level of depletion is greater than 10% of its unfished biomass. In fact, the No Action harvest level for widow rockfish is about four to five times greater than that under the most liberal action alternative (Table 2-3). There is a zero percent probability of attaining B_{MSY} in the maximum time allowable (T_{MAX} = 2042), since the stock's spawning biomass does not reach the biomass target in the almost 100-year projection horizon in the most recent rebuilding analysis (He, *et al.* 2003a). Therefore, the No Action Alternative for widow rockfish does not comport with legal rebuilding mandates. The same is true when considering either of the competing models (Models 7 or 9) in the rebuilding analysis.

2.1.4 Yelloweye Rockfish

The No Action Alternative specifies slightly higher yelloweye rockfish harvests in 2004-2006 than the action alternatives (Table 2-4). However, there is a zero percent probability of attaining B_{MSY} in the maximum time allowable (T_{MAX} = 2070), since the stock's spawning biomass does not reach the biomass target in an almost 350-year projection horizon (i.e., the stock fails to rebuild by 2351—the last year projected in available model runs). Therefore, the No Action Alternative for yelloweye rockfish does not comport with legal rebuilding mandates.

2.2 Action Alternative 1

Action Alternative 1 generally specifies the most liberal, legally-compliant harvests considered by the Council for rebuilding these four species. While this action alternative may constrain fisheries less than the other alternatives considered, it does entail the highest risk of not rebuilding by T_{MAX}. Therefore, of the considered action alternatives, Action Alternative 1 has the lowest, short-term negative economic impacts to fisheries and fishing communities and the highest biological risk to these overfished stocks.

2.2.1 Bocaccio (P_{MAX} = 60%)

Action Alternative 1 for bocaccio specifies a rebuilding strategy estimated to have a 60% probability of rebuilding by T_{MAX}. Annual harvest levels under the STATc base model from the most recent rebuilding analysis by MacCall (2003a) range from 373 mt to 376 mt during 2004-2006. However, major model uncertainties in the rebuilding analysis compelled the STAR Panel (Helser, *et al.* 2003) and the SSC to recommend consideration of the competing STARb1 and STARb2 models. The range of 2004-2006 harvests is, therefore, extended to 295 mt to 713 mt under this alternative (Table 2-1). The target rebuilding year (T_{TARGET}) for bocaccio under this alternative is 2025, 2027, or 2031 depending on whether the STATc,

STARb1, or STARb2 model, respectively, represents the true state of nature. Bocaccio harvest rates (F) specified under Action Alternative 1 are 0.0615, 0.0914, or 0.0643 under rebuilding models STATc, STARb1, or STARb2, respectively.

2.2.2 Cowcod (P_{MAX} = 55%)

Action Alternative 1 for cowcod specifies a rebuilding strategy estimated to have a 55% probability of rebuilding by T_{MAX}. Unlike other species rebuilding plans analyzed in this EIS, which specify a constant harvest rate strategy, the cowcod rebuilding plan contemplates a constant annual harvest strategy. This action alternative specifies an annual harvest of 2.4 mt in the Conception INPFC area. The GMT recommended, and the Council adopted, the same harvest limit for the Monterey International North Pacific Fishery Commission (INPFC) area. Therefore, this alternative specifies a 4.8 mt constant annual harvest limit for the Conception and Monterey INPFC areas combined (Table 2-2), which encompasses waters off California south of 40°30' N latitude. The estimated T_{TARGET} under this alternative is 2095.

2.2.3 Widow Rockfish (P_{MAX} = 60%)

Action Alternative 1 for widow rockfish specifies a rebuilding strategy estimated to have a 60% probability of rebuilding by T_{MAX}. Annual harvest levels under the base Model 8 from the most recent rebuilding analysis by He *et al.* (2003a) range from 284 mt to 289 mt during 2004-2006. However, major model uncertainties in the rebuilding analysis compelled the STAR Panel (Conser, *et al.* 2003) and the SSC to recommend consideration of the competing Models 7 and 9. The range of 2004-2006 harvests is, therefore, extended to 180 mt to 513 mt under this alternative (Table 2-3). The target rebuilding year (T_{TARGET}) for widow rockfish under this alternative is 2038, 2039, or 2034, depending on whether Model 8, 7, or 9, respectively represents the true state of nature. Widow rockfish harvest rates (F) specified under Action Alternative 1 are 0.0093, 0.0067, or 0.0146 under rebuilding models 8, 7, or 9, respectively.

2.2.4 Yelloweye Rockfish (P_{MAX} = 60%)

Action Alternative 1 for yelloweye rockfish specifies a rebuilding strategy estimated to have a 60% probability of rebuilding by T_{MAX}. Annual harvest levels specified under this alternative range from 27 mt to 29 mt during 2004-2006 (Table 2-4). The target rebuilding year (T_{TARGET}) for yelloweye rockfish under this alternative is 2067, and the harvest rate is 0.0167.

2.3 Action Alternative 2

Action Alternative 2 is one of the two intermediate action alternatives considered by the Council in November 2003 for detailed analysis in this EIS. Short-term negative socioeconomic impacts to fishermen and fishing-dependent communities are greater than those under Action Alternative 1, but less than those specified under the other action alternatives. Consequently the risk of not rebuilding by T_{MAX} is less than Action Alternative 1, but greater than the other action alternatives.

2.3.1 Bocaccio (P_{MAX} = 70%)

Action Alternative 2 for bocaccio specifies a rebuilding strategy estimated to have a 70% probability of rebuilding by T_{MAX}. Annual harvest levels under the STATc base model from the most recent rebuilding analysis by MacCall (2003a) range from 306 mt to 309 mt during 2004-2006. However, major model uncertainties in the rebuilding analysis compelled the STAR Panel (Helser, *et al.* 2003) and the SSC to recommend consideration of the competing STARb1 and STARb2 models. The range of 2004-2006 harvests is, therefore, extended to 250 mt to 633 mt under this alternative (Table 2-1). The target rebuilding year

(T_{TARGET}) for bocaccio under this alternative is 2023, 2024, or 2029, depending on whether the STATc, STARb1, or STARb2 model, respectively represents the true state of nature. Bocaccio harvest rates (F) specified under Action Alternative 2 are 0.0498, 0.0801, or 0.0541 under rebuilding models STATc, STARb1, or STARb2, respectively.

2.3.2 Cowcod (P_{MAX} = 60%)

Action Alternative 2 for cowcod specifies a rebuilding strategy estimated to have a 60% probability of rebuilding by T_{MAX}. Unlike other species' rebuilding plans analyzed in this EIS that specify a constant harvest rate strategy, the cowcod rebuilding plan contemplates a constant annual harvest strategy. This action alternative specifies an annual harvest of 2.1 mt in the Conception INPFC area. The GMT recommended and the Council adopted the same harvest limit for the Monterey INPFC area. Therefore, this alternative specifies a 4.2 mt constant annual harvest limit for the Conception and Monterey INPFC areas combined (Table 2-2), which encompasses waters off California south of 40°30' N latitude. The estimated T_{TARGET} under this alternative is 2090.

2.3.3 Widow Rockfish (P_{MAX} = 70%)

Action Alternative 2 for widow rockfish specifies a rebuilding strategy estimated to have a 70% probability of rebuilding by T_{MAX}. Annual harvest levels under the base model 8 from the most recent rebuilding analysis by He *et al.* (2003a) range from 212 mt to 216 mt during 2004-2006. However, major model uncertainties in the rebuilding analysis compelled the STAR Panel (Conser, *et al.* 2003) and the SSC to recommend consideration of the competing Models 7 and 9. The range of 2004-2006 harvests is, therefore, extended to 111 mt to 430 mt under this alternative (Table 2-3). The target rebuilding year (T_{TARGET}) for widow rockfish under this alternative is 2035, 2035, or 2031, depending on whether Model 8, 7, or 9, respectively represents the true state of nature. Widow rockfish harvest rates (F) specified under Action Alternative 2 are 0.0070, 0.0041, or 0.0122 under rebuilding models 8, 7, or 9, respectively.

2.3.4 Yelloweye Rockfish (P_{MAX} = 70%)

Action Alternative 2 for yelloweye rockfish specifies a rebuilding strategy estimated to have a 70% probability of rebuilding by T_{MAX}. Annual harvest levels specified under this alternative range from 26 mt to 28 mt during 2004-2006 (Table 2-4). The target rebuilding year (T_{TARGET}) for yelloweye rockfish under this alternative is 2062, and the harvest rate is 0.0161.

2.4 Action Alternative 3

Action Alternative 3 is one of the two intermediate acton alternatives considered by the Council in November 2003 for detailed analysis in this EIS. Short-term negative socioeconomic impacts to fishermen and fishing-dependent communities are greater than those under Action Alternative 1 or 2, but less than those specified under Action Alternative 4. Consequently, the risk of not rebuilding by T_{MAX} is less than Action Alternative 1 or 2, but greater than Action Alternative 4.

2.4.1 Bocaccio (P_{MAX} = 80%)

Action Alternative 3 for bocaccio specifies a rebuilding strategy estimated to have an 80% probability of rebuilding by T_{MAX}. Annual harvest levels under the STATc base model from the most recent rebuilding analysis by MacCall (2003a) range from 237 mt to 242 mt during 2004-2006. However, major model uncertainties in the rebuilding analysis compelled the STAR Panel (Helser, *et al.* 2003) and the SSC to recommend consideration of the competing STARb1 and STARb2 models. The range of 2004-2006 harvests

is, therefore, extended to 199 mt to 541 mt under this alternative (Table 2-1). The target rebuilding year (T_{TARGET}) for bocaccio under this alternative is 2020, 2022, or 2027, depending on whether the STATc, STARb1, or STARb2 model, respectively represents the true state of nature. Bocaccio harvest rates (F) specified under Action Alternative 3 are 0.0383, 0.0670, or 0.0430 under rebuilding models STATc, STARb1, or STARb2, respectively.

2.4.2 Cowcod (P_{MAX} = 60%)

The cowcod specifications under Action Alternative 3 are the same as under Action Alternatives 2 and 4.

2.4.3 Widow Rockfish (P_{MAX} = 80%)

Action Alternative 3 for widow rockfish specifies a rebuilding strategy estimated to have an 80% probability of rebuilding by T_{MAX}. Annual harvest levels under the base Model 8 from the most recent rebuilding analysis by He *et al.* (2003a) range from 123 mt to 126 mt during 2004-2006. However, major model uncertainties in the rebuilding analysis compelled the STAR Panel (Conser, *et al.* 2003) and the SSC to recommend consideration of the competing Models 7 and 9. The range of 2004-2006 harvests is, therefore, extended to 30 mt to 333 mt under this alternative (Table 2-3). The target rebuilding year (T_{TARGET}) for widow rockfish under this alternative is 2032, 2031, or 2028, depending on whether Model 8, 7, or 9, respectively represents the true state of nature. Widow rockfish harvest rates (F) specified under Action Alternative 3 are 0.0040, 0.0011, or 0.0094 under rebuilding models 8, 7, or 9, respectively.

2.4.4 Yelloweye Rockfish (P_{MAX} = 80%)

Action Alternative 3 for yelloweye rockfish specifies a rebuilding strategy estimated to have an 80% probability of rebuilding by T_{MAX}. Annual harvest levels specified under this alternative range from 25 mt to 27 mt during 2004-2006 (Table 2-4). The target rebuilding year (T_{TARGET}) for yelloweye rockfish under this alternative is 2058, and the harvest rate is 0.0153.

2.5 Action Alternative 4

Action Alternative 4 generally specifies the most conservative, legally-compliant harvests considered by the Council for rebuilding these four species. While this action alternative may constrain fisheries more than the other alternatives considered, it does entail the lowest risk of not rebuilding by T_{MAX}. Therefore, of the considered action alternatives, Action Alternative 4 has the highest, short-term negative economic impacts to fisheries and fishing communities and the lowest biological risk to these overfished stocks.

2.5.1 Bocaccio (P_{MAX} = 90%)

Action Alternative 4 for bocaccio specifies a rebuilding strategy estimated to have a 90% probability of rebuilding by T_{MAX}. Annual harvest levels under the STATc base model from the most recent rebuilding analysis by MacCall (2003a) range from 130 mt to 137 mt during 2004-2006. However, major model uncertainties in the rebuilding analysis compelled the STAR Panel (Helser, *et al.* 2003) and the SSC to recommend consideration of the competing STARb1 and STARb2 models. The range of 2004-2006 harvests is, therefore, extended to 127 mt to 414 mt under this alternative (Table 2-1). The target rebuilding year (T_{TARGET}) for bocaccio under this alternative is 2018, 2020, or 2025, depending on whether the STATc, STARb1, or STARb2 model, respectively represents the true state of nature. Bocaccio harvest rates (F) specified under Action Alternative 4 are 0.0209, 0.0496, or 0.0271 under rebuilding models STATc, STARb1, or STARb2, respectively.

2.5.2 Cowcod (P_{MAX} = 60%)

The cowcod specifications under Action Alternative 4 are the same as under Action Alternatives 2 and 3.

2.5.3 Widow Rockfish (P_{MAX} = 90%)

Action Alternative 4 for widow rockfish specifies a rebuilding strategy estimated to have a 90% probability of rebuilding by T_{MAX}. The annual harvest level under the base Model 8 from the most recent rebuilding analysis by He *et al.* (2003a) is 4 mt during 2004-2006. However, major model uncertainties in the rebuilding analysis compelled the STAR Panel (Conser, *et al.* 2003) and the SSC to recommend consideration of the competing Models 7 and 9. The range of 2004-2006 harvests is, therefore, extended to 0 mt to 213 mt under this alternative (Table 2-3). The target rebuilding year (T_{TARGET}) for widow rockfish under this alternative is 2028, 2030, or 2026, depending on whether Model 8, 7, or 9, respectively represents the true state of nature. Widow rockfish harvest rates (F) specified under Action Alternative 4 are 0.0001, 0.0000, or 0.0060 under rebuilding Models 8, 7, or 9, respectively.

2.5.4 Yelloweye Rockfish (P_{MAX} = 90%)

Action Alternative 4 for yelloweye rockfish specifies a rebuilding strategy estimated to have a 90% probability of rebuilding by T_{MAX}. Annual harvest levels specified under this alternative range from 23 mt to 25 mt during 2004-2006 (Table 2-4). The target rebuilding year (T_{TARGET}) for yelloweye rockfish under this alternative is 2054, and the harvest rate is 0.0142.

2.6 Action Alternative 5 (Council-Preferred)

The Council chose its preferred alternative for each species rebuilding plan at its April 5-9, 2004 meeting in Sacramento, California. The impacts of the preferred alternative, which combines rebuilding strategies, falls within the range of impacts predicted for the alternatives described above.

2.6.1 Bocaccio (P_{MAX} = 70%, Using the Base Model STATc)

The Council-preferred Alternative for bocaccio (Action Alternative 2) specifies a rebuilding strategy estimated to have a 70% probability of rebuilding by T_{MAX}. The Council also chose the base model STATc as the most plausible for rebuilding bocaccio given its endorsement by the stock assessment author. Annual harvest levels under the STATc base model from the most recent rebuilding analysis by MacCall (2003a) range from 306 mt to 309 mt during 2004-2006. The target rebuilding year (T_{TARGET}) for bocaccio under this alternative is 2023 and the harvest control rule (F) is 0.0498.

2.6.2 Cowcod (P_{MAX} = 60%)

The Council-preferred Alternative for cowcod (Action Alternatives 2, 3, and 4) specifies a rebuilding strategy estimated to have a 60% probability of rebuilding by T_{MAX}. Unlike other species' rebuilding plans analyzed in this EIS that specify a constant harvest rate strategy, the cowcod rebuilding plan contemplates a constant annual harvest strategy. This action alternative specifies an annual harvest of 2.1 mt in the Conception INPFC area. The GMT recommended, and the Council adopted, the same harvest limit for the Monterey INPFC area. Therefore, this alternative specifies a 4.2 mt constant annual harvest limit for the Conception and Monterey INPFC areas combined (Table 2-2), which encompasses waters off California south of 40°30' N latitude. The estimated T_{TARGET} under this alternative is 2090. The Council also chose the obligatory use of the CCAs (see Section 5.1.1.2) as a primary strategy for rebuilding cowcod.

2.6.3 Widow Rockfish (P_{MAX} = 60%, Using the Base Model 8)

The Council-preferred Alternative for widow rockfish (Action Alternative 1) specifies a rebuilding strategy estimated to have a 60% probability of rebuilding by T_{MAX}. The Council also chose the base Model 8 as the most plausible for rebuilding widow rockfish given its endorsement by the stock assessment team. Annual harvest levels under the base Model 8 from the most recent rebuilding analysis by He *et al.* (2003a) range from 284 mt to 289 mt during 2004-2006. The target rebuilding year (T_{TARGET}) for widow rockfish under this alternative is 2038. The widow rockfish harvest rate (F) specified under the Council-preferred Alternative is 0.0093.

2.6.4 Yelloweye Rockfish (P_{MAX} = 80%)

The Council-preferred Alternative for yelloweye rockfish (Action Alternative 3) specifies a rebuilding strategy estimated to have an 80% probability of rebuilding by T_{MAX}. Annual harvest levels specified under this alternative range from 25 mt to 27 mt during 2004-2006 (Table 2-4). The target rebuilding year (T_{TARGET}) for yelloweye rockfish under this alternative is 2058, and the harvest rate is 0.0153. The Council also adopted the optional use of the YRCA (see Section 5.1.1.4) as a strategy to aid in yelloweye rockfish rebuilding.

2.7 Alternatives Considered, But Eliminated From Further Detailed Analysis

Any alternatives with less than a 50% probability of rebuilding to B_{MSY} within T_{MAX} are not compliant with the MSA as interpreted in a 2000 Federal Court ruling (*Natural Resources Defense Council* v. *Daley, April 25, 2000, U.S. Court of Appeals for the District of Columbia Circuit*). Such alternatives are not analyzed in this rebuilding plan.

The Council further limited the range of alternatives for detailed analysis at its November 2003 meeting. Those alternatives with a 50% probability of rebuilding to B_{MSY} within T_{MAX}, as well as those alternatives with a zero percent fishing mortality rate, were rejected from detailed analysis.[1/] A 50% rebuilding probability was considered too risky a long term rebuilding strategy for any of these species, while the economic harm to West Coast fisheries and fishing communities resulting from a zero fishing strategy was considered too high a cost to pay to rebuild these stocks.

The Mixed Stock Exception is a provision in National Standard Guideline (NSG) 1 allowing an OY above the overfishing level as long as the harvest meets certain standards. Harvesting one species of a mixed-stock complex at its optimum level may result in the overfishing of another stock component in the complex. The Council may decide to permit this type of overfishing only if all of the following conditions are satisfied:

(a) The Council demonstrates by analysis that such action will result in long-term net benefits to the Nation.
(b) The Council demonstrates by analysis that mitigating measures have been considered and that a similar level of long-term net benefits cannot be achieved by modifying fleet behavior, gear selection/configuration, or other technical characteristic in a manner such that no overfishing would occur.
(c) The resulting rate or level of fishing mortality will not cause any species or evolutionarily significant unit thereof, to require protection under the Endangered Species Act.

1/ One exception is the Action Alternative 4 for widow rockfish under the assumption that Model 7 represents the true state of nature. This scenario specifies a zero harvest and harvest rate with an estimated 82.8% probability of rebuilding by T_{MAX}.

However, the Council chose not to consider a mixed stock exception alternative in this analysis when advised by NMFS that a mixed stock exception would not be supported for any of these species. Therefore, despite its legal availability, a mixed stock exception alternative is not further analyzed herein.

Lastly, there is a limited range of cowcod alternatives for analysis. Cowcod was the first of the overfished West Coast groundfish stocks so declared after adoption of FMP Amendment 11, which was responsive to the mandates of the 1996 SFA. Many of the tools used to analyze rebuilding effects, such as the Punt rebuilding program (Punt 2002), were not available when this stock was assessed, and a rebuilding analysis was prepared. Coupled with the data limitations in the assessment, cowcod stock status is poorly estimated, and the typical suite of rebuilding projections are unavailable. Consequently, there is no way, short of conducting a new assessment, to analyze alternatives with probabilities of rebuilding to B_{MSY} within T_{MAX} greater than 60%. However, it is noted that a new cowcod assessment is contemplated in 2005. The SSC recommended to the Council in April 2004 that the assessment team should "attempt to select a model whose output can be used in the rebuilding software" (i.e., the Punt rebuilding program). Such a modeling change in the cowcod assessment would therefore allow the same statistical treatment of rebuilding alternatives provided for the other overfished groundfish species managed under the FMP.

2.8 Summary of the Alternatives for Each of the Four Overfished Species

2.8.1 Bocaccio

There is a wide range of harvest levels and consequent effects between the bocaccio rebuilding alternatives. The OYs projected in the short term (2004-2006) range from 0 mt to 115 mt under the No Action Alternative, (which is a viable rebuilding strategy according to the NSGs) depending on which model is judged to most closely resemble a true state of nature. A near-zero exploitation standard would significantly constrain commercial and recreational fisheries south of Cape Mendocino and would be akin to the actions taken in 2003, when most fisheries were closed in the 20 fm to 150 fm depth zone to manage for a 20 mt OY. In fact, the presence of a strong 1999 year class (MacCall 2003b) might constrain fisheries to a greater extent, since that cohort is now recruited to fisheries and more likely to be incidentally caught. The range of short- term harvests under the action alternatives is 130 mt to 713 mt annually with a difference of about 13 years in predicted rebuilding times, depending on the rebuilding model (Table 2-1). While this range of harvests under the action alternatives has a proportional range of effects, based on the scale of constraints imposed on fisheries to manage to these total catch OYs, actual constraints are likely to be based on other species' rebuilding plans, most notably, canary rockfish. It is unlikely the higher end of the harvest range could ever be attained in the near future, as long as fisheries are constrained by the need to rebuild canary rockfish, cowcod, yelloweye rockfish, and other depleted groundfish species co-occurring with bocaccio. Such effects are more thoroughly evaluated in Chapters 5, 6, and 8 of this EIS.

2.8.2 Cowcod

There is a negligible difference in the harvest levels and subsequent effects of the No Action Alternative and the two action alternatives for rebuilding cowcod. All alternatives are essentially the same, prescribing zero or near-zero harvests and complete avoidance strategies. Realistically, the zero harvest under the No Action Alternative and the most liberal annual harvest level of 4.8 mt in the Conception and Monterey INPFC areas combined are functionally the same, given our ability to detect such small impacts in the affected fisheries. Therefore, this analysis will not strive to differentiate effects of cowcod rebuilding alternatives, but will instead focus on biological effects of rebuilding and critique management strategies designed to avoid cowcod.

2.8.3 Widow Rockfish

There is significant uncertainty in widow rockfish rebuilding projections, which confounds the decision on the most appropriate rebuilding strategy. The base Model 8 in the assessment and the rebuilding analysis was considered the most plausible by the Stock Assessment Team (STAT) Team, STAR Panel, and SSC. Accordingly, the Council interim harvest rate of 0.0093 set for 2004 fisheries estimates an OY of 284 mt with a 60% probability of rebuilding within T_{MAX} (Action Alternative 1, Table 2-3). The target rebuilding year under this strategy is 2038. However, a more risk-averse approach with higher rebuilding probabilities quickly diminishes rebuilding yields and disrupts current fisheries. For instance, Action Alternative 4 specifies a strategy with a P_{MAX} of 90% and a negligible harvest rate, which projects near-zero rebuilding yields. The widow rockfish stock would rebuild 10 years faster under this alternative relative to Action Alternative 1. Action Alternatives 2 and 3 provide some yields of widow rockfish to accommodate incidental bycatch, with intermediate risk relative to Action Alternatives 2 and 3. The No Action Alternative is not viable for widow rockfish, since it does not rebuild within the maximum allowable time specified in the NSGs.

2.8.4 Yelloweye Rockfish

There is little difference in the No Action Alternative and the action alternatives to rebuild the coastwide yelloweye rockfish stock, at least in the short-term (2004-2006) projections provided in Table 2-4. The 4 mt to 6 mt difference in harvest limits between the most liberal and most conservative alternatives analyzed is arguably not within the current data monitoring systems' capability to precisely differentiate (see Chapter 7). Additionally, the differential short-term effects to the physical (habitat) and socioeconomic environments (fisheries and fishing communities) are negligible. Biological effects of the alternatives are more significant. The difference in predicted rebuilding times between the most liberal and most conservative action alternative is 13 years (Table 2-4). The No Action Alternative for rebuilding yelloweye rockfish is not legally viable, given the stock does not rebuild in the maximum allowable time (T_{MAX}) according to the NSGs. This is due to the escalating harvest rate, as biomass increases under the 40-10 rule.

TABLE 2-1. Harvest specifications (2004-2006 total catch OYs) and strategic rebuilding parameters associated with alternative rebuilding models for bocaccio under each analyzed rebuilding alternative.[a/] (Page 1 of 1)

Harvest Specifications and Strategic Rebuilding Parameters	Rebuilding Alternatives				
	No Action	1	2	3	4
			STATc (base model)		
2004 OY (mt)[b/]	0	376	306	237	130
2005 OY (mt)	7	375	307	240	134
2006 OY (mt)	28	373	309	242	137
P_{MAX}	77.6%	60%	70%	80%	90%
T_{TARGET}	2025	2025	2023	2020	2018
F rate	NA	0.0615	0.0498	0.0383	0.0209
			STARb1		
2004 OY (mt)[b/]	13	710	625	526	392
2005 OY (mt)	67	713	633	538	407
2006 OY (mt)	115	704	630	541	414
P_{MAX}	90.4%	60%	70%	80%	90%
T_{TARGET}	2019	2027	2024	2022	2020
F rate	NA	0.0914	0.0801	0.0670	0.0496
			STARb2		
2004 OY (mt)[b/]	0	295	250	199	127
2005 OY (mt)	0	304	259	209	134
2006 OY (mt)	0	308	265	215	140
P_{MAX}	83.7%	60%	70%	80%	90%
T_{TARGET}	2026	2031	2029	2027	2025
F rate	NA	0.0643	0.0541	0.0430	0.0271

a/ Bocaccio harvest specifications and strategic rebuilding parameters are based on the most recent rebuilding analysis by MacCall (2003b).

b/ These 2004 OYs are projected from the most recent rebuilding analysis and are not necessarily the harvest specification decided by the Council for 2004. The Council chose a bocaccio OY of 250 mt for 2004 with no stated or inferred preference for which model represents the true state of nature. While the OY specification is 250 mt, the Council decided to target a harvest limit of 199 mt; the difference representing a buffer against catch estimation uncertainty.

TABLE 2-2. Harvest specifications (2004-2006 total catch OYs) and strategic rebuilding parameters associated with cowcod rebuilding alternatives.[a/] (Page 1 of 1)

Harvest Specifications and Strategic Rebuilding Parameters	Rebuilding Alternatives		
	No Action	1	2, 3, & 4
2004 OY (mt)[b/]	0	4.8	4.2
2005 OY (mt)	0	4.8	4.2
2006 OY (mt)	0	4.8	4.2
P_{MAX}	NA	55%	60%
T_{TARGET}	NA	2095	2090
F rate	NA	0.0100	0.009

a/ Cowcod harvest specifications and strategic rebuilding alternatives are based on the most recent rebuilding analysis by Butler and Barnes (2000). The OYs in the rebuilding analysis are only for the Conception INPFC area. The GMT recommended the same OY for the Monterey INPFC area; therefore, the OYs depicted in the table are double those presented in the rebuilding analysis.

b/ These 2004 OYs are projected from the rebuilding analysis and are not necessarily the harvest specification decided by the Council for 2004. The Council chose a cowcod OY of 4.8 mt for the Conception and Monterey areas combined (i.e., Action Alternative 1) with no stated or inferred preference for a rebuilding alternative.

TABLE 2-3. Harvest specifications (2004-2006 total catch OYs) and strategic rebuilding parameters associated with alternative rebuilding models for widow rockfish under each analyzed rebuilding alternative. a/ (Page 1 of 1)

Harvest Specifications and Strategic Rebuilding Parameters	Rebuilding Alternatives				
	No Action	1	2	3	4
			Model 8 (base model)		
2004 OY (mt)[b/]	1,439	284	212	123	4
2005 OY (mt)	1,359	285	213	124	4
2006 OY (mt)	1,317	289	216	126	4
P_{MAX}	0%	60%	70%	80%	90%
T_{TARGET}	NA (>2102)	2038	2035	2032	2028
F rate	NA	0.0093	0.0070	0.0040	0.0001
			Model 7		
2004 OY (mt)[b/]	1,088	180	111	30	0
2005 OY (mt)	1,016	180	111	30	0
2006 OY (mt)	974	181	111	30	0
P_{MAX}	0%	60%	70%	80%	90% [c/]
T_{TARGET}	NA (>2102)	2039	2035	2031	2030 [c/]
F rate	NA	0.0067	0.0041	0.0011	0
			Model 9		
2004 OY (mt)[b/]	1,888	501	418	323	206
2005 OY (mt)	1,799	505	423	327	209
2006 OY (mt)	1,755	513	430	333	213
P_{MAX}	0%	60%	70%	80%	90%
T_{TARGET}	NA (>2102)	2034	2031	2028	2026
F rate	NA	0.0146	0.0122	0.0094	0.0060

a/ Widow rockfish harvest specifications and strategic rebuilding alternatives are based on Model 8, the base model in the most recent stock assessment (He *et al.* 2003a) and rebuilding analysis (He *et al.* 2003b).

b/ These 2004 OYs are projected from the most recent rebuilding analysis and are not necessarily the harvest specification decided by the Council for 2004. The Council chose a widow rockfish OY of 284 mt for 2004 with no stated or inferred preference for which model represents the true state of nature.

c/ There is only an 82.8% probability of rebuilding widow rockfish with a zero harvest under Model 7. $T_{TARGET} = T_{MIN}$ in this scenario.

TABLE 2-4. Harvest specifications (2004-2006 total catch OYs) and strategic rebuilding parameters associated with yelloweye rockfish rebuilding alternatives.[a/] (Page 1 of 1)

Harvest Specifications and Strategic Rebuilding Parameters	Rebuilding Alternatives				
	No Action	1	2	3	4
2004 OY (mt)[b/]	27	27	26	25	23
2005 OY (mt)	29	28	27	26	24
2006 OY (mt)	31	29	28	27	25
P_{MAX}	0%	60%	70%	80%	90%
T_{TARGET}	NA (>2351)	2067	2062	2058	2054
F rate	NA	0.0167	0.0161	0.0153	0.0142

a/ Yelloweye rockfish harvest specifications and strategic rebuilding alternatives are based on the most recent rebuilding analysis by Methot and Piner (2002b).

b/ These 2004 OYs are projected from the most recent rebuilding analysis and are not necessarily the harvest specification decided by the Council for 2004. The Council chose a yelloweye rockfish OY of 22 mt for 2004 with no stated or inferred preference for which model represents the true state of nature.

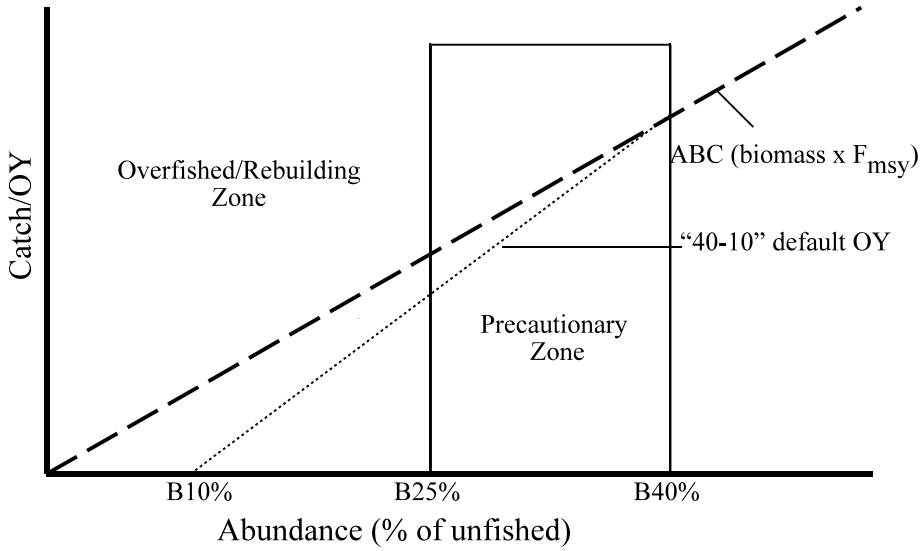

FIGURE 2-1. Relationship of the acceptable biological catch (ABC) of groundfish and the biomass-based reduction of the optimum yield (OY) for groundfish species managed under the Pacific Coast Groundfish Fishery Management Plan default policy.